



Master's degree thesis

LOG950 Logistics

Structural changes needed for a port to turn from a transportation node to a logistics center: a theoretical review

Seyedalireza Babolhavaeji

Number of pages including this page: 75

Molde, 24.05.2012



Mandatory statement

Each student is responsible for complying with rules and regulations that relate to examinations and to academic work in general. The purpose of the mandatory statement is to make students aware of their responsibility and the consequences of cheating. Failure to complete the statement does not excuse students from their responsibility.

Please complete the mandatory statement by placing a mark <u>in each box</u> for statements 1-6 below.		
1.	I/we hereby declare that my/our paper/assignment is my/our own work, and that I/we have not used other sources or received other help than is mentioned in the paper/assignment.	<input checked="" type="checkbox"/>
2.	I/we hereby declare that this paper <ol style="list-style-type: none"> 1. Has not been used in any other exam at another department/university/university college 2. Is not referring to the work of others without acknowledgement 3. Is not referring to my/our previous work without acknowledgement 4. Has acknowledged all sources of literature in the text and in the list of references 5. Is not a copy, duplicate or transcript of other work 	Mark each box: 1. <input checked="" type="checkbox"/> 2. <input checked="" type="checkbox"/> 3. <input checked="" type="checkbox"/> 4. <input checked="" type="checkbox"/> 5. <input checked="" type="checkbox"/>
3.	I am/we are aware that any breach of the above will be considered as cheating, and may result in annulment of the examination and exclusion from all universities and university colleges in Norway for up to one year, according to the Act relating to Norwegian Universities and University Colleges, section 4-7 and 4-8 and Examination regulations section 14 and 15.	<input checked="" type="checkbox"/>
4.	I am/we are aware that all papers/assignments may be checked for plagiarism by a software assisted plagiarism check	<input checked="" type="checkbox"/>
5.	I am/we are aware that Molde University college will handle all cases of suspected cheating according to prevailing guidelines.	<input checked="" type="checkbox"/>
6.	I/we are aware of the University College's rules and regulation for using sources	<input checked="" type="checkbox"/>

Publication agreement

ECTS credits: 30

Supervisor: Naima Saeed

Agreement on electronic publication of master thesis

Author(s) have copyright to the thesis, including the exclusive right to publish the document (The Copyright Act §2).

All theses fulfilling the requirements will be registered and published in BrageHiM, with the approval of the author(s).

Theses with a confidentiality agreement will not be published.

I/we hereby give Molde University College the right to, free of charge, make the thesis available for electronic publication: yes no

Is there an agreement of confidentiality? yes no

(A supplementary confidentiality agreement must be filled in)

- If yes: **Can the thesis be online published when the period of confidentiality is expired?** yes no

Date:

Preface

This master thesis is accomplished as the final part of the Master of Science in Logistics at Molde University College. The thesis is written in the period from December 2011 to May 2012. The main supervisor for this study is Ms. Naima Saeed.

Basically, the thesis attempts to shed light on impacts of logistics centers on ports.

Acknowledgements

My sincere gratefulness goes to Professor Naima Saeed for her valuable supervision through helpful criticism, comments and suggestions.

I would like to take this opportunity to thank the professors Halrald Hjelle and Halvard Arntzen, who inspired me significantly during last two years.

I would also like to convey a special thanks to all the professors in Molde University College for sharing their knowledge.

A big thanks goes to my mother Fatemeh Bamdadi and my brother Omid Babolhavaeji, who mean the world to me, for supporting me during my studies in Norway.

Abstract

Having proper understanding of ports operations as well as utilizing methods of development by the means of value-added service, could change role of a port from a transportation node to an efficient point in a transportation chain. Trend of globalization has been followed by an increase in level of demand for freight transportation and thereafter establishing suitable port services. Developments of transportation chains, logistics and progress of these networks have enhanced the sustainable condition and level of transportation. What is assumed to increase efficiency in the performance of the ports is to provide an environment for the activities that can meet high potential, reduce cost and increase replacement speed in parallel with the development of international business. Today, use of logistic activities and providing areas in the coasts of ports are important as a general process for improving the ports. Currently, competitiveness in the ports relies on providing centers to develop the equipment for utilizing value added services. To provide such a center, a facility should be customized to logistical operations, in which there could be a warehouse, freight forwarder, repair depot and different service providers, including value added services. The center is called logistics center. Logistics and supply chain processes have high efficiencies in increasing performance potential of the ports. Regarding performance of the ports, logistic parks in the coasts of ports play an essential role in supporting the economic development aiming at absorbing local and global clients for offering value added services. The function of these centers can be investigated from different aspects. Their effects on environment and traffic and on the services of ports are quite evident. The mentioned centers provide an infrastructure for increasing the efficiency of the ports. Economic effects of this system are noticeable based on modern supply and general economy. Competition between the ports has resulted in establishment and development of these centers in hinterlands of the ports so that the ports might be placed in a high level of logistics and transportation services. Moreover, the function of these centers in the field of commercial logistics might be estimated according to the costs and obtained revenues based on the level of offered services. One of the reasons for establishing a logistics center is to provide the facilities for increasing the level of traffic. The efficiency of this system in reducing the traffic of the roads, in urban and inter-urban transportation is highly emphasized. Concentration on establishment of a logistics center is a policy which is today addressed by global managers due to its contribution to achieve the competitive advantage, so that they can take an essential step in achieving business and economic goals to meet the growing demands.

Contents

1) Chapter One: Principle.....	1
1.1) Introduction.....	1
1.2) Problem statement and research questions	4
1.3) Personal interests in the topic	4
1.4) Conceptual and theoretical issues	4
1.5) Research questions.....	4
1.5.1) Strategies.....	4
1.5.2) Application of the strategies	5
1.5.3) Competitive advantage	5
1.6) Method of analysis.....	6
1.7) Research design	6
1.8) Structure of thesis	6
2) Chapter Two: A Review of Technical Literature	7
2.1) Introduction.....	7
2.2) Marine Transportation	7
2.3) Marine Transportation Systems	8
2.3.1) Components of marine transportation systems.....	9
2.4) Containerization.....	13
2.4.1) Stages of containerization growth.....	14
2.5) Existing condition in marine traffic	14
2-6: Logistics and functions	15
2.6.1) Main Concept and Processes of Transportation & Logistics.....	16
2-7) Supply Chain:	18
2-8) Globalization and ports:	19
2-9) Transportation planning:	20
2-10: Intermodalism:	20
2.11) Container Terminals	21
2.11.1) Value-added services at container terminals	22
2.12) Change of functions at ports	24
2.12.1) Key factors in change of ports function.....	24
2.12.2) Change of competitive advantage.....	25
2.13) Conclusion	26
3) Chapter Three: Development of Ports with Logistic Centers.....	27
3.1) Introduction.....	27
3.2) Logistic Operations at Ports.....	27
3.2.1) Logistics & Economic Sections of a Port	29
3.3) Port Logistic Activity Zones as Specialized Logistic Platforms	30
3.3.1) Definition of Logistic Platforms	30
3.3.2) Logistic Lines and Port Operational Zones	31
3.3.3) Different Logistic Platforms	32
3.4) Logistic demand in the port logistic centers	35
3.4.1) Investigation of centralized logistic chains in the ports.....	36
3.4.2) General logistic demand in the port logistic centers.....	37
3.5) Services & Facilities in Ports Logistic Centers	38
3.5.1) Strategic Goals in Logistic Centers	38
3.5.2) Preliminary definition of service supply in port logistic centers.....	38
3.5.3) Intermodal facilities in the port logistic centers.....	39

3.5.4) different services in logistic centers.....	40
3.5.5) Supply and demand in available services in port logistic centers	42
3.5.6) Functions of Logistic Centers	45
3.6) Selection criteria of the location for logistic centers	46
3.7) Management and planning in port logistic centers	46
3.7.1) Marketing for logistic centers	46
3.7.2) Planning for port logistic centers	50
3.7.3) Planning process for port logistic centers in a general framework.....	50
3.8) Development problems of logistic centers in the ports.....	50
3.8.1) Limited Infrastructures	50
3.8.2) Poor performance of specialized logistic services companies.....	51
3.8.3) High price of land for development of logistic centers	51
3.8.4) Inefficiency of administrative procedures	51
3.8.5) Low level of service supply in the ports	51
3.9) Development process of ports logistic centers	51
3.9.1) Systematic planning and development of logistic centers	51
3.9.2) Organizing incentive mechanisms	52
3.9.3) Development of free trade zones	52
3.9.4) Investment for the development of infrastructures	54
3.9.5) Development of the professional companies supplying logistic services.....	54
3.9.6) Governance issues.....	55
3.10) Conclusion	55
4) Chapter Four: Function of Port Logistics Centers	56
4.1) Introduction.....	56
4.2) Investigating the effects of logistics centers	56
4.3) Effect of logistic centers on the ports	57
4.3.1) Evaluation of the effects of logistic centers on the port areas	57
4.3.2) Logistic centers and their effect on the port services.....	58
4.3.3) Evaluation of logistics centers in the port traffic	58
4.4) Effect of port logistics centers on the commercial network	59
4.5) Economic effects of logistics centers	60
4.5.1) Characteristics of economic effects	60
4.6) Competition of port logistics centers	60
4.7) Effect of logistics centers on transportation	61
4.8) Contribution of logistics centers to achieve a competitive advantage.....	62
5) Conclusion	63
Reference List:	64

1) Chapter One: Principle

1.1) Introduction

Completion of the Second World War in which many countries were involved was followed by the beginning of reconstruction period during which the countries and nations spent their energy, time and resources for growth and development. In this regard, global business and production has had a sustainable development since post-war years and clearly some countries had more contributions due to high motivation for national progress, optimal and efficient utilization of resources and tagging importance to research, development and assessment of the previous operations (Korpi, 1989)

Along with the development of global business, interdependence of the countries has increased due to limited resources. Therefore, transportation industry can be considered as a major tool for growth and development that increases the grounds to access to welfare and facilities. As a result, a mutual and interconnected relation between transportation industry and global business and development growth may be considered. As we know, the terrorist attack on September 11 was a shock for the development of global business and international transportation industry that resulted in world economic crisis in the recent years (Brakman et al., 2006).

Producers need transportation to get their raw materials, and to send their final product. There are four forms of transport that they can choose namely railway, road, airway and sea. "Maritime transportation is the major conduit of international trade, but the share of its weight borne by sea is hard to come by. In countries with long shorelines or navigable rivers, or in countries consisting of multiple islands, water transportation may play a significant role also in domestic trades, e.g., Greece, Indonesia, Japan, Norway, Philippines, and USA."(Christiansen, et al. 2007)

As the most important and widely used part of transportation industry, marine transportation systems link the countries to global business. They are also major and basic tools for national, regional and global economic development. Reduction of tariffs as well as reduction of other impediments of global business caused by enacting new rules has led to increasing development of global economy and business. Besides this economic development, the countries started planning for different resources throughout the world in their agenda due to several reasons including access to cheaper resources and reduction of production costs. Therefore, the global development of business was guaranteed by assigning a new role for marine transportation due to different advantages including its cost effectiveness (Rondinellia & Berry, 2000).

High tendency to marine transportation has resulted in high profitability of this industry. The countries providing marine transportation gained the most benefits from such an overflowing profit and made their positions more stable as the providers and receivers of such services (Rondinellia & Berry, 2000).

The advent of container shipping and development of different containers, besides intermodalism, for shipping different cargoes with their specific characteristics have improved the advantage and superiority of marine transportation. Today, most of the countries are developing the necessary infrastructures for development and compatibility of container shipping (Hummels, 2007).

Containers have been used in shipping for more than 50 years. They have not only influenced marine transportation, but also global business. Transportation of cargoes and goods using container-based methods has imposed its requirements on marine transportation systems and other transportation modes in lower levels. Utilizing ports with specific facilities and equipment for loading, unloading, containers has a major advantage

for the countries having marine transportation systems. Capacities and efficiencies of vessels and ports as well as their applied equipment have increased considerably and therefore, costs, speed, security and efficiency of transportation network cannot be compared to those of the past. More than 50 years have passed since the time the first ship began its trip into the sea with 58 containers. In 2005, this movement achieved about 520 million twenty-foot equivalent units (TEU) in the ports of the world (United nations conference on trade and development, 2007) (Wang & Cullinane, 2006).

As Crainic and Kim stated in their book (2007), “Containers are usually both faster and cheaper to load and unload than the general cargo that is stuffed in them. This means that containers can efficiently be loaded and unloaded several times between their origin and their final destination. The performance of container-based transportation in international trade has had some remarkable consequences. Ports and container terminals have been built or profoundly modified to accommodate container ships and efficiently perform the loading, unloading, and transfer operations”.

Development of transportation and logistic chains and the considerable progress made in designing and planning such networks have increased the sustainable condition of transportation. An appropriate insight on marine transportation has improved the trends of the services in the ports and has also provided extensive facilities and equipment due to the efficiency of the ports including development of logistic activities in ports as the most important element (Bichoua & Graya, 2004).

Business development and transportation are highly related. Globalization and development of world economic markets accelerate business exchanges and increase transportation processes. Globalization of world economy indicates a sustainable development within the recent 20 years that has improved international commerce and has doubled its growth rate due to global production. (Janelle, 1997).

However, globalization increases instability and variable development (short term economic periods). Logistics and transportation factors are the most important reasons for instability in the globalization process. Shortcomings in transportation, services and logistic infrastructures of the developing countries lead to a situation in which land transportation costs between countries are doubled (ESCAP, 2005).

Currently, commerce in the developed countries indicates the largest contribution of international transactions. Exchanges between the traditional poles, i.e., US, Japan and EU, form one-third of the world commerce. However, the presence of developing countries with their fundamental potentials for development makes us to have a look to the world economic alliance. The partnership of Southeast Asia in the international production and commerce has increased since 1980s and its current power is an undeniable reality. Recent agreements between the main economic poles and new developing regions including China or Latin America change world economic order in the 21st century (Gilpin, 2000).

About 40% of logistic costs include the costs of transportation sector (Kasilingam & Reddy, 1995). Therefore, analysis of transportation process and establishment of an environment to reduce this cost is totally needed. Transportation includes both downstream movements from the resources of raw materials to the factory or middle warehouse and upstream movements from factory (production processing centers) to consumers or distribution centers. A broad range of planning and operational issues gets involved in the transportation process. Determining fleet size and the routes of transportation vehicles, planning personnel duties, designing the network, determining and positioning of terminals and transportation hubs are some of the issues related to planning. (Friend & Neil Jessop, 1977)

Routing is concentrated on selecting the most optimum direction in which the structure of route, distances and route capacity are evaluated. The duties of workforce are also planned

for optimal use in transportation sections and subsections. Network design, route determination process, terminal priority and distribution of facilities are crucial. Reduction of costs and transportation time, on time delivery, minimum fluctuation in the transportation time, accessibility of transportation integrated services which is constituted of different modes, availability of items such as warehouse systems and efficient equipment are considered as the requirements of transportation industry (Kim, Barnhart, Ware, & Reinhardt, 1999).

Since the major part of goods exchange between countries is performed through the sea and considering the advantages of marine transportation as compared to other transportation modes, ports of the world are considered as the main centers for goods entry and exit. Therefore, ports should be capable to meet the demands and shall be developed and equipped towards adaptation of demand and supply. Ports, as the important connecting chain of transportation networks and systems, have considerable effects on the global economy. Supplying the fundamental needs of each country, providing transit grounds for shipments to other countries are the roles of ports (Notteboom & Rodrigue, 2007).

As mentioned, ports have significant effects on the global economy. During last decades, ports operators and managers provided a new attitude of ports activities and introduced the ports as complexes in dynamic networks of production, distribution, international logistics of goods and services (ESCAP, 2002)

Ports managers in order to provide port facilities and services modified their passive role to provide logistics and distribution services to their customers, by applying modern management and information technology.

Ports managers and operators provided different viewpoints on the activity type of the ports. They have shifted from a passive role in providing port facilities and services to the role of cooperating in the international trade systems. In addition to the routine activities performed in their ports, logistics and distribution services are also offered to customers. These services are performed by using modern tools and scientific management through information technology (Notteboom & Rodrigue, 2005).

Therefore, the goal of managers and owners of the ports is to optimize the operations and processes in the ports especially considering the rapid change of international transportation so that the competitiveness of ports can be improved by reducing the handling time of port operations and port costs which may be fulfilled by using managerial systems, facilities and equipment, information technology and exchange of advanced data (Tongzon & Heng, 2005).

What is considered to increase efficiency in the performance of the ports is to provide an environment for the activities that can meet high potential, reduce cost and increase replacement speed in parallel with the development of international business. Today, use of logistic activities and providing areas in the coasts of ports are important as a general process for improving the ports. Competitiveness in the ports relies on providing logistic facilities and equipment for utilizing value added services. Logistics and supply chain processes have high efficiencies in increasing performance potential of the ports (Tongzon & Heng, 2005).

“The market environment in which ports operate has changed dramatically, and this continuous process of change raises questions on the role of port authorities. Structural changes in international trade, transport and shipping on strategic and operational issues in the framework of port management have impacts. A successful port (authority), like a successful actor, must be prepared to constantly adopt new roles in order to cope with the changing market environment.” (Notteboom and Winkelmanns, 2001)

Companies seek a suitable place for packing, labeling, assembling and other value added activities. Ports with their useful characteristics have been suitable places within the recent

20 years for the aforesaid activities. Currently, all industrial and developing countries codify extensive plans to equip and develop activities in their ports as required items for the development of economic plans (Tongzon & Heng, 2005).

1.2) Problem statement and research questions

The following problem implies a base for this thesis that my research seeks to explore: How does a port function when it has been developed to a logistics center? OR in other words, what are impacts of logistics centers on ports?

1.3) Personal interests in the topic

Since most of the commodity exchanges in the world, including my country, Iran, is being done by the sea and due to shipping advantages compared to other modes of transport, ports around the world are considered as the main focal centers for flow of goods. Besides, container ports in Iran are among the fastest growing ports in the world. Hence, I am very enthusiastic to have a research on a topic, in which I can see the links towards development of Iranian ports.

1.4) Conceptual and theoretical issues

One theoretical issue could be what practically the efficiency in port terminals is. Evidently, there are a number of integrated issues, as an illustration, impact of logistics centers in ports services, in the logistics business, in terminals capacity and traffic, and on and operational flow and finally on competitive advantage of ports.

1.5) Research questions

Providing a reasonable answer for the above mentioned problem, three main research questions have to be addressed:

1.5.1) Strategies

Question 1: Which logistics/SCM related strategies can be adopted by a port?

The first research question is seeking to explore any strategic changes in the role of ports. Therefore, under certain circumstances, the following descriptions have to be tracked.

Value-added services within the ports:

Various services can be provided for customers at ports; as for instance, assembly, packaging, labeling, and repairing and so forth.

In order to improve productivity in ports performance, the space should be created for the activities that can meet the growing global trade, reduce costs and increase the speed of the movements. Today, using logistics activities in hinterlands is a progressive process towards ports development. Nowadays, competitiveness in ports relies on building logistics centers and utilizing logistics facilities for establishing value-added services (ESCAP 2002).

International companies are looking for a good place for such services and during last twenty years, ports hinterlands were proper locations to provide them.

Intermodal services: By advent of containerization along with intermodal services has led the shipping to a higher level of excellence.

As logistics of any company requires continuous modification of supply chain in order to reduce costs and improve efficiency, there is also a tendency at ports to enhance international and domestic delivery system. Logistics centers at ports could successfully solve this problem offering a number of intermodal services: trucking, intermodal terminal management and so on.

An intermodal logistics freight terminal is used to exchange cargo from one mode of transportation to one another. According to Tongzon (1994), a logistic terminal can also increase the efficiency of a port. Terminal performance is a crucial component of any waterfront change aimed at improving port efficiency. The influence of terminal performance on port efficiency provides a justification in order to give high priority to improving terminal performance. As an instance, the crane productivity (TEUCH) plays a substantial role in efficiency of the terminal and eventually in efficiency of the port.

The intermodal logistics freight terminal has storage space and equipment to receive freight and load it to a different vehicle. Intermodal center also renders services like: consolidation with other incoming cargo, or separation into smaller outbound shipments (Middendorf, 1998)

Additional intermodal services:

- door-to-door services (including transcontinental, regional and dedicated option of freight delivery)
- State-of-the-art technology - communicational technology; assures fast and accurate exchange of freight bill information between carriers, allows to have up-to-date information of cargo location (Schneider National Inc., 2011).
- Variety of trucking services; import/export drayage, intermodal contract drayage, temperature-controlled equipment, emergency and expedited service, over-the-road trucking, etc. (Eagle Intermodal Services, 2011).
- Exclusive containers
- Maintenance facilities

1.5.2) Application of the strategies

Question 2: How these strategies have been applied by different ports

Second research question tries to exemplify the strategies by providing live cases. It will be earned by dissection of the following description.

Practical application of the strategies:

Those ports, that are attempting to turn to logistics and distribution centers in order to obtain a sustainable competitive advantage, are struggling to conduct more and more value-added services; as mentioned above, assembly, packaging, labeling, and repairing, and so on.

1.5.3) Competitive advantage

Question 3: Whether the implementation of these strategies has contributed to get a competitive advantage or not?

And finally, the last research question wonders how the positive impacts of logistics center come to play the role towards obtaining the competitive advantage. Basically, this question is fairly related to the previous one, due to the fact that it follows the same trends to achieve the most proper answer. In this stage, I explore whether the competitive advantage is gained through all of the efforts in order to establish the logistics ports.

In order to shed light on the question, the description below will move on;

Impacts of logistics center on ports:

Some possible impacts which logistics center may have on ports will be discussed, in other words by accomplishing those fundamental changes at ports that we aimed to catch, a number of consequences will emerge, as for instance, logistics center will definitely affect economy of the port.

Any other possible impacts could be on the following areas:

Competition of logistics centers

willingness of investors to invest their money

Etc.

1.6) Method of analysis

The research will basically be a qualitative research, expressing a conceptual work which will conduct a descriptive theoretical review.

As mentioned earlier, the decision framework will be to consider the transformation of ports to logistics centers, fundamentally through a survey on the foresaid descriptive elements in logistics ports

When it comes to categorization in port research, I can classify my work in the field of strategic management & Logistics/SCM Discipline bases.

1.7) Research design

Generally speaking, the study specifically touches upon the value-added logistics activities and for cases I attempted to come up with an instance of the real life.

I also intended to bring up economic impacts of logistics systems on the ports, as well as impacts on ports services, traffic and environment. I urged myself to tackle the question of how the efficiency of logistics center can be measurable, through an investigation of whether these different strategies have contributed to achieve a competitive advantage “the common goal”.

1.8) Structure of thesis

This study deals with collecting the studies regarding change of ports and transformation to logistic centers as well as providing patterns from different viewpoints. The second chapter explains aspects regarding marine transportation, transportation planning, fundamentals of logistics and supply chain and the needs of world markets. The third chapter directly refers to the issue of logistic centers to provide an understanding about them. It classifies different centers based on the strategies assigned for the activity area of

the centers and refers to generalities concerning the facilities and duties. The fourth chapter provides subjects relevant to the performance evaluation of these centers in the ports, and finally, contribution of the strategies to achieve a competitive advantage will be investigated.

2) Chapter Two: A Review of Technical Literature

2.1) Introduction

In order to study a plan or a project, the generalities related to the issues on which it may be relied should firstly be defined. On this basis, in the first chapter of this study, the study points to the generalities that will be used in the next chapters as main subjects and keywords.

What is going to be provided in this chapter includes generalities concerning the procedures of marine transportation, ports, logistic centers and the processes of logistics and supply chain. Globalization process and the effects of logistics and transportation are considered as important items. In this chapter, the activities and services of third generation of the ports are described due to the importance of the activities by reviewing marine transportation systems and by having a look at its elements. Afterwards, containerization and its development stages are reviewed and some information regarding the available processes in port and sea traffic is provided. Explicitly, general processes of global logistics effects on the ports are investigated and explained by providing definitions. Intermodalism, value added services in the ports and container terminals are the other issues for which some definitions are provided. At the end, competitiveness standards are investigated by an emphasis on the change of duties of the ports.

2.2) Marine Transportation

Marine transportation is the most important part of transportation industry sector that is most used and bonds countries and world trade. It is regarded as an important and fundamental appliance for economic growth at national, regional and world levels. Decrease of tariffs and other obstacles for international trade through legislation of new rules, has led to utmost growth of economy and world trade, especially from the 1960s onward. Along with such economic growth, due to various reasons, countries inserted use of various resources at various places all over the world. Consequently and obviously, prominent role of world trade growth will be played by marine transportation due to its various advantages including its cost-effectiveness.

The result of great tendency toward marine transportation has led to profiting of the industry. Countries that create advantage for transportation passages, obtain the utmost benefits from this profit. They stabilize their position providing desirable facilities and paths. (JUHEL, 1999)

Emergence of container transportation and development of different kinds of containers beside intermodalism for transportation of consignments has promoted superiority of marine transportation to higher levels (Roodsari, 2006).

Development of transportation and logistic chains and its surprising progress in design and planning of the networks have upgraded the level of transportation. Perspective of marine transportation as well as functions of chains responds to the growingly trade in the world.

2.3) Marine Transportation Systems

Marine transportation systems, like other transportation systems consist of transportation links and transportation nodes. Due to lower transportation costs, energy savings and higher capacity of vessels, they have superiority compared to other modes (Roodsari, 2006).

Due to utmost extension of industrial, manufacturing and trading centers, shipping lines have remarkably been extended and have caused establishment of interconnected networks among various ports all over the world. However, there is an integrated demand for such system throughout the world, which is based on minimizing costs incurred by final consumer, raise of stability and reliability, raise of value and characteristics affiliated to transportation of goods from the place they are produced to the place where they are consumed. (JUHEL, 1999)

World trade growth and marine trade growth have similar increase or decrease and their interaction is totally evident due to their interrelationship. (UNCTAD, 2009) Diagram 2-1 indicates the subject in detail.

Blue line: Percentage of marine trade growth

Red line: Percentage of world trade growth

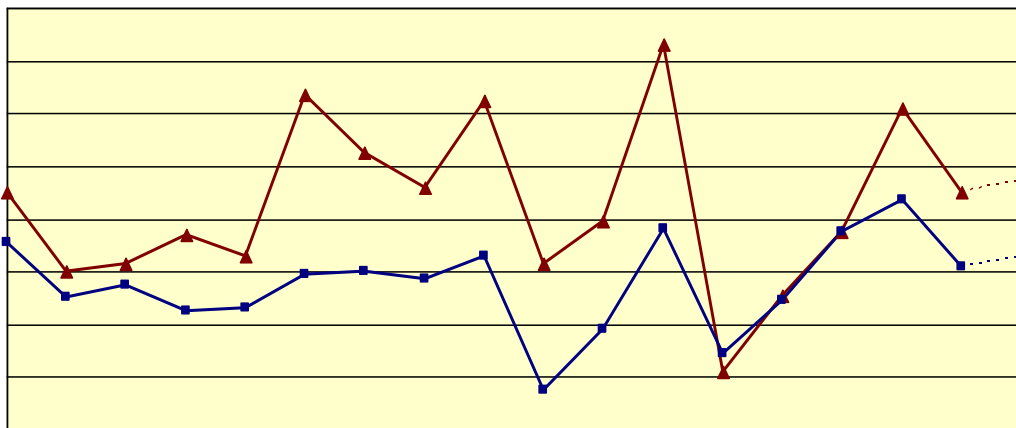


Figure 2-1: Diagram of growth in world trade and marine trade (UNCTAD, 2009)

For instance, severe decrease of world trade was in 2001, which is surprisingly evident in figure 2-1, has revealed the effect of terrorism attack in Sept 2001 in destruction of the world trade twin towers.

Due to systemic characteristics of marine transportation, growth in world trade eventually causes marine transportation system start compatible growth. Consequently, cost-effectiveness and technological progresses drive ship manufacturing companies toward construction of larger ships with higher capacity. Figure 2-2 indicates type of response and final expectation in marine transportation systems. Considering the figure 2-2, it is assumed that trade growth and exchange of goods at national and international levels is a base for economic development and growth. The following diagram indicates marine transportation respond and its interaction with world economic growth. (Roodsari, 2006)

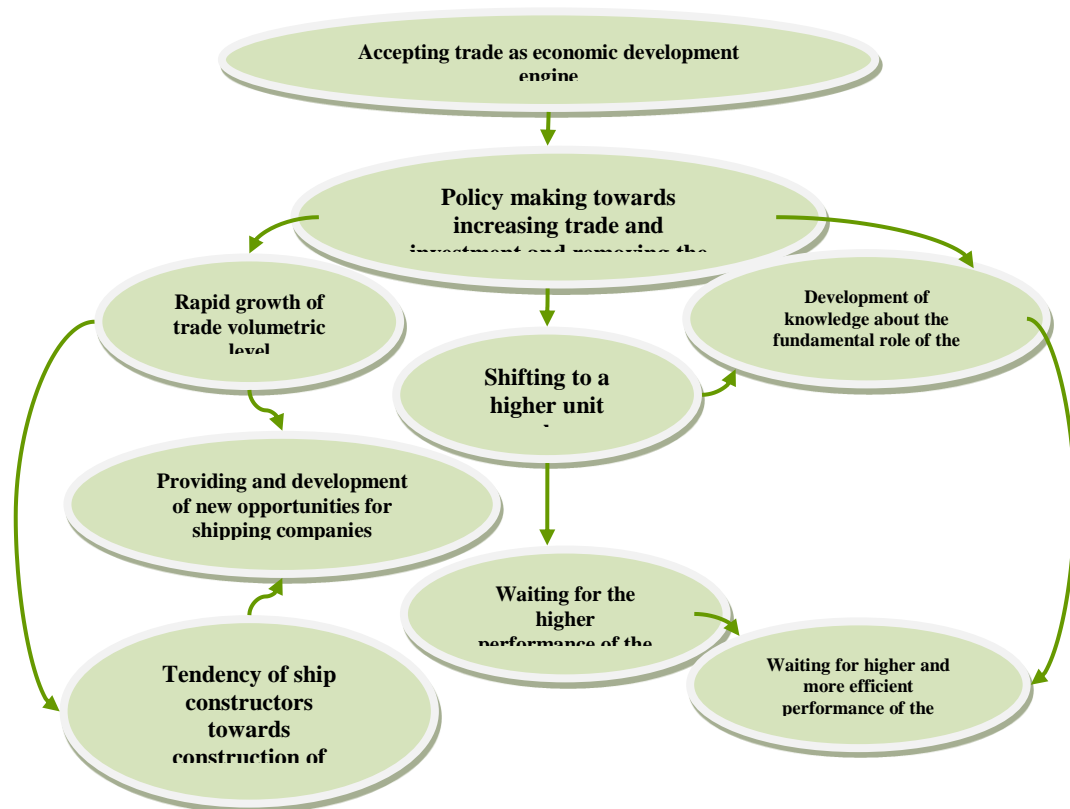


Figure 2.2) Response of Marine Systems to Economic Development (Roodsari, 2006)

2.3.1) Components of marine transportation systems

The comprising components and facilities of marine transportation systems can be divided into the following categories in order to have appropriate knowledge of the systems. The following division is based on types of activities and functions of marine transportation. (Mansouri, 2004)

A.Ports:

In a general definition, a port can be defined as a system connecting land to sea. Port is a place where required facilities are provided to render service to goods and ships and desirable accessibility of land has been devised behind the port. Port is the most critical part in marine transportation systems. A great part of costs incurred by owners of consignments consists of port expenses. A great part of such expenses is incurred due to delays and loss of time caused by inefficiency of port operational services and shipping lines. (ESCAP, 2005)

On the whole, in ports, facilities are laid out in particular places in order to fulfill the requirement for a particular kind of goods i.e. special way of unloading and loading of the goods. The facilities are called “Terminal”. Terminals of goods in bulk, general goods, container goods, oil and dangerous goods are among the most common kinds of terminals. Main operations of ports can be summarized as follows. (ESCAP, 2005)

- Operations of ships and vehicles
- Process of unloading and loading
- Arrangement and distribution of goods
- Transfer of goods to other transportation modes

- Receipt of goods from other transportation modes
- Value-added services
- Services for control, maintenance and protection of ports

Therefore, improvement of each operation and process that has been mentioned above is among aims of runners and owners of ports. Consequently, they may improve competitive status of ports through decrease of time of port operations and port costs, which is possible through application of management systems, information technology, facilities and equipment and exchange of advanced data. Furthermore, efficiency and capacity of ports have a determining role in export and import of a country. Efficiency or inefficiency of ports affects producers and consumers because connection of sea to land is performed through ports.

Table 2-1: Evolution of port function in the 1st to 3rd generations of ports (UNESCAP, 2002)

	Ports of the first generation	Ports of the second generation	Ports of the third generation
Time period	Before 1960	After 1960	After 1980
Main goods	Conventional cargo	Conventional cargo and bulk cargo	bulk cargo and unit cargo containerization
Strategy for development of ports	Connection point of sea to land transportation system	Development of centers for production and transportation	Logistic centers and chain of world trade communication
Range of activity	Cargo handling, storage and navigation	Range of the first generation plus distribution of load, industries related to ships and development of port areas	Range of the first generation plus second generation plus cargo information, distribution of cargo, logistic activity, forming terminals and distribution centers
Forming structures and specifics	Individual activity in port/official liaison between ports and customers	Closer relationship between ports and customers, necessity for convergence among port activities, lack of positive cooperation between ports and self-sufficient societies	Establishment of port collaborative system, concentration of trade chains and relationship between ports and self-sufficient societies and development of port structure
Nature of productivity	Exclusive offer of simple services, distribution of load and low value-added	Cargo processing/complicated services and increase of value-added-distribution of value-added	Process of cargo and information, distribution of cargo and information, and combination of

			various services and distribution and value-added
Key factors	Labor/capital	Capital	Technical knowledge and technology

According to UNESCAP (2002), attitude, strategy and policy for ports development by planners, managers and operators of the ports of the third generation have been designated based on a different viewpoint and attitude. They view ports as a dynamic complex that is being developed in a complicated complex of production and distribution network of goods and services at international level.

Based on such way of thinking, managerial view of this generation of ports has changed from passive role of offering port facilities and services to active role of collaboration with world trade process.

Recent efforts of ports managers have finally led to promotion and development of trade and transportation activities, resulted in marketing and value-added activities. According to results of these efforts, ports have changed to logistic centers for international trade. This generation of ports has appeared from the 1980s due to worldwide development of container trade and multidimensional transportation and growing needs of world trade. Corresponding activities and services of the third generation of specialized ports are different and comprehensive. They are divided into the following separate categories:

1. Common and traditional services of ports: The concept of the ports of the third generation doesn't mean that the activities of the ports of the first and second generations have halted in this kind of port. Instead, natural and common activities of ports including discharging and loading have remained and shall remain as main structure of the activities of these ports. However, the difference is that considering the third generation of ports, further to common activities, logistics and distribution services are also offered to the port customers. Moreover, traditional and common services are controlled and guided in the ports of the third generation using modern equipment and scientific management through electronic systems and information technology and communication.
2. Industrial services: There are two types of industrial services in the ports of the third generation. One is technical and industrial services related to ships such as ship repairs and other technical and engineering services concerning ships. These services have great importance for modern ports in the area of marketing so that they should guaranty high productivity and raise validity of ports for customers with respect to decrease of economic and technical risks. The second type of services is dealing with technical and industrial services related to goods. Main objective of port is to provide techniques to handle goods or giving permission to others for establishment of such industries inside the port that is to increase arrival and exit of goods in ports and their value-added accordingly.

According to UNCTAD (1999), there is another division of ports, called 'fourth generation'. The fourth-generation ports are physically separated but linked through common operators or through a common administration, for instance merging of the ports of Copenhagen Port and Malmo Port.

Ships:

Ships are means of transportation of goods and passengers and carrying out sea missions. Capacity is placed higher than other transportation systems. Nowadays, ports

are adapting their facilities with sizes of ships. Upon change of capacity of ships, investment in ports is being spent on compatibility of facilities and infrastructures of ports with sizes of ships.

The characteristic of container ships during the half a century period usage, has rapidly been changed. Reduction of costs, compatibility of maximized loading space by ships with size of containers, increase of transportation speed, easiness in arrangement, loading and discharging of containers, and finally, promotion of ship operations in ports and elevation of tonnage and capacity of transportation are included among the elements that have caused swift changes in development of container ships. (Christiansen et al., 2007)



Figure 2-3: A view of a new generation of containerships (Los Angeles Times, 2011)

Among specifications of these ships we can point out capacity of TEUs and FEUs. All container ships are divided into six various generations based on their capacity.

According to Brinkmann (2011), increase in sizes of container ships is still continued and there is a high demand for such ships all over the world. Some elements influence sizes of container ships in market and growth of capacity of such ships. The most important elements are namely

- Capability of container terminals for provision of piers and desirable docking with new ships
- Operational power and capacity of terminals for passage of containers (discharging and transfer or transfer and loading) at optimum time
- Appropriate hinterland accessibilities of terminals with increasingly new volume
- Technical problems and container terminals limitations

C. Shipbuilding and Repair:

Manufacturing and Maintenance are strategic parts of marine transportation systems. Nowadays, maintenance management has a great role in all industrial sectors, equipments

and ships. Moreover, ship manufacturers act upon development of ships, considering market requirements and new engineering plans. (Roodsari, 2006)

D. Navigational Aid Systems and Equipments

These systems include such facilities and equipments as vessels, alarm lamps, maps, hydrographic and environmental data, telecommunication and electronic communications and positioning systems by means of which safety and security coefficient of the system will be promoted. Bodily protection of the personnel of marine transportation, consignments, goods and assets of companies should be carried out at an acceptable level. (Roodsari, 2006)

E. System personnel

Personnel perform their assigned duties at various sea and land units for accomplishment of the mission of ships, involving in port processes and participating in navigation duties and other tasks which are defined in the whole system.

2.4: Containerization

About fifty years have passed since the first use of containers in marine transportation. Containers influenced not only marine transportation but also world trade. Ports with special equipments and facilities for discharging, loading and services offered for containres are regarded as major advantage for the countries within marine transportation systems. Capacity and efficiency of ships and ports have been increased. Currently, capacity, cost, speed, security and efficiency of transportation network can't be compared to those in the past. (Hayut, 1981)

Malcom Mc Lean (1914-2001) is named as Father of Containerization. In the 1930s, he was the innitiative in New Jersey applying a method that led to use of discharging and loading by containers. He owned a transportation company. Malcon Mc Lean found that in stead of unloading cotton bales from a cotainer and then loading the consignments from deck to ship and in order to raise efficiency the truck itself can be loaded on the ship making a few changes. In the next years, his first container ship left Newark to Texas in April 1956 with 58 trailers. Consequently, container transportation started its mission (Wikipedia, 2011).

Use of containers has increaed due to quite a few fundamental characteristics given as follows: (Bernhofen et al., 2011)

- Prevention of damages incurred by goods (such as breakage, falling and tearing) and theft of goods
- Reduction of packaging, discharging and loading costs
- Provision of facilities for transportation of any kind of goods
- Provision of transportation facilities from the venue of production site to consumption site
- Increase in speed of discharging and loading of consignments



Figure 2-4: Display of a deck in a container port (Port of Antwerp, 2009)

2.4.1) Stages of containerization growth

During past fifty years, various stages of growth and development of this industry are named as follows:

- First Stage: Replacement of general goods transportation ships by container transportation ships - more safety of goods and prevention of damage of the goods during discharging and loading process and trip – deduction of goods insurance tariff
- Second Stage: Decrease of container cost due to increase of capacity and speed
- Third Stage: It started in the 1980s- widespread and extensive use in marine transportation- including all goods except for goods in bulk
- Fourth Stage: It started in 2000. Remarkable increase of containers in market, transportation and shortage of container ships leading toward development of container ships
- Fifth Stage: It has recently started. Emergence stage of very large container ships- leading to shortage of capacity for unloading and loading in many ports all over the world

Figure 2-5: Stages of containerization growth from the past up to now (ESCAP, 2002)

2.5) Existing condition in marine traffic

Recent changes in marine transportation are designated by three elements namely specialization, in consideration of traffic (oil tanker, vessels for dry goods in bulk, trade ships, etc), overcapacity caused by development periods, liberalization and constant growth in container traffic and subsequently, evident tendency toward a great growth.

Specialization is an act conducted at transportation sector. Certainly, specialization as a characteristic through which sorts and kinds of active vessels, ship market was differentiated from one to another. As of the last critical periods of sailing and ship manufacturing in 1970s and 1980s, main shipping companies throughout the world adopted an effective policy. Consequently, they succeed in increase of overcapacity through 70 Million DWT in 1993 to 20 Million QWT at present. (ESCAP, 2005)

Further to irregular traditional shipping services (freelance ships), regular international lines services are joined to market regiment where coordinating trade rules are being changed. Benefiting from huge transportation units, instead of execution of domestic industrial protectionism system, the services include deduction of corresponding costs. The first marine services of container transportation emerged in the USA in 1956. Since then container traffic development has constantly continued considering number of ships and dimension of the unit. Presently, 2300 container ships with a capacity of 4,000,000 TEU are active throughout the world. This process still continues its huge growth. It has not found its economic aspects from technical point of view. Container traffic growth in the world causes trading concentration. Growth of the size of the container ships leads to deduction of hub ports and increase of feeder capacity-center. This will be increased by the port owners that utilize desirable strategic geographical location and subsequently, increasingly competition. Competition between ports is defined as accessibility of a possible role as a hub or central terminal among the other ports with sufficient capacity and services that they offer. (UNCTAD, 2005)



Figure 2-6: Display of ships traffic in a port (Port of Santander, 2008)

2-6: Logistics and functions

According to Kasilingam (1998), logistics is group of functions and activities that guarantees accessibility of products in quantities demanded by customers on due time. In fact, logistic functions offer a group of services and activities in a constant process. Such process is a liaison between production and consumption market. Various values are added to it at various steps along with the path through which goods are provided for consumers. In general, the said values can be divided into two classes of time and location. Production costs, location and transfer, warehousing services and stock control and finally possession costs compromise goods value. Such value is promoted during logistic functions. Respective activities containing logistic chains are generally divided into three classes. Location of the activities in logistic supply chain is indicated in figure 2-7:

- Inbound logistics

- Intra-facility logistics
- Outbound logistics

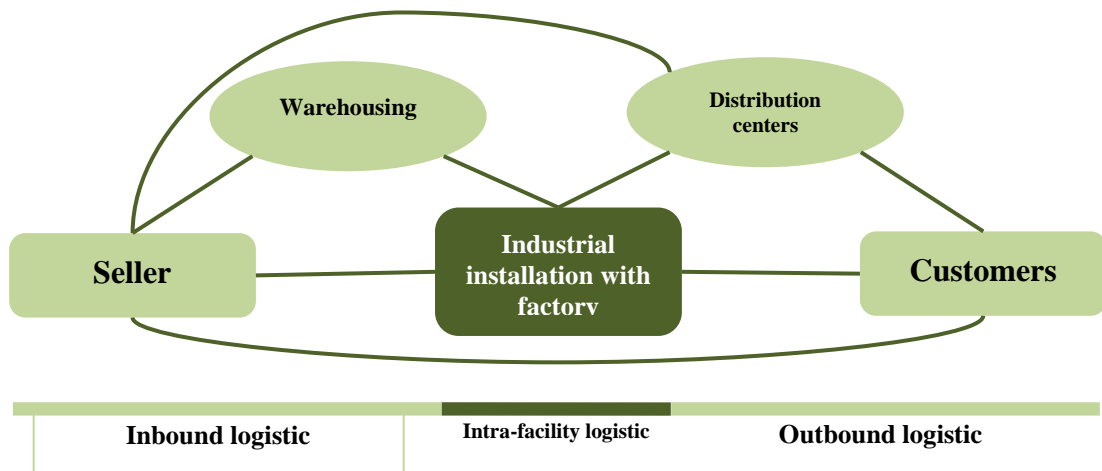


Figure 2.7) Arrangement of the triplet logistic activities (Kasilingam, 1998)

Therefore, the goal of supply and logistic chains is to support shipment displacement from production place to the consumption place on an efficient and safe basis with a suitable planning for maximum use of facilities inside the chain and minimization of costs. Logistic functions and their types of activities are presented in table 2.2.

Table 2.2) Logistic functions (Kasilingam, 1998)

Logistic Functions	Activities
Order Registration	Destination determination
Inventory control	Amount of order, dispatch frequency, warehouse control and evaluation, inventory consumption
Layout	Number and type of necessary facilities, essential features in the facilities
Transportation	Selecting transportation method, terminals, carrier
Intra-facility logistic	Selecting intra-facility system, capacity design, pre-driven transportation tools, warehouse design

2.6.1) Main Concept and Processes of Transportation & Logistics

Different transportation modes differ from the viewpoint of price, quality and access. When a transportation chain with different modes is established, the concerned chain includes its specific costs and qualitative situations.

Transportation chain concept: It is the succession of transportation modes designed to transport goods from origin to destination including one or more than one modes of transportation. In an integrated transportation chain, different modes are interrelated through bases with three available levels (Stank & Goldsby, 2000):

- 1) Physical or underlying level in which infrastructures and equipment are devised with the capability different types of goods traffic;
- 2) Level of operation from which services are offered with their cost, time, and managerial and organizational methods;
- 3) Level of information in which the information is organized, produced and disseminated according to its chain and framework.

Logistics has been defined as offering methods that accurately manage and control the flow of raw materials and information in all industrial stages, i.e., supply-production-distribution, through optimization of Dual Cost/Quality Function.

Logistic process concept:

Logistics and transportation chains affect each other and it can be assumed that these chains interact with each other. Some of the effects of logistics on traffic are presented in the following table:

Table 2.3) Main logistic process and their effects (Aronsson & Huge Brodin, 2006)

Main logistic developments and their effects on traffic and transportation	
Main processes	Effect on traffic and transportation
Centralization of products and warehouses	Longer distances, increased volume of transportation
Reduction of goods storing and just in time delivery stages (JIT)	Smaller shipments, faster (road) transportation and reduction of goods related factors
Integration of supplier chain	Reduction of number of suppliers/transportation companies, increase of road transportation as the result of exogenous nature of goods
Reduction of demand period cycle	Demand-centered processes lead to more trips and less efficiency of transportation
Increase of production level	Smaller shipments, increase in the number of trips

Three courses are being distinguished in a logistic process (Gunasekaran & Ngai, 2003) (Hou & Trappey, 2002):

- 1) The course of goods in which the goods is controlled from origin to the destination, type and volume of goods determine the mode which should be used during the control process;
- 2) Reserved goods process: It allows the product to be transferred in each connecting loop in the transportation chain (different modes).
- 3) Information course: Development and management of information exchange and in a logistic process network is very important. Technology and information are considered as the main factors of production and a key to access the privileges of a sustainable competition.

The existing information flow in the logistic process has been improved within the recent years due to information and communication technology. The technology to integrate physical and information processes and electronic data interchange (EDI) have been developed and data transfer networks have been established among the ports. This technology has been designed to deeply investigate the purchasers' information and the operations for sales and purchase and delivering e-commerce information in terms of new economy. About 40% of logistic costs are related to costs of transportation center. Transportation includes both inbound displacements from the resources of raw materials to the factory or middle warehouses, and outbound logistics from factory (production processing centers) to consumer or distribution centers. In transportation process, a broad range of planning and operational issues are involved. Determination of fleet size and the routing of vehicles, planning for personnel duties, designing the network, determination and positioning of transportation terminals are some of the issues related to planning.

Scheduling transportation vehicles and the duties of personnel and employees, distribution of facilities, substitute determination process and reserve in the network are the areas related to operations. Capacity determination and transportation selection method are performed in the determination of fleet size. Routing is centralized on the selection of the most optimum route in which the evaluation of route structure, distances and route capacity are performed. Planning for the duties of manpower is also performed for optimal use of personnel in the transportation sections and subsections.

2-7) Supply Chain:

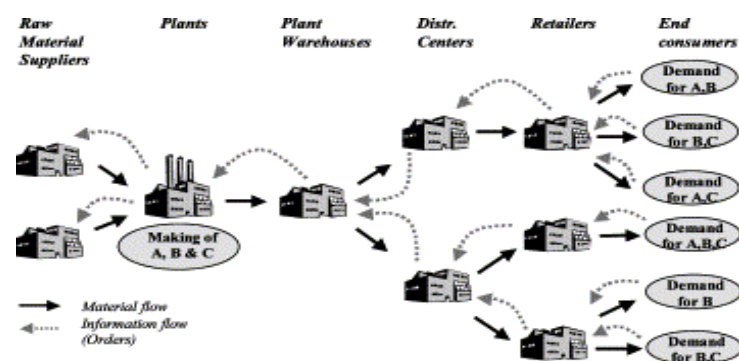
One can easily realize that organizations do not act isolated or separately. Instead, they sometimes appear at a position of a client or customer upon purchase of materials from a supplier. Some other time, they are suppliers upon delivery of goods to its consumer. Supply chain can be defined as follows (Bowersox, et al., 2002):

Supply chain is a complete process of goods procurement and services for final consumer. It goes beyond logistics. Furthermore, it consists of other activities as well. Mostly, it includes management activities such as attitude toward various manufacturing companies, targeting, designating domestic and international purchase strategies, promotion of manufacturing companies, marketing and offering more desirable services to customers. In fact, supply chain existed prior to logistics. It completely covers logistics accordingly.

Supply chain is a complicated logistic system where raw materials are transformed to final products and then, they are distributed for consumption among final consumers and clients. This system comprises offering manufacturing centers and factories, warehouses, distribution centers, and retailing markets. Various names are used by those involved in such system for corresponding activities. Among the names we can point out value chain, demand chain, logistic channel and logistic process. These various descriptions are created from various views depending on manner and area of activities of individuals. However, according to an accurate and multilateral description, one can regard supply chain as a collection of activities and organizations through which trend of materials is formed from primary supplier to final consumer. It is worth mentioning that each product has its particular supply chain, which is usually very complicated and long. For instance, paper supply chain starts from seed and ends to a final consumer. These items are placed in this process: shrubs, grown-up trees, timber, paper paste, raw paper, large rolls of paper, smaller rolls of consumable paper, paper sheets, prepared packages, wholesale and retailing.

Figure (2-8) indicates a supply chain which can be seen as a sample.

Figure 2-8: A simplified display of supply chain (Perea-López, Ydstie, & Grossmann, 2003)

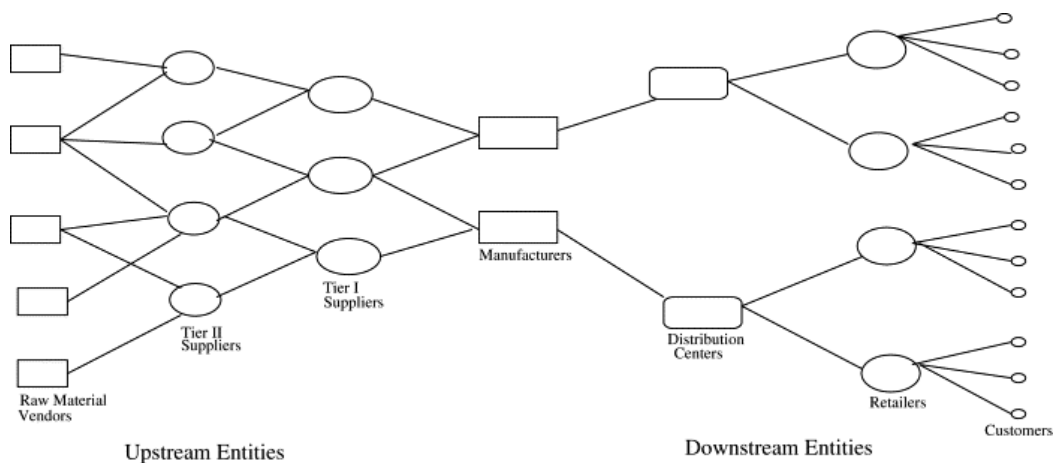


In figure 2-8, it is shown that movement is from supplier of raw materials to production center, assembly center or warehouse, distribution centers (main and regional), retailers and finally consumers.

The simplest picture of a supply chain is movement of one type of product through a series of organizations that each adds value in a certain way. Movement of materials toward the organization or all pre-organizational activities are called Upstream activities and all post-organizational transfers and activities are named as Downstream activities. Upstream activities may be divided into layers of suppliers (Choon Tan, 2001).

In practice, many organizations receive their required materials from various suppliers and sell their product to various consumers or clients. Consequently, supply chain indicates a kind of convergence from primary suppliers to the organization and a kind of divergence from organization to the final client. Figure 2-9 displays the structure of a supply chain indicating details of upstream and downstream trends and their layers.

Figure 2-9: Structure of supply chain (Deshpande, Gupta, & Basu, 2003)



2-8) Globalization and ports:

According to Notteboom & Rodrigue, (2008), globalization of economy is a process that promotes international trade with respect to high volume of goods for which warehousing costs too much. Global logistics promotes physical aspects and real application of multi aspects of various communication networks. Orders for goods are placed based on increase of number of consignments in considering of their conformity to the conditions of each client. This process does require a series of operations that must be done at final stages of logistic chain. This type of logistics accelerates trend of competition among manufacturers and suppliers of services, ports in particular. From this point of view, competition of port is based on estimation of international capability of ports over hinterlands. Through this trend the port can access goods, market and globalized services. This forms an increasingly economic part of logistic agents. At this part, companies gradually find independence and power of decision making on the field of transportation chain and logistics management. Moreover, through a hierarchal coordination, the growing process of integration of units

and establishment of unions are made so that ports would maintain their main and evident position in transportation and logistic chains.

2-9) Transportation planning:

According to Guangyi & Chaoyang (2008), accessibility of efficient and effective transportation modes are base of logistic chains that definitely lead to growth of world trade. On-time delivery, least fluctuation upon delivery, accessibility of integrated transportation services, warehouse systems and effective equipment are essentials of transportation industry, (Figure 2-10) indicates transportation structure in logistic chains.

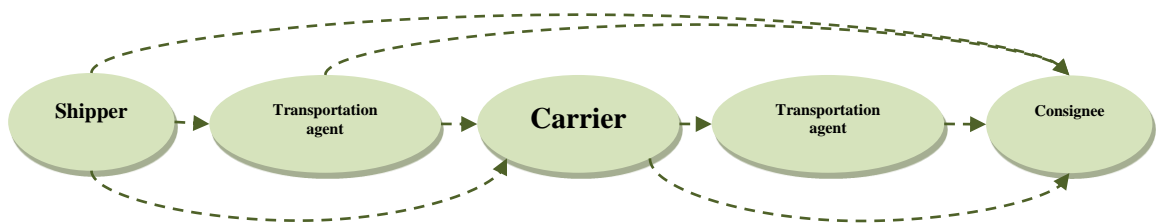


Figure 2-10: transportation process of consignments (Kasilingam R. G., 1998)

Components of transportation network are listed hereunder (Kasilingam R. G., 1998):

- Facilities such as terminals, paths, bridges, channels and berths
- Equipment such as containers, trailers, ships, trains and aircrafts
- Manpower such as personnel of discharging and loading at various units of transportation networks, personnel of repair and maintenance and administration staff

2-10: Intermodalism:

Intermodal transportation is a kind of advanced transportation that has been introduced to the world of trade and transportation along with world trade growth, widespread changes in rules, extension of globalization and surprising growth of information technology in the recent years.

Remarkable application of intermodal transportation and its appropriate effect on the world of transportation and logistics, along with container development has led to development as an essential industry, but complicated. In fact, it is possible that at transit sector, intermodalism can't be separated from containerization. However, word application of intermodalism in the position of a dynamic and efficient system has extensively been used so that growth of containerization is defined inside this system. Intermodal trips are integrated trips where change of transportation mode is done very easily with least delay (JENNINGS & HOLCOMB, 1996).

Third and fourth generations of marine terminals and ports have obviously been made and developed under the influence of intermodalism and containerization. This is because integration distribution systems have been replaced by fragmented systems which were commonly used as of the 1970s. Eventually, developing countries along with developed countries have started developing intermodalism for the purpose of harmonization with global systems, because intermodal transportation system has certain priorities compared to fragmented systems (U.S. Department of Defense, 1996).

- General costs in transportation chain
- Creation of a more efficient and useful economy
- Decrease of density at road network level
- Shortening period of capital return
- Low energy consumption
- Offering higher level of security and safety
- Creation of more opportunities for growth and variety in trade world

Pioneer governments and developers of transportation are doing their best in improvement of such system toward growth of intermodalism. Growth of container trade and development of intermodal systems in transfer of container consignments has caused container ports start making every possible effort for their compatibility with new systems. The aim of the growth of such systems is to achieve such goals (U.S. Department of Defense, 1996):

- Offering stable services (updated and damage free)
- Precise standardization (electronic, urgent and extensive)
- High safety (minimum accidents and pollution)
- High flexibility Minimum general costs
- Connectivity and integrity
- Maximum security (against electronic and physical defects)

2.11) Container Terminals

Growth of container trade is moving simultaneous with growth of world trade. Container terminals are main nodes of containerization system. They are responsible for transfer of containers from ships to other transportation modes (mostly road and rail ones) or from the other transportation modes to ships. During such transshipment, warehousing, inspection and value added services are being done on containers.

Considering major activities done at container terminals, a general view of all kinds of this type of terminals can be illustrated. Figure 2-11 indicates division related to major activities:

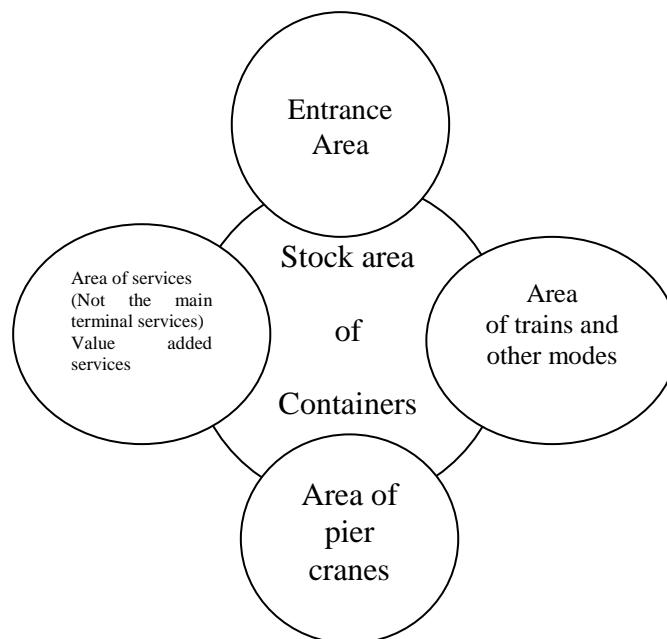


Figure 2-11: General figure of container terminals (Vis & Koster, 2003)

As it has been indicated in Figure 2-11, the entire space of a container terminal is divided into five areas based on type of the operation that is done in the space. Area for cranes of docks and piers is a place including all operations and processes related to unloading and loading, arrangement of containers on docks and removal of the containers that have been processed. The area where corresponding activities of trains-basic such as unloading of containers received from trains to be loaded on ships and/or loading of the containers unloaded from ships to be loaded in trains, is named as train area.

Entrance area is related to the activities, done within the operational area of terminal gate. Such activities as unloading of containers from trucks, inspections, weighing, control of corresponding documents and similar activities that act as entrance gates. The entire operation of stocking, arrangement of containers and short-term and long-term management of the containers at terminals are operated within the area of containers stock. Nowadays, value added activities are being assigned to a major part of container terminals. They increasingly prioritize such services. Moreover, these services are particularly regarded as the most important part of successful and efficient ports in modern container systems.

Moreover, container terminals can be divided into the following subsystems in the area of container consignments trend (Henesey, 2004).

- Ships/piers: Transfer of containers from ships to piers and vice versa
- Transfer: Transfer of ships from piers to certain areas and vice versa
- Stocking: Layout and arrangement operations at special levels of stocking
- Delivery, receiving: Operations for delivery of container consignments to other modes

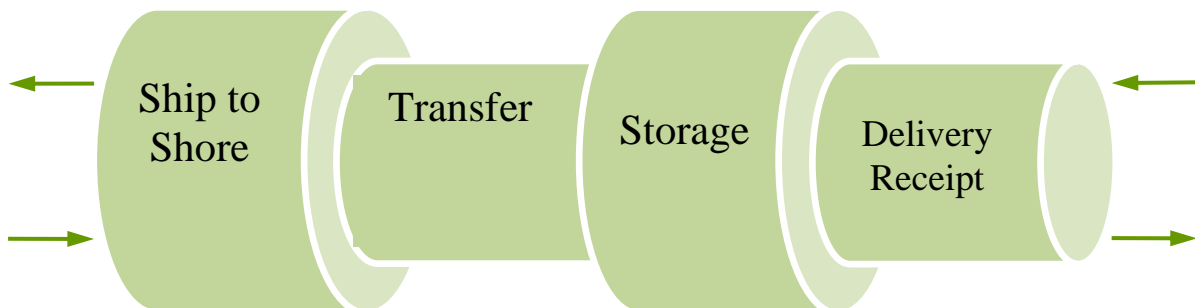


Figure 2-12: Diagram of Container Terminal Subsystems (Henesey, 2004)

While compiling long-term goals and strategies at organizations and companies running container terminals (container terminal operator), planning for operations in these subsystems is crucially significant in consideration of the role of three elements namely manpower, equipment and land. In order to establish equilibrium between stability and renovation and provision of suitable grounds for change, strategies should consider operations management of these subsystems, as base for their designs.

2.11.1) Value-added services at container terminals

One can absolutely confirm this matter that container port operations as an operational center in container transportation chains play substantial role in the port revenue.

As it has been stated, due to containerization and intermodalism, new consumption patterns, role of ports in render such logistics and value added services are highlighted.

Considering viewpoint of port owners, rendering fresh and value added services will increase economic operation of the ports promoting the attractiveness of the port for existing and potential customers. Consequently, this will help promotion and progress of the competitive location of ports. It is required that value added services and profitability are considered as base. A huge number of activities may be regarded as value added services at ports. Figure 2-13 indicates the activities. Value added services can be classified into two parts of value added logistics and value added facilities. Value added logistics consists of two parts of general logistics facilities and services. (Port Reform Toolkit, 2004)

Based on Port Reform Toolkit (2004), in fact, general logistics facilities are the same as traditional facilities such as unloading and loading, filling and emptying containers, warehousing and distribution. They have no direct effect on nature of goods. However, besides these facilities, complicated logistics chain integration facilities are being developed. Their importance is growingly increased at container terminals. These facilities are actually parts of the process of factories and manufacturing centers, which are outsourced by these centers. In today's trade world, there is less inclination by factories for conduction of such activities. Among these services, we can point out assembly of parts, quality control and packaging.

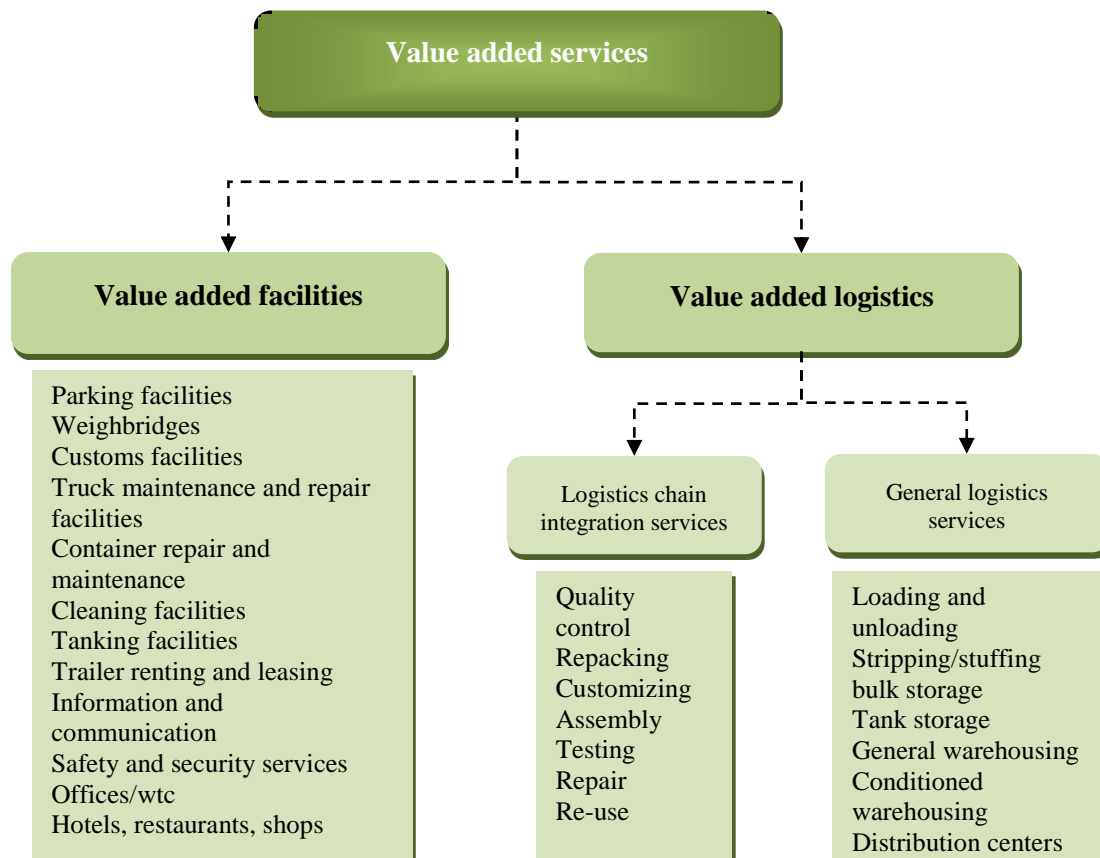


Figure 2-13: Common value added services at marine terminals and ports (Port Reform Toolkit, 2004)

Following ports traffic trend, value added facilities are offered by operator of the port. Nowadays many successful and important ports throughout the globe are trying to establish distriparks in the side areas of ports especially at container terminals where transportation-affiliated activities are done. The Netherlands, France, UK and Germany are

the countries that have taken the lead in this respect. For example, Rotterdam Port presently consists of three distribution parks. Two of the said parks are allotted to container services and one park for chemical materials. Huge warehouses have been developed in the parks as well (Port Reform Toolkit, 2004).

2.12) Change of functions at ports

Change of function of ports has always been of great interest by managers. Effective elements in change of duty function aim at achievement of goals of policy makers responding requirements and promoting productivity. These changes create certain advantages for ports as the services in increase.

2.12.1) Key factors in change of ports function

A. Globalization of production and distribution

The global business environment enforces a radical shift in the business operations of global firms, especially shifts in logistical trends. Hence, global firms are looking for a new production and logistics structural design to achieve the advantages, pertaining to global production.

Accordingly, high value-added and time-critical products are being transported to market using the postponed production method, in which the ending process to manufacture a product, assembly and customization, takes place at distribution centers, adjacent to the end user, near ports so that demands can be met faster and more flexible (ESCAP, 2002).

B. Development of container transportation:

In order to decrease operational costs, size and capacity of ships have increased. Average size of container ships was increased from TEU 655 in 1970 to TEU 1750 in 2000. Use of larger ships usually results in saving of operational costs. However, it has caused increase of larger discharging and loading equipment and piers with a draft depth of over 14m. Consequently, ports must always for improvement and promotion of terminals equipment and hinterland accessibilities (rails and roads). Moreover, discharging and loading of large ships take longer and incur more cost. On the whole, use of larger ships has increased port costs as well (Abdullahi, 2009).

C. Transportation unions:

Land operations costs consist of a considerable share of total transportation cost. Close relation cooperation between transportation companies and operator terminals will lead to decrease of costs and more control of loading and discharging operations (MORASH & CLINTON, 1997).

D.IT Development

Nowadays, through internet network IT has been used in all transportation services. Many activities such as ports operations, stocking, insurance, and land transportation are affiliated to such IT. Innovative uses of internet for example in inspection of ships using electronic transmission of data should be added to previous applications as well. Singapore Port has the most advanced and applied website from among all ports offering a wide range of useful and applied information with respect to registration of goods, customs operations, land transportation and delivery of products (ESCAP, 2005).

Due to bureaucracy of customs operations, governments of developing countries must accelerate process of improvement and modification of customs system. This process must consist of simplification, coordination and automation of procedures and required systems for accessibility of quick release of goods. Furthermore, use of uniform procedures for reporting and inspection by shipping companies for awareness of ports and coastal guard and immigration officers and health as well as other governmental organization upon

arrival and exit of ships will be effective for acceleration of such improvement. (ESCAP, 2002)

Typically, the success of process depends on compilation of strategy and policy for development of information systems. Many important and well-known ports have harmonized and compiled their port information system. A few of such systems in world's major ports are listed hereunder (Park et al., 2005):

- PORTEL: the system at governmental ports in Spain
- SEAGHA: the system at Antwerp Port
- DAKOSY: the system at Hamburg Port
- PORNET: the system at Singapore Port

E. Investment in logistic infrastructures:

Increasingly growth of container ports requires permanent investment. Many ports do require renovation and restoration of worn-out infrastructures and equipment. Investment in renovation of the worn-out equipment will be regarded as the most important challenges of developing countries. Under such circumstances, optimum use of existing infrastructures and equipment together with consideration of increase of capacities is of great importance (Langevin & riopel, 2005). Privatization approach of container terminals may lead to increase of operational efficiency and decrease of manpower cost. Presently, about 40% of loading and discharging operations in over 80 ports across the globe is done by private sector (Tongzon & Heng, 2005).

2.12.2) Change of competitive advantage

Nowadays, trade success and development of ports may be due to promotion of productivity in loading and unloading services or offering value added services or both. Rendering services with value added due to need of customers of such services is an effective method for creating sustainable competitive advantage. Figure 2.14 has indicated the interaction between two kinds of ports advantage.

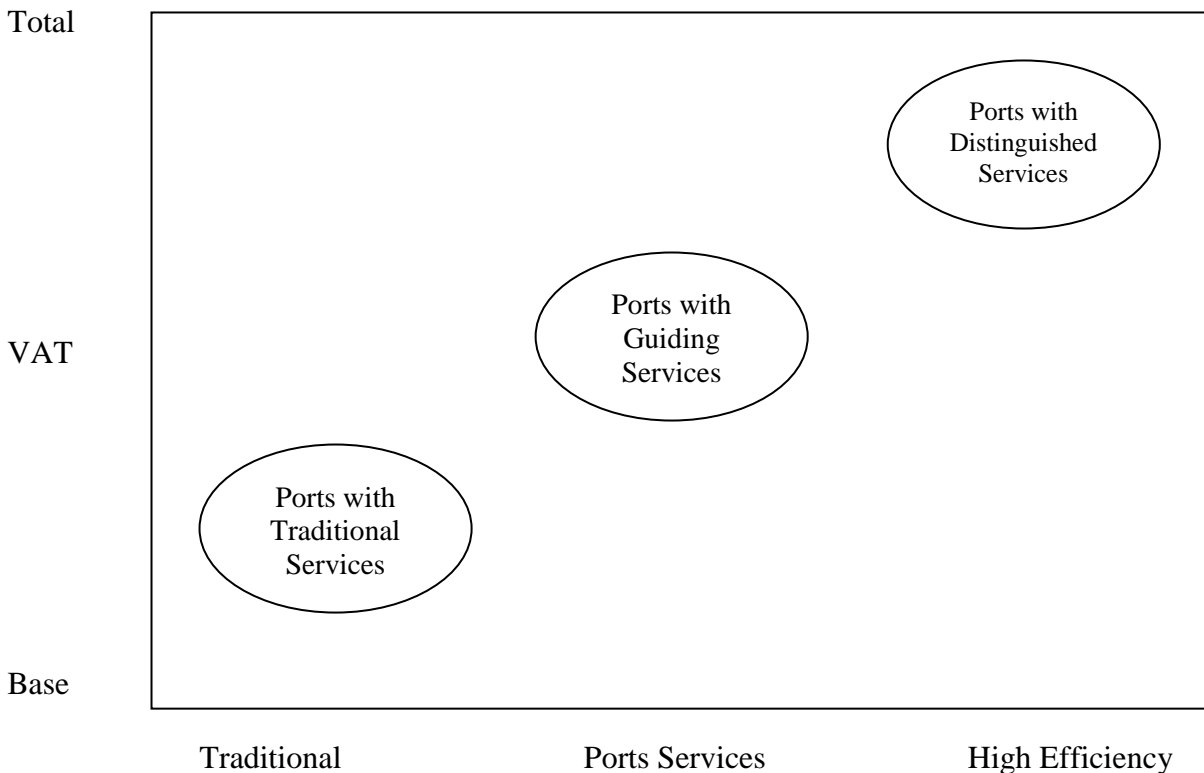


Figure 2.14) Competitive Advantages of Ports (Abdullahi, 2009)

Traditional ports are located in the lower left side of the matrix. The ways to develop these ports include movement to the right side of the matrix (improving the efficiency of port services) or to the upper side (providing integrated value added services). It is obvious that in the future the number of the ports in the right corner of the matrix will be in the majority. Middle ports are located between these two ports which are in the course of development (ESCAP, 2002). Elements with which the competitive capability of the ports can be compared are presented in the following figure. It includes three major groups, namely supply criteria, economic and non-economic factors.

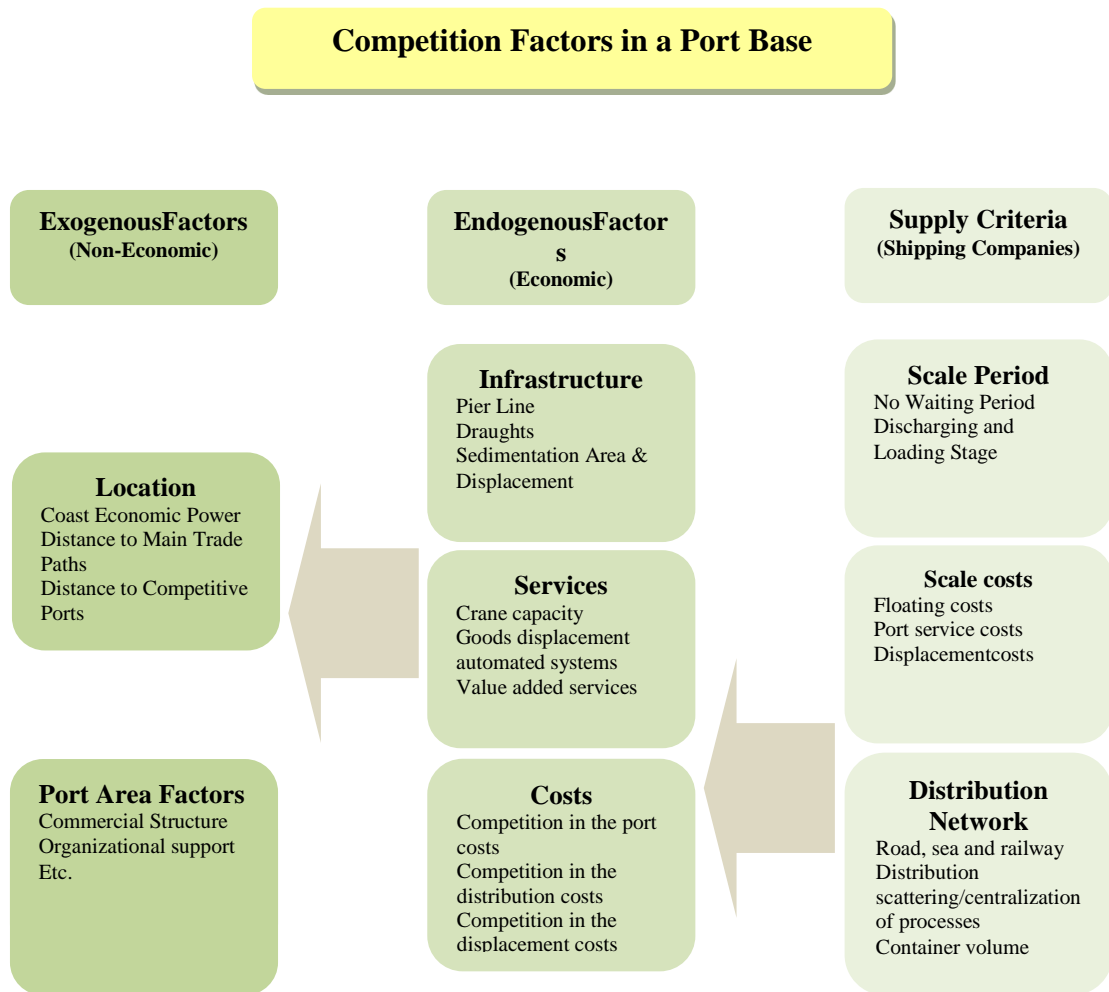


Figure 2.15) Port Selection Criteria (Murphy, Daley, & Dalenberg, 1999)

Today, ports seek for more efficiency and development of service activities in different fields of transportation and logistics.

2.13) Conclusion

What was presented in this chapter includes some generalities about the processes of marine and logistic transportation in the world as well as issues related to the necessary concepts in the field of marine transportation, ports, logistic centers and the process related to logistic and supply chain which were mentioned several times in this study. Globalization process and its effects on logistics and transportation are considered as

important subjects. In this chapter, the activities and services of third generation of the ports were described due to the importance and development of their activities by reviewing marine transportation and marine transportation systems and by detailed investigation of the elements with an emphasis on the growth and development. Thereafter, available procedures in the port and sea traffic are presented by referring to the containerization and its development stages. Afterwards, general procedures of global logistics as well as their effects on the ports are presented by providing definitions and generalities on the logistics and supply chain. Intermodalism, value added services of ports and container terminals are other issues that are presented. At the end, with an emphasis on the change of function of ports duties, the key factors are explained in detail in several sections and competitiveness criteria of the ports is investigated.

3) Chapter Three: Development of Ports with Logistic Centers

3.1) Introduction

After the general concepts, in this chapter we deal with direct investigation of distribution parks, logistic centers and logistics in the ports. What is aimed in this chapter is the definition of logistic ports and understanding its meaning in the world. Logistic operations in the ports and the relationships of economic sections in interaction with logistics will be explained. Then, types of activities and position of port as a logistic platform are discussed and logistic lines and operational areas of port are investigated in details. After providing some definitions and contexts, the main goal of this paper is dealt with, i.e., logistic centers. Measures for the level of value added services in ports and issues related to the establishment of these centers in the ports with an approach of centralized logistic chains in the ports are the main topics discussed in this chapter. Services and facilities relevant to ports from different viewpoints are presented with an emphasis on intermodal services in these centers and the duties of these centers are then classified. It can be emphasized about mentioned activities that the achievement of strategic goals has resulted in the establishment of these centers. Utilization of a systematic approach for planning and development of ports and logistic centers is one of the issues that today have involved all processes relevant to logistic centers. At the end of this chapter, method of planning to achieve the majority of the intended goals in the perspective as well as impediments of development and a suitable understanding of what they have ahead in the world in the development of logistic centers are pointed out. It should also be mentioned that the base of the studies in this chapter is related to logistic centers in Europe as well as UN Study Reports in Southeast Asia with the goal of investigating the condition of these centers.

3.2) Logistic Operations at Ports

Competitive advantage of logistic development makes port authorities to enhance their own strategic and operational goals by optimizing multilateral operations towards changing the ports. Efforts should be made as the first basic strategy so that the flow of cargoes is performed more efficiently and promptly. The following subjects show the classification of this strategy (ESCAP, 2005)

- Optimization of goods physical process;
- Coordination between different parts in the port chain (displacement, transportation, warehousing, etc.)
- Efficient integration between different elements (shipping companies, shipping representatives, etc.)

Along with the flexible strategy for passage of goods from the ports, profitability of services in ports will undoubtedly force port authorities to progress logistic activities as the second basic strategies. Use of centralized inventories and final assembly of products in the port have led to increase of ports competition. Port has a logistic potential that encompasses the following special conditions (ESCAP, 2002):

- Establishment of port spaces and infrastructures from the viewpoint of logistic goal;
- Determining and allocation of different necessary spaces for execution of a logistic center;
- Active participation of specialized personnel in complete operations of port;
- The procedures used in the network information directed through improvement of ports as the important bases for information control.

The available procedures and services in the ports are provided in the following figure.

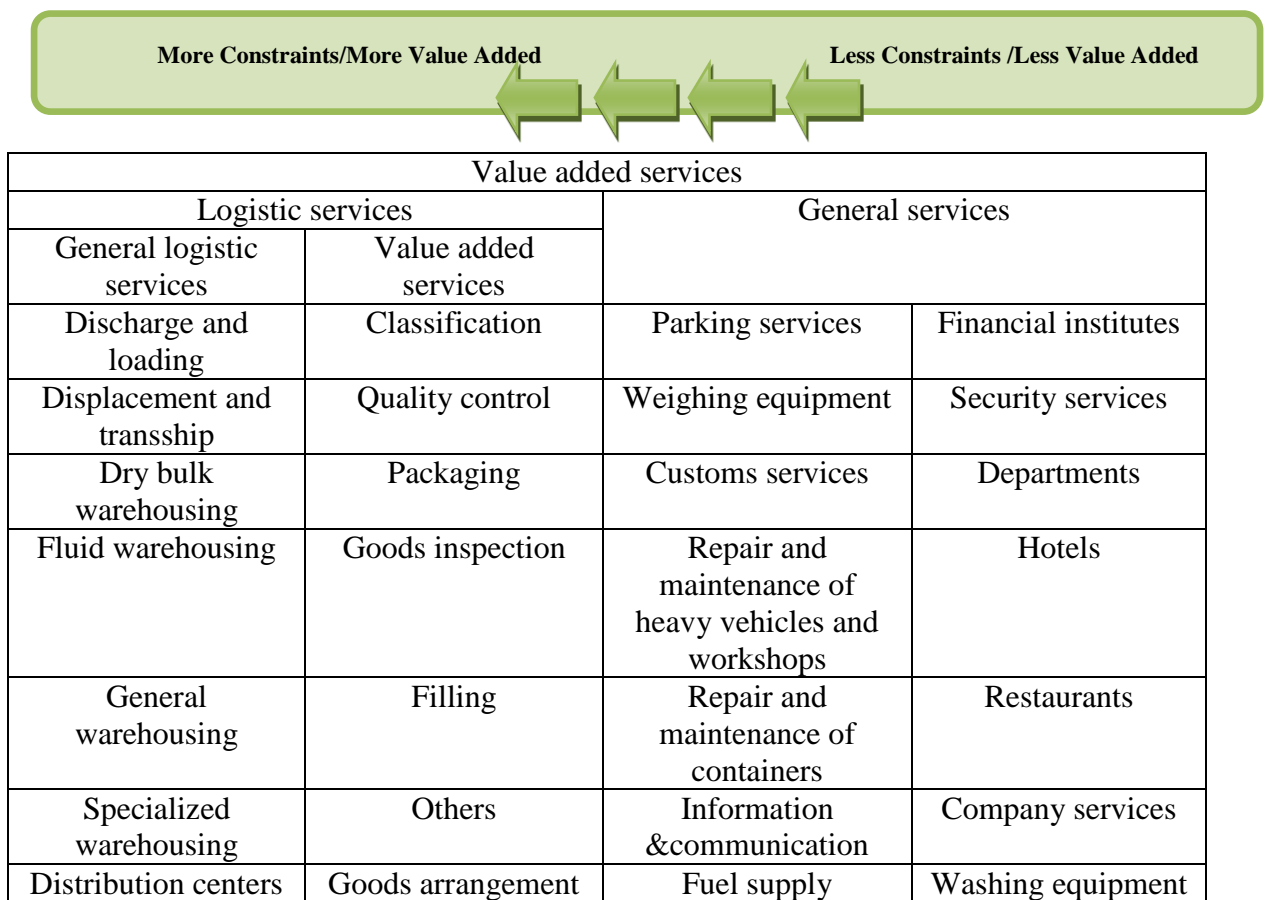


Figure 3.1) Available Logistic Procedures & Services in the Ports (Notteboom & Rodrigue, 2005) (Nottebooma & Winkelmansa, 2001)

Change of a port from a transportation center to a logistic one basically increases the information process between economic agents. Land connections improvement strategies and especially railway are among the priorities. Main European ports currently intend to improve their intermodal connections from the viewpoint of infrastructure and services. (Nottebooma & Winkelmansa, 2001)

3.2.1) Logistics & Economic Sections of a Port

According to Boske & Cuttino (2003), in logistic processes, each economic section has its own level of logistic capability. The differences between the logistics of economic sectors make the researchers to specify them separately.

Determination of sections depends on port specialization, necessary details for investigation and available information. However, sometimes it is not easy in a certain economic sector to classify the goods that lack a mutual strong economic relation. A certain commodity may be the output of one production process and simultaneously the input of another relevant production process that each belongs to different economic sectors. Considering the said subjects, it is necessary to make the analysis from logistic viewpoint and to investigate which type of logistic activity may be fulfilled considering the commodity in the concerned port to in the adjacent area. A deep study takes us from macro logistic analysis to the intermediate level of logistic chains which facilitates the analysis of logistic centers operations. The characteristic of each economic sector should separate its relevant economic and logistic aspects. Each of them may include the items in the following table:

Table 3.1) Characteristic of each economic and logistic sector related to the commodity in ports (Boske & Cuttino, 2003)

Economic aspect		Logistic aspect	
Basic information	Foreign production and trading of the present, past and future scenario	Logistic related to the sector	Explanation of logistic standard process
Port transportation traffic	Distribution of domestic and international transportation through transportation methods, the contribution of port from the market	Logistic place standards	Attraction of ports at each stage of logistic process
Policies and processes related to the sector	Policy for adjustment and development of the sector concerning international, European, national and regional areas		

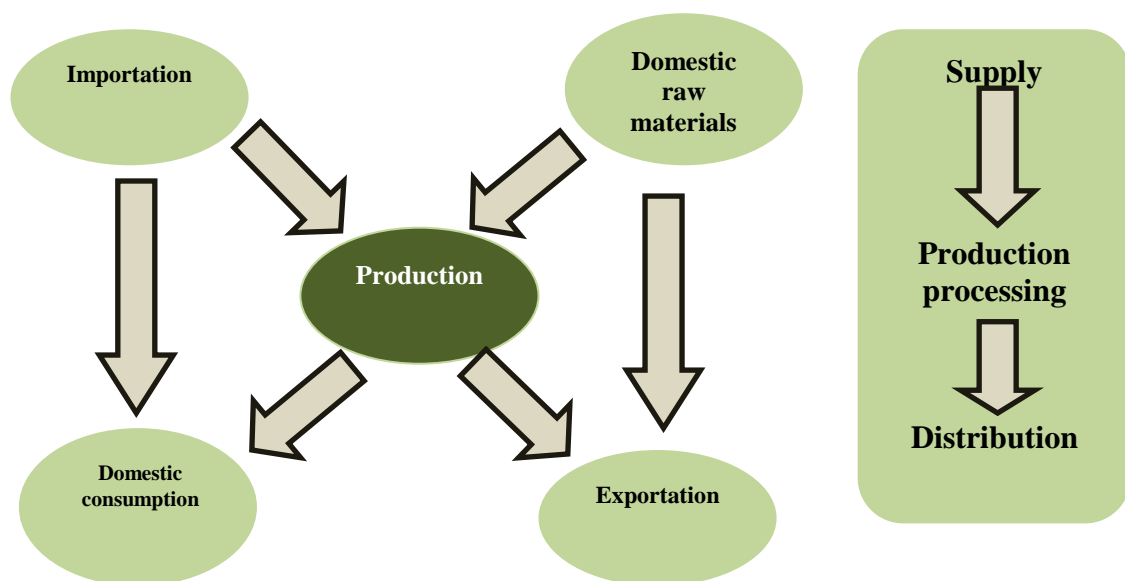


Figure 3.2) Economic & logistic aspects in the investigation of general sectors (Boske & Cuttino, 2003)

Hence, it should be acknowledged that strategic plans for logistics of each port require accurate determination and investigation of specific economic sectors.

3.3) Port Logistic Activity Zones as Specialized Logistic Platforms

3.3.1) Definition of Logistic Platforms

A specified zone in which different authorities perform all activities related to transportation, logistics and distribution of goods in the domestic and international areas. These authorities may be the owners or lessees of buildings, equipment and installations (warehouses, goods storage areas, departments, parking lots, piers, etc.) built in the center. This type of platform should have a free competition for all the jobs that include the mentioned activities. In addition, it should be equipped with all common pieces of equipment that are required for correct execution of the assigned activities. On the other hand, it should provide common services for the personnel and transportation vehicles of the user. This platform should be necessarily administrated by a public or private organization (Abrahamsson et al., 2003).

At the present time, one of the most important goals for national and international development of platforms network is to assist in the development of intermodal transportation. Evolution trend of logistic platforms is shown in the following figure.

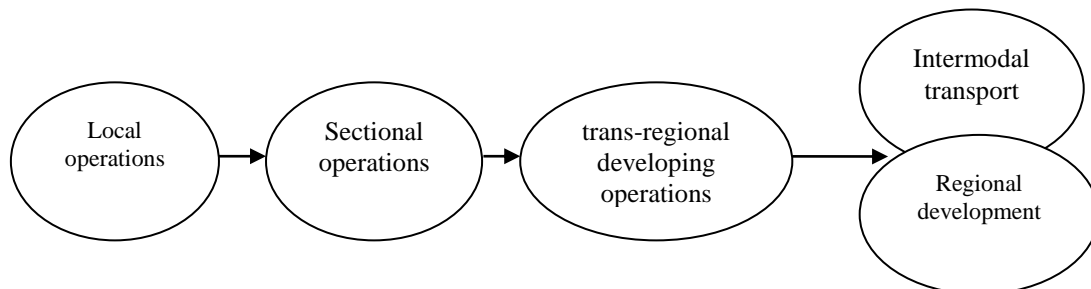


Figure 3.3) Logistic platform development (ESCAP, 2002)



Figure 3.4) A view of the Garonor logistic platform (foncière europe logistique, 2009)

3.3.2) Logistic Lines and Port Operational Zones

Activity in the ports requires three operational zones. Operational zone is called to a part of operational platforms with a certain level of integrated activities and a unique and defined goal in the center of each platform. The activities intended in this discussion on the port can be classified according to the following figure and logistic lines can be specified:

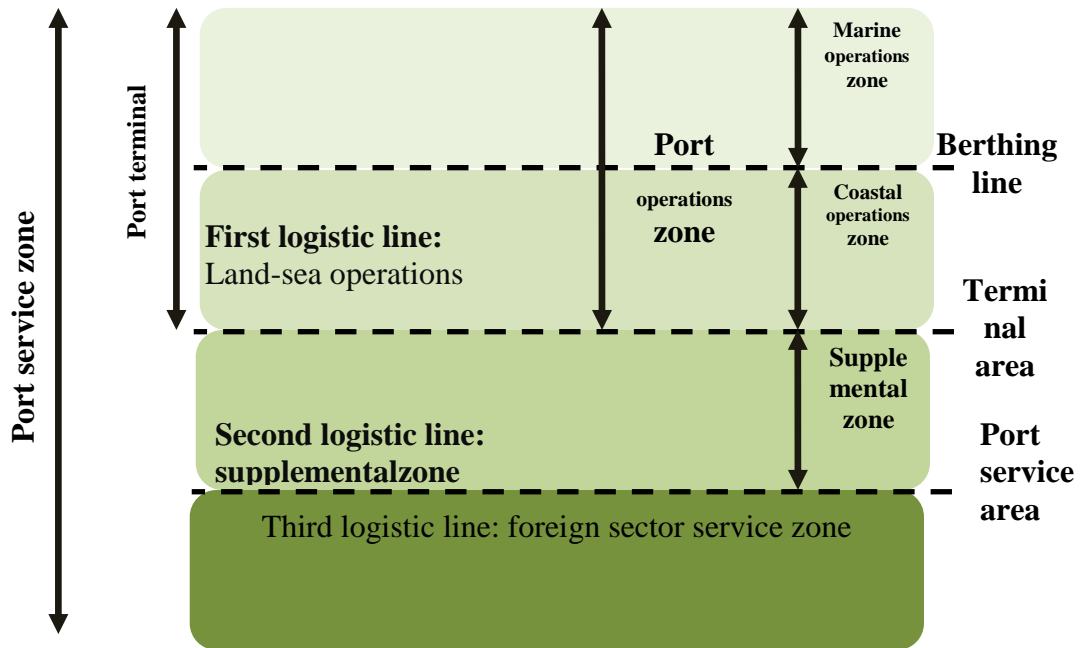


Figure 3.5) Logistic lines of port activity (Notteboom & Rodrigue, 2005)

First logistic line activities encompass all activities included in the port operation zone, coastal section (displacement of goods on the vessels, etc.) and land section (displacement of goods, warehousing, reception, control, etc.) that are usually equal to the port terminal area.

Second logistic line activities include all activities related to warehousing and distribution sections as well as all other activities which are not necessary in intermodal displacement but they have a supplemental role. These activities are conducted outside port terminal and inside port area in which vessels are provided with assistance services.

Third logistic line activities are called to the operations that are related to the developed logistic activities in the specific logistic centers. The mentioned centers are limited to a part of the port and not necessarily to the inside of the port.

Table 3.2) Different operational zones in logistic platforms (ESCAP, 2007)

Logistic zones	intermodal zones	Service centers or zones
<ul style="list-style-type: none"> • Zones/platforms for goods transit and distribution • Logistic and urban distribution zones • Warehouse and distribution zones- distribution zones • Specific or single purpose logistic zones • Agriculture and foodstuffs zone • Dry bulk goods logistic platforms • Risky goods logistic zones • Motor vehicles logistic zones • Customs system platforms 	<ul style="list-style-type: none"> • Road-rail intermodal zones • Road-air intermodal zones • Land-marine intermodal zones (including marine transportation and domestic waterways) 	<ul style="list-style-type: none"> • Specific service zone • Risky goods zone • Central service zone • Services of work, personnel and vehicles • Customs services

3.3.3) Different Logistic Platforms

Logistic platforms may be divided into two groups based on transportation modes, namely logistic platforms that perform displacement by using one transportation mode and logistic platforms that perform displacement using more than one transportation mode. Different types of logistic platforms are indicated in the following figure and will be explained in detail.

Different logistic platforms							
Logistic platforms that perform displacement by using one transportation mode				Logistic platforms that perform displacement using more than one transportation mode			
Road centers or transportation service centers	Urban distribution centers or urban logistic centers	Distribution zones	Transportation centers	Port logistic activity zones	Air cargo hub	Dry ports	Intermodal logistic platforms

Figure 3.6) Different logistic platforms (ESCAP, 2007)

Logistic platforms that perform displacement using one mode of transportation include the followings:

Transportation centers: Transportation centers are logistic centers that are centralized on road transportation. The activities of these centers in the future will be in the central/provincial area. They usually include a logistic zone (transship and distribution zones/platforms) and a zone for supplying services to the personnel and vehicles. The above centers are designed for supply of more than one service to the road transportation companies (the goal of road centers) and actually include all companies working in the transportation sector. They have an integrated logistic zone and a comprehensive service zone that provide the personnel, vehicles, administrative centers of transportation companies, commodity contract conclusion centers, etc. (Goldman & Gorham, 2006)



Figure 3.7) CTM transportation centers in Madrid (Madrid, 2007)

Road centers or transportation service centers: Platforms mainly including a service zone for road transportation companies. They only cover a small logistic zone in special conditions that usually depend on the service zone (Crainic, Ricciardi, & Storchi, 2004).

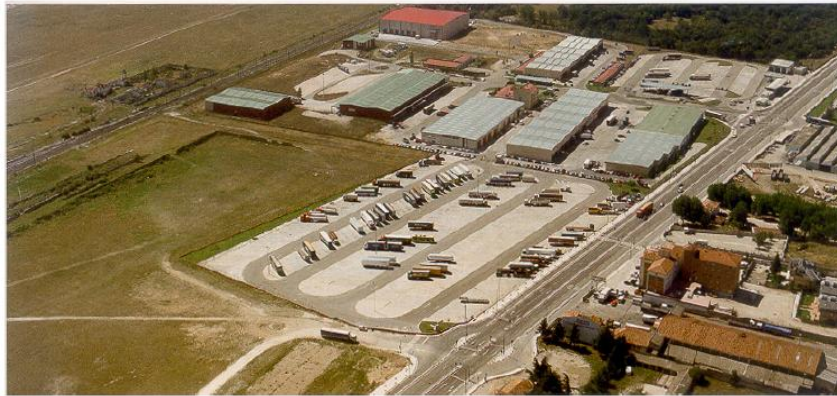


Figure 3.8) Transportation service center, Burgos, Spain (Puertos del Estado, 2003)

Warehouse and distribution logistic zone: They are generally regional logistic platforms and include all necessary services and equipment for performing warehousing and distribution activities. They have logistic departments related to manufacturers, distributors, logistic authorities, warehouse, etc. (Port of Antwerp, 2009)



Figure 3.9) Distribution and warehouse logistic zone, Antwerp Port (Port of Antwerp, 2009)

Logistic platforms that perform displacement serving more than one transportation mode include the followings:

Port logistic activity zones: logistic platforms connected to the ports cover the second and third lines of port activities and are generally allocated to the logistic activities of marine commodities. These platforms are established for displacement and distribution of marine commodities to the port coasts and from there to other destinations. (ESCAP, 2002)



Figure 3.10) Port logistics activity zones: Barcelona Port logistics centers (Sophie, 2007)

Air cargo hub: Platforms are specialized in the air-land transportation and processing of air commodities. They should have a first line intermodal zone (general products, connecting and coordinating terminals). These platforms may include a second line logistic zone for performing all activities intended for offering additional services for sending commodities (warehouse for warehouse keepers and logistic authorities, operational departments). They may also cover a unique and integrated service zone. These platforms may utilize a distribution zone for the authorities of commodities in certain conditions (Zhang & Zhang, 2002).



Figure 3.11) CCAMB air commodity center, Barajas Airport (Puertos del Estado, 2003)

Intermodal logistic platforms: These platforms are those which utilize more complex operations and also serve in several operational zones among which rail-road is the most important zone. In addition, not only, they have logistics and service zones, but also can cover logistic and multipurpose specialized zones. These platforms are national and sometimes regional (Crainic, Ricciardi, & Storchi, 2004).



Figure 3.12) Intermodal logistic platform, Bologna Port, Italy (provincia.prato, 2008)

Dry ports: A type of intermodal terminals inside a country that connects one or more than one origin and destination by way of railway network and it is for this reason that the contradictory term "Dry Port" has been selected for that. Dry ports displace port traffic inside a country. These ports include a rail-road intermodal zone which is considered as the main operational space and are usually connected to other operational zones and essentially distribution and service zones. (ESCAP, 2007)



Figure 3.13) A view of a dry port (portvision, 2010)

3.4) Logistic demand in the port logistic centers

Logistic demand is investigated in the logistics centers of the ports based on marketing and a series of activities that may be performed in the zone. An accurate estimation for

establishment and evaluation and development of these centers could be regarded based on the actual demand of a logistics center.

3.4.1) Investigation of centralized logistic chains in the ports

Logistic operations of the ports significantly depend on the nature of cargo and their typology. From the strategic viewpoint, each group of cargoes belongs to a certain economic sector. What should be considered here is a deep study of logistic processes related to each port process to determine the type of logistic process inside the port. In order to determine which logistic process is capable to be executed in any conditions and which will be developed in the best manner, researchers are required to analyze and investigate the international transportation chain and to study on logistic activity for each section of that chain. Description of logistic chains provides a clear perspective of transportation and logistics activities relevant to transportation from origin to destination. This organizing process which indicates the simplification of the existing ambiguity and complexity is directed through the use of an efficient tool to help to the conceptualization of logistic process. Logistic chains procedures include the following advantages (Marlow & Paixão, 2003):

- They are adjusted in the form of equal groups through logistic chains procedures of logistic activities, in the manner that a simple and fast method is provided for determining final logistic stages. In this method, it is the cargo which is known during transportation.
- This procedure clarifies the main aspects related to how, why and where for transshipment between origin and destination by a diagram.
- These procedures allow for comparison of processes and clarify the relations between the chains related to different types of cargoes, equipment or routes.

To determine logistic chains, they can be classified according to the following criteria:

- Type of cargo through the main classification standard
- Type of transportation equipment by a specific emphasis on the container traffic
- Type of the route, the difference between the cargoes.

In table 3.3, logistic chains related to the economic sectors have been totally classified. Few cases can be found with no clear relation between the two groups (a single commodity may be used in two economic sectors, in the manner that it is considered as the input and output of a similar item depending on how it is considered). (ESCAP, 2005)

Table 3.3) the relation between economic sectors and logistic chains (Carbone & De Martino, 2003)

Economic sector	Logistic chain
Oil & gas	Raw oil and natural fluid gas
Coal	Charcoal and mineral (1)
Chemicals	Chemical fertilizers, potashes and phosphates, chemical productions
Iron, steel and metallurgy	Iron and steel productions
Automobile	Motor vehicles
Cement and clinker	Cement and clinker
Construction materials	Charcoal and mineral (2)

Agriculture and livestock	Bulk grain
Foodstuffs and beverage	Fruit and vegetables, fresh and frozen fish
Industrial goods	General and container products
Paper	Pulp, wood paper and cork
Logistic transportation	All above chains

3.4.2) General logistic demand in the port logistic centers

Theoretically, classification standards for logistic centers demand include clients and goods that are administrated in the port considering its necessary relation with the port. Two types of demand may be defined here by this standard (Guangyi & Chaoyang, 2008):

1) Current demand of the port: When the goal is merely to achieve customer's loyalty through preservation of current relation with the port or improvement of this relation. This demand is for responding to the port commercial target, i.e., improvement of relations with permanent customers.

2) New demand of the port: It is the result of commercial network activity that administrates marine goods and can provide a new traffic for the port. On the other hand, this demand is the result of logistic environment which is merely provided in the logistic centers through quality and price of supplied services.

According to Notteboom & Rodrigue (2005), the main goal of a logistics center is to attract and maintain logistic operations related to the port chains. However, a logistics center can attract the demand for supplemental services and logistics by which it may improve its total performance in order to increase the level of service efficiency and to facilitate the execution. Making decisions on the supplemental demands that are not directly related to the ports is considered as a final element in the port planning process. Any of the efforts made to restrict the conditions of logistic centers merely in the field of activities not related to the port has been unsuccessful in different port conditions. What should be considered is the interaction and cooperation between all the companies that administrate the ports as well as logistic supplier companies in order to establish a suitable process in the logistic centers of the ports. This may attract a suitable demand for the port. Production or distribution-related logistic demand arises from different types of marine cargoes. As mentioned before, in most cases this type of demand which is related to the companies' productions usually include multi-traffic equipment that may provide side changes. Today, methods are provided to evaluate the potential for logistic attraction which is indirectly related to the port. In this regard, port logistic centers may provide an excellent opportunity for refocus of a port in logistic conditions and in macro urban zone or influence domain. Ports always play an axial logistic role in the cities in which they are geographically located. In most cases, planning for urban and land use has gradually changed the logistic centrality of the ports. As a result, metropolis logistic hubs have emerged that are often more dynamic and are more associated with distribution centers and city access roads.

Ports usually occupy a central geographical location in an area. Where a logistics center is designed as a mixed complex, its characteristic can be utilized and the attraction of new logistic activities in the port area. In this way, a port can improve the operations of its base in the economy of an area by considering its central conditions and without restricting the activities.

3.5) Services & Facilities in Ports Logistic Centers

Services and facilities in a port logistic center are defined based on the needs in economic and marketing sectors and also based on macro policies considered by managers.

3.5.1) Strategic Goals in Logistic Centers

According to Cooper & Ellram (1993), strategic goals of logistic centers in most cases are multipurpose. In other words, although logistic centers should have a main function to determine its total operations to a high extent, in most cases, logistic centers play a multipurpose role that varies according to the certain production type and its logistic chain. To define strategic operations of logistic centers, the following special characteristics should be considered orderly and should be used for more facilitation of these operations. The main parts of a strategic operation can be seen in the following figure (Cooper & Ellram, 1993):

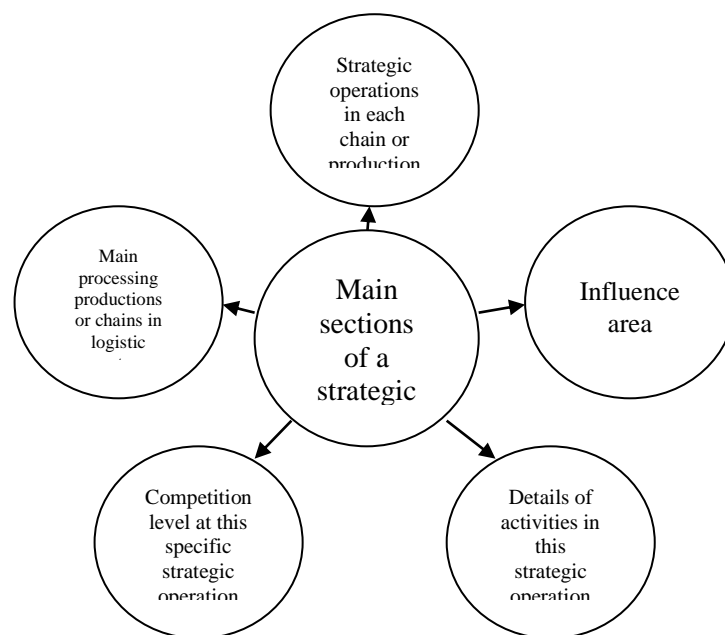


Figure 3.14) Diagram of the main parts of a strategic operation

Main processes in the logistics centers include items on which the commercial policy of logistic centers will be focused. Strategic operations in each chain include control center, distribution center, goods transportation center, service center, goods collection, etc. But the influence area is the regional, national or international center that has been planned for a certain zone.

3.5.2) Preliminary definition of service supply in port logistic centers

According to Notteboom & Rodrigue (2005), the defined strategic operations specify the facilities that should be established in the port logistic centers. Generally, these facilities will not be related only to one operation. A multipurpose definition of logistic centers provides separate facilities. Of course, some of these facilities will finally change into common and exchangeable facilities. The characteristics of the facilities that will be provided can be defined quite generally and easily for initial logistic centers (e.g., warehouses with average rentals) in details for multipurpose logistic centers in broader scales. The following table shows the general characteristics of complicated and detailed

definition of these facilities. This table defines preliminary characteristics of the facilities provided by logistic centers.

Table 3.4) Preliminary characteristics of facilities in logistic centers (Notteboom & Rodrigue, 2007) (Notteboom & Rodrigue, 2005)

Operational characteristic	Explanations and examples
Different spaces that should be provided in logistic centers	<ul style="list-style-type: none"> • Broad or dense logistic zones, service areas, etc.
Nature of communicating ways with necessary transportation infrastructure	<ul style="list-style-type: none"> • Direct access to container terminals, the need for road access and communication ways with the main road network, adjacent local position of an intermodal rail terminal, etc.
Different facilities and areas	<ul style="list-style-type: none"> • Locations for warehousing for rapid flow of goods, warehousing areas or open spaces for accumulation of goods, etc. • Size of standard areas: Broad warehouses, broad segmented units, etc.
Quality of spaces to be established	<ul style="list-style-type: none"> • Operational quality level of facilities in relation to the level of prices and competition: Influence and quality of design, quality of the building, etc.
The best marketing method to achieve these facilities	<ul style="list-style-type: none"> • For sale, rent, land operation right, etc.
Price: quality ratio	<ul style="list-style-type: none"> • The facilities should have a competitive price level in the direction of general strategic operations: level of competition with other ordinary logistic bases or adjacent industrial properties, etc. The level of these prices is relevant to the above quality level.
Supplementary services established in the logistic centers	<ul style="list-style-type: none"> • Different necessary services: customs system and services, auxiliary services, main services, value added services, etc. • Nature and price of services: quality ratio, etc.

3.5.3) Intermodal facilities in the port logistic centers

Intermodal transportation includes a type of displacement and transportation that covers more than one transportation mode and is a process in which there is mutual links and effects as well as displacement between transportation modes (U.S. Department of Defense, 1996). Intermodal transportation includes a link between the ports and port logistic centers, communication with port area and communication of port area with the area outside the port. This point can be completely emphasized that it impossible to achieve an optimum level of efficiency without any intermodal system in the logistic port area. It is also notable that rail transportation has a certain position in the intermodal system and it serves as the main bridge in the logistic centers that are established outside the port area (dry ports) (ESCAP, 2005). Generally, intermodal system terminals are required to have the following items (Kasilingam & Reddy, 1995):

1. Rail section (rail access, a series of side rails for receipt and dispatch of goods, side rails for discharge and loading, side rails for filled and empty rail vehicles to park, rail vehicles workshop, etc.).
2. Loading and discharging section beside the rail (container transship area, filled and empty containers warehousing area, containers repair and maintenance workshops, gantry cranes, etc.).
3. Loading and discharging section beside the road (access to the discharging/loading areas, commercial management building, scale, housing construction supporting companies, etc.).

3.5.3.1) Different intermodal areas

a) Rail-road intermodal area: These areas have rail terminals for intermodal services and transportation that are directly related to them. (U.S. Department of Defense, 1996)

b) Marine - land area: For intermodal marine-road transportation, it should be said that intermodal area is located inside marine terminal where intermodal transition is performed in addition to the activities related to getting cargoes on and off. This area may not be incorporated into a logistic platform that may be located beside a terminal. For marine-rail transportation, the infrastructure of intermodal transition can be placed inside the marine terminal. In other cases, the intermodal displacement area will be located outside the marine terminal (of course, adjacent or close to that). Therefore, it needs road transportation. For the last case, rail terminal is better to be located in a logistic platform (Brewer, Button, & Hensher, 2001).

c) Intermodal areas that include privatized terminals: These are areas with independent industrial clients or logistic operators and are equipped with rail access and are responsible for the logistic activities related to non-container miscellaneous goods (Kasilingam & Reddy, 1995). Moreover, these areas have intermodal road equipment as well.

d) Terminals in which goods transportation is performed by wagons: Goods displacement by wagons may often be performed for transportation of iron and steel, bulk dry and fluid products, fertilizers, grains, etc. (Kasilingam & Reddy, 1995)

e) Container terminals: All transportation modes may be used for containers and will lead to coordination and optimization of integrated transportation. (U.S. Department of Defense, 1996)

f) Privatized terminals: They include the areas of independent industrial clients or logistic operators with direct rail access and are responsible for logistic activities related to non-container miscellaneous cargoes. These areas have intermodal road equipment as well (U.S. Department of Defense, 1996).

3.5.4) different services in logistic centers

By service areas and centers for port logistic centers, it is meant the services that are offered by the logistic platforms including personnel services, goods and transportation equipment services and commercial services. Internal structure of logistic centers may follow the three general following forms (LU, 2004):

1. Collection of all services in an individual operational field, service center or area (known by different names such as integrated service center, central service area, etc.).
2. Distribution of services between different operational fields of logistic centers.

3. A combined solution specifically used for large logistic centers: Centralization of main services in a central area, allocation of less important and more ordinary services to some of the operational areas which are far from the central area.

Central core of logistic centers of service area are considered as the most important operational part of a logistic center (its central base). Services that are supplied by service area are related to the following people: Truck drivers who transport the goods from a port or to a destination (drivers who wait for truck loading/unloading), those people who have to stop due to speedometer, those who want to make a call before arriving at the destination, or those who intentionally stop at nights so that not to arrive in the early morning of the next day and those truck drivers who live in the metropolis around the port. All necessary services for these drivers are offered (carwash, workshops, parking lots, etc) (Berglund, van Laarhoven, & Sharm, 1999).

Marine transportation operators (those for whom a part of services are supplied merely to meet their needs, e.g., container services, vehicle services, etc.), logistic companies that need a central position in the operational areas and port lands and those for whom the advantages of being in such a position is significant due to availability of sufficient equipment, accessibility to the port, auxiliary support services, etc. The goal of offering services is not to provide several services that there is no sufficient demand for them, rather, it means those services which are required for local users and vehicles that are involved in loading and unloading in the port. This will certainly increase the importance of logistic centers. Generally, the services that are supplied by the service area or center of logistic centers can be grouped and classified according to criteria (Berglund, van Laarhoven, & Sharm, 1999).

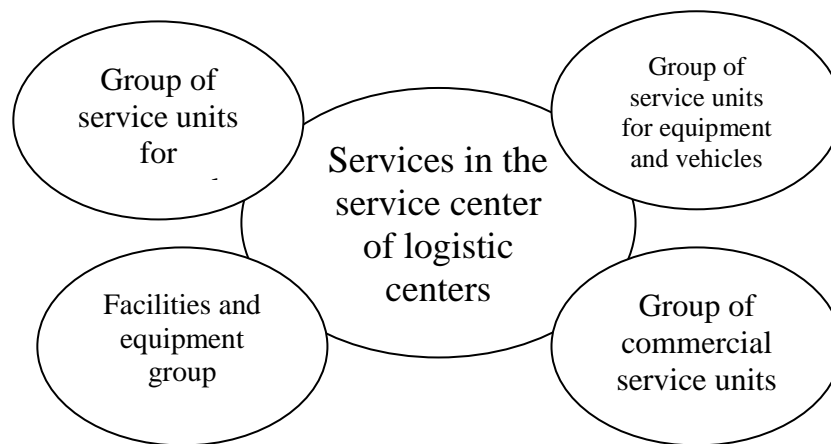


Figure 3.15) necessary services in the port logistic centers based on service units (Berglund, van Laarhoven, & Sharm, 1999)

The group of service units for equipment and vehicles include all services related to vehicles such as service stations, workshops, equipment for washing vehicles and tanks, exhibitions for the sales of vehicles and spare parts and parking lots for trucks. The second group of this classification consists of commercial service units including commercial centers (service or commercial center) and modular office space for companies and logistic operators. The group of personnel service units includes services such as hotels, restaurants and catering centers, shops, commercial service units, etc. Facilities and equipment group of this group is not available in all service units. The mentioned group in some cases includes regional/metropolis equipment for logistic centers such as educational

centers, conference centers, etc. Moreover, parking lots and helicopter landing areas may be constructed as well.

3.5.5) Supply and demand in available services in port logistic centers

There may be several services relevant to logistic centers which can be classified according to different criteria.

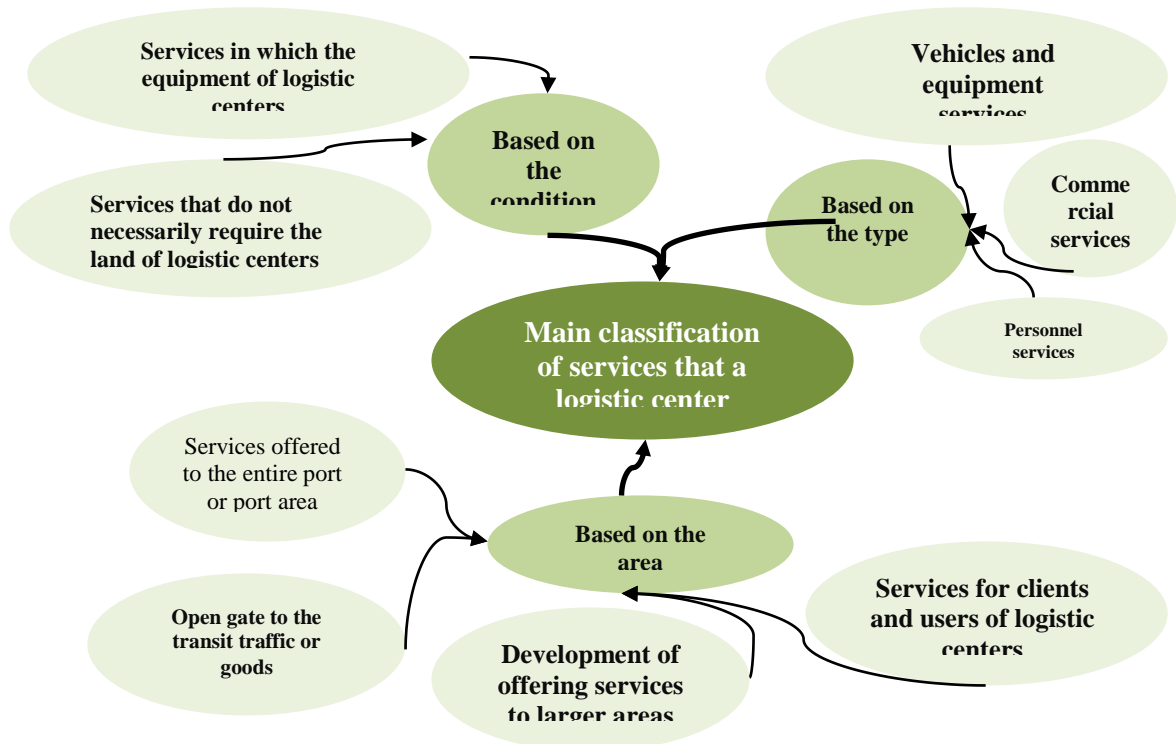


Figure 3.16) Main service classification criteria of logistic centers (ESCAP, 2002)

Demand evaluation for the services of logistic centers is not a mere process; rather it is strongly based on the conditions that conform to the existing space allocated for these services such as the area of services. On the other hand, it is based on the decisions made concerning the system that develops these services. These conditions have a high impact on a series of services that should be evaluated. The conditions provided by the model intended for development and administration of the integrated service area will determine their actual size of demand. These models are classified as follows (Hesse & Rodrigue, 2004):

a) The conditions provided by the intended model:

Development of the integrated service area for administration model will determine actual size of demand. By simplifying this issue, three general models for special development of the integrated service area can be pointed out:

Table 3.5) General models for development of service areas of logistic centers based on demand level (ESCAP, 2007)

Model	Main characteristic	Remarks
Global utilization concession	The concession of transferring or selling the integrated service area to the operator of an international department The holder of concession directly administrates some of the commercial and service units and rents the others	Preliminary investigation and sizing may only be done in general since detail investigation of demand, definition and sizing of commercial units will be performed by the holder of concession
Self-development	Direct development of the centers by the fonder company. This company determines the center as well as each of the working and service centers. It directly administrates some of the commercial and service units and rents the others.	A detail investigation should be made for demand and each commercial and service unit that should be determined and sized.
Group models	The company that establishes logistic centers transfers the concession of a group of services to the operators or a specialized fonder and develops the services itself directly or indirectly.	This model is placed between the two above models.

b) The conditions caused by the demand level

The necessary potential for attracting demand for the services of integrated center depends on the effect of that center as well as the decisions made by the port department. The area of services related to clients and users of logistic centers is limited. Essentially if the services in the service area are optimally used, in this case the integrated service center in the logistic centers can be considered as a center for the whole port. The services are developed beyond the port area (other industrial zones, surrounding zones, suburbs, etc.). Those offered in the adjacent industrial network are always used optimally. There is a tendency for attraction of transit (Hesse & Rodrigue, 2004).

c) Other conditions and general comments

Considering the market's preliminary evaluation of the available space for the services in a logistic center, it is necessary to remember that in most cases there is no complete demand for a major part of the offered services. Considering the integrated service, zones lack of sufficient experience for logistic centers is a reality. But there are some exceptions as well. Experience has shown that despite a limited initial response to market, the main demand emerges over time and leaves an effect more than the predicted level. This theory generally leads to a contradiction with the concept of the strategy intended for development of these services which in turn affects the investigation and analysis of their market. The two following strategies are based on the above theory (Hesse & Rodrigue, 2004).

1) Predicted strategy for development: Services are developed at the first stage and are popular from the beginning despite the complicated nature of demand as a different and conditional issue for logistic centers.

2) Time strategy on development: Service development is always performed in the advanced development stages of logistic centers. The clients first settle in logistic centers and then the demand for services can be accurately measured.

The following table will explain service models.

Table 3.6) some of the methodological theories for estimation of service demand (Meidutea, 2005)

Service model	Service or commercial unit	Remarks
Equipment services	Parking space for heavy vehicles	<ul style="list-style-type: none"> Generally, the level of public demand is very high. Spacing should be performed suitably and based on the available land and the operational system thereon disregard of other services around there.
	Service center	<ul style="list-style-type: none"> This unit should exist. Its size and area are based on the attraction capacity of logistic centers as well as accessibility of main roads outside logistic centers.
	Workshops and other car services	<ul style="list-style-type: none"> In this regard, competitive equipment in the surrounding area is investigated.
Commercial services	Commercial centers including commercial buildings	<ul style="list-style-type: none"> This center is available in most cases although its area and development depends on the demand conditions for new centers. Existence of administrative buildings requires initial investigation of market on administrative spaces in that city since in most cases demand is merely concentrated in urban centers. Administrative buildings should be considered for use of specialized operators, multipurpose halls, etc.
	Customs services	<ul style="list-style-type: none"> We strongly recommend such services to be included in logistic centers although final decision depends on the structure of these services in the port border area. Their sizes are usually specified by legislating authorities.
	Services for companies working in the buildings of logistic centers	<ul style="list-style-type: none"> This section is usually related to the services of personnel who work in commercial buildings.
	Telecommunication center	<ul style="list-style-type: none"> This is one of the unique services which can be methodologically placed in the previous classification.
Personnel services	Restaurants and catering services	<ul style="list-style-type: none"> This section is better to include a different level of quality/price/service although the latter depends on the attraction level of demand.
	Hotel	<ul style="list-style-type: none"> This place is rarely locally demanded by the port or logistic centers. It is necessary to investigate hotel section in the city and to evaluate the potential location of logistic centers to supply a special demand.
	Services in a commercial building	<ul style="list-style-type: none"> There is an increasing tendency in constructing buildings with more than one shop. These buildings are generally in relation to the service center. In addition, some certain buildings are for supplying certain services.
Miscellaneous services	Private buildings	<ul style="list-style-type: none"> These buildings are often private and are generally related to the demand by public departments – fire department, specific educational services buildings, conference centers, etc. As a result, they should be investigated separately.

3.5.6) Functions of Logistic Centers

As is was said before, besides traditional activities, these centers also supply value added logistic services such as labeling, assembling, production of semi-fabricated product, and customization. They combine logistic and industrial activities to meet the needs of local clients in different countries. When logistic centers are located beside each other in a certain location, they are called distribution parks. Therefore, the distribution park of a highly advanced value added logistic complex in a large scale and with several facilities is for distribution operations and has been directly connected to container terminal and land transportation systems for goods transit by using the latest information technology and communication. The duties of these centers are classified based on the type of performance strategy and equipment. The following figure can show a suitable outcome of the duties of a logistics center.

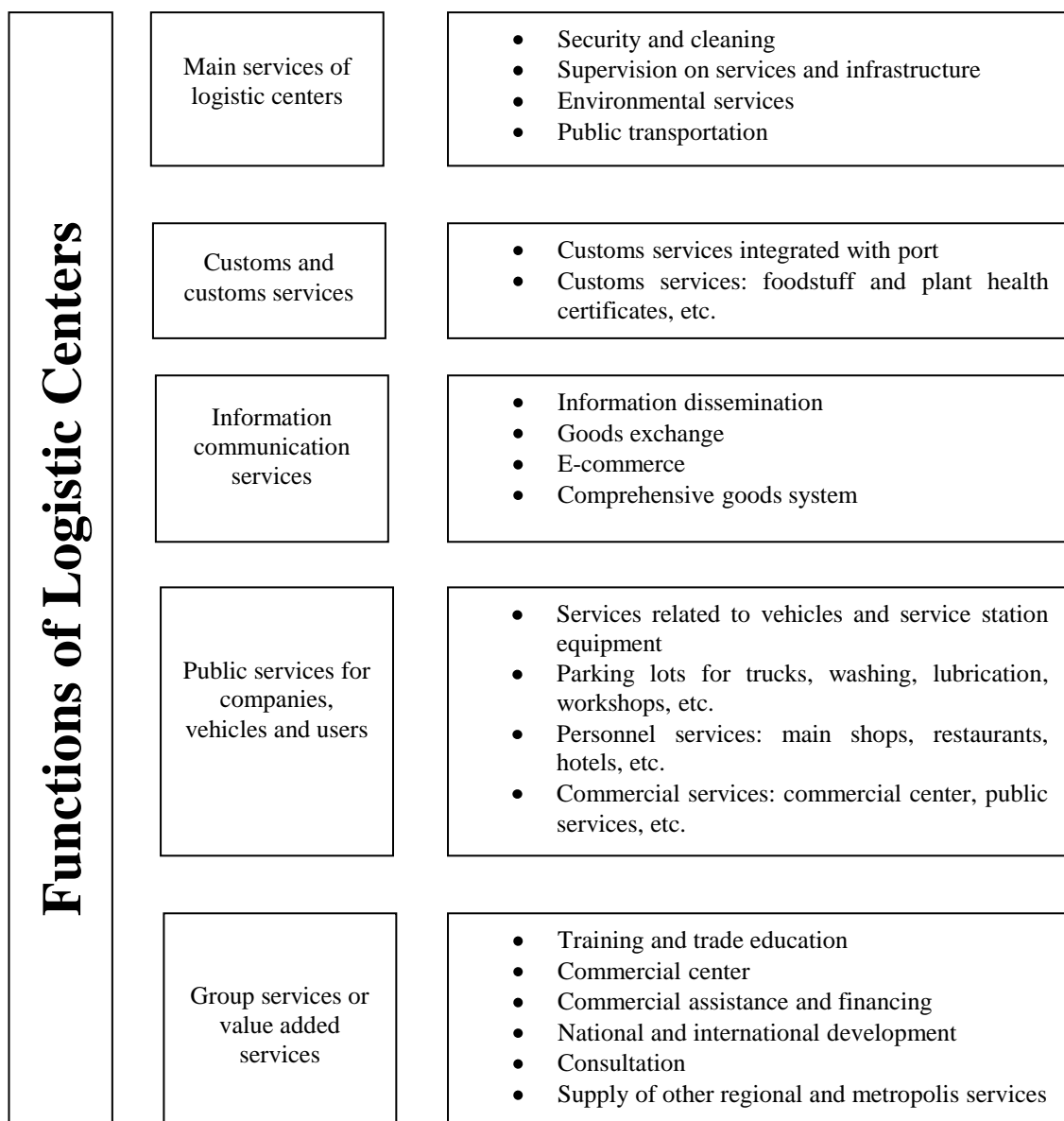


Figure 3.17) Services of logistic centers (ESCAP, 2002)

3.6) Selection criteria of the location for logistic centers

Traditional criteria for selecting commercial locations emphasized on cost factors such as cost effectiveness and transportation cost (ESCAP, 2002). Nowadays, human resource skills and non-economic variables have found more importance as compared to the past. Recent studies have identified the following factors:



Figure 3.18) Effective factors in positioning of logistic centers (ESCAP, 2002)

Considering the above factors, the key criteria for selecting logistic centers at the time of planning include port IT infrastructures, price of land, level of labor skill, level of wages, existing information technology, the condition of surrounding cities, etc. (ESCAP, 2002)

3.7) Management and planning in port logistic centers

Management and planning are among the factors that are considered in establishment and development of logistic activities of the ports in different areas. Planning for the said centers should be made in full coordination with transportation network and management in the port complex (Gunasekaran & Ngai, 2003).

3.7.1) Marketing for logistic centers

General methods for logistic centers marketing are the basis or the major part of strategic lines of a logistics center. Generally, each logistic center should follow the following 4 marketing methods according to strategic characteristics and goals of the project which are provided and explained in the following figure.

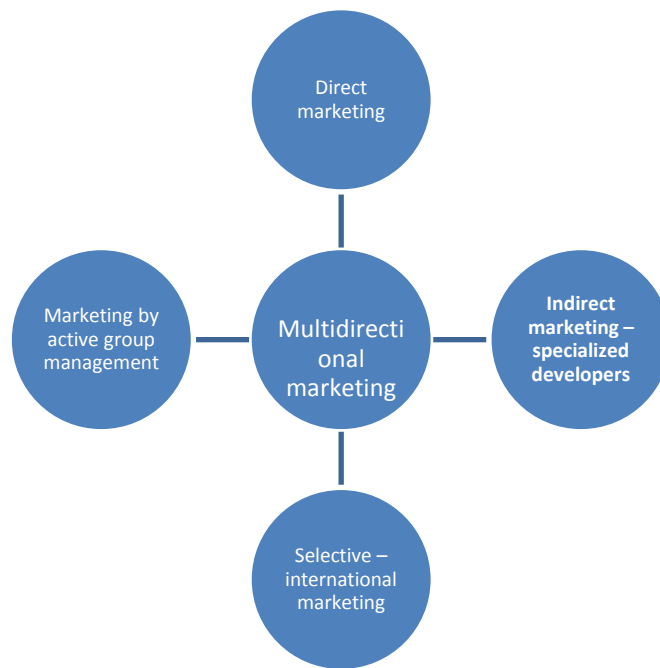


Figure 3.19) General marketing methods for logistic centers (Meidutea, 2005)

- Direct marketing: Classic marketing by considering local demand for port-logistic base and encouraging final customers to purchase partially in the operational areas that have been directly developed by logistic centers.
- Indirect marketing – specialized developers: marketing for specialized developers or operators that develop the operational areas inside logistic centers: intermodal center, integrated services center, sections of commercial unit for renting, etc.
- Selective – international marketing: Selective marketing for attraction of special operators with commercial credibility outside the zone. Generally, such commercial operations should bear regional support.
- Marketing by sections: Active group management: selective and general marketing by strategic economic sections in the port – logistic base. This marketing should be performed along with other measures for the development of the section such as training, assisting the companies, labor, etc.

According to Rodrigue et al. (2010), commercial developments of logistic centers, a selective and integrated pattern for the commercial and logistic groups around the ports and establishment of a commercial service complex to support economy require an active development approach in many aspects as well as an agreement between companies and public institutes. This approach is so complicated and deep that it certainly encompasses more than one development operation. The mentioned approach requires the integration of commercial networks and public sectors which is performed to provide necessary conditions for development of this service complex. This complex will be established in middle and long terms. Nevertheless, some measures should be taken to operate and enhance that in a short term. Therefore, marketing for a logistic center (which is always subject to special needs of the concerned case) should not be merely a passive one that only covers general facilities of the market. Local and classic marketing methods are always important. But the commercial activity of logistic centers should be developed by different plans and beyond the zone adjacent to the port-logistic base. They should also cover active participation of the actual management team that belongs to the logistics

centers development company. A selective-commercial process should be established in the direction of marketing and general development and for the purpose of attracting national and international sectors. The goal of such a measure is to provide facilities which are provided by logistic centers in the regional and trans-regional markets. Such facilities are especially suitable for the operations of integrated companies and logistic operators that are interested to work in the zone on a centralized basis. Joint activity of commercial associations and companies, importation and exportation sections and commercial subsections provide special facilities and in this way, settlement of these advanced operators will be facilitated. This teamwork should develop advanced methods for centralization of services and in this way, platform will be a strong support for development and competition of the logistic base of the port.

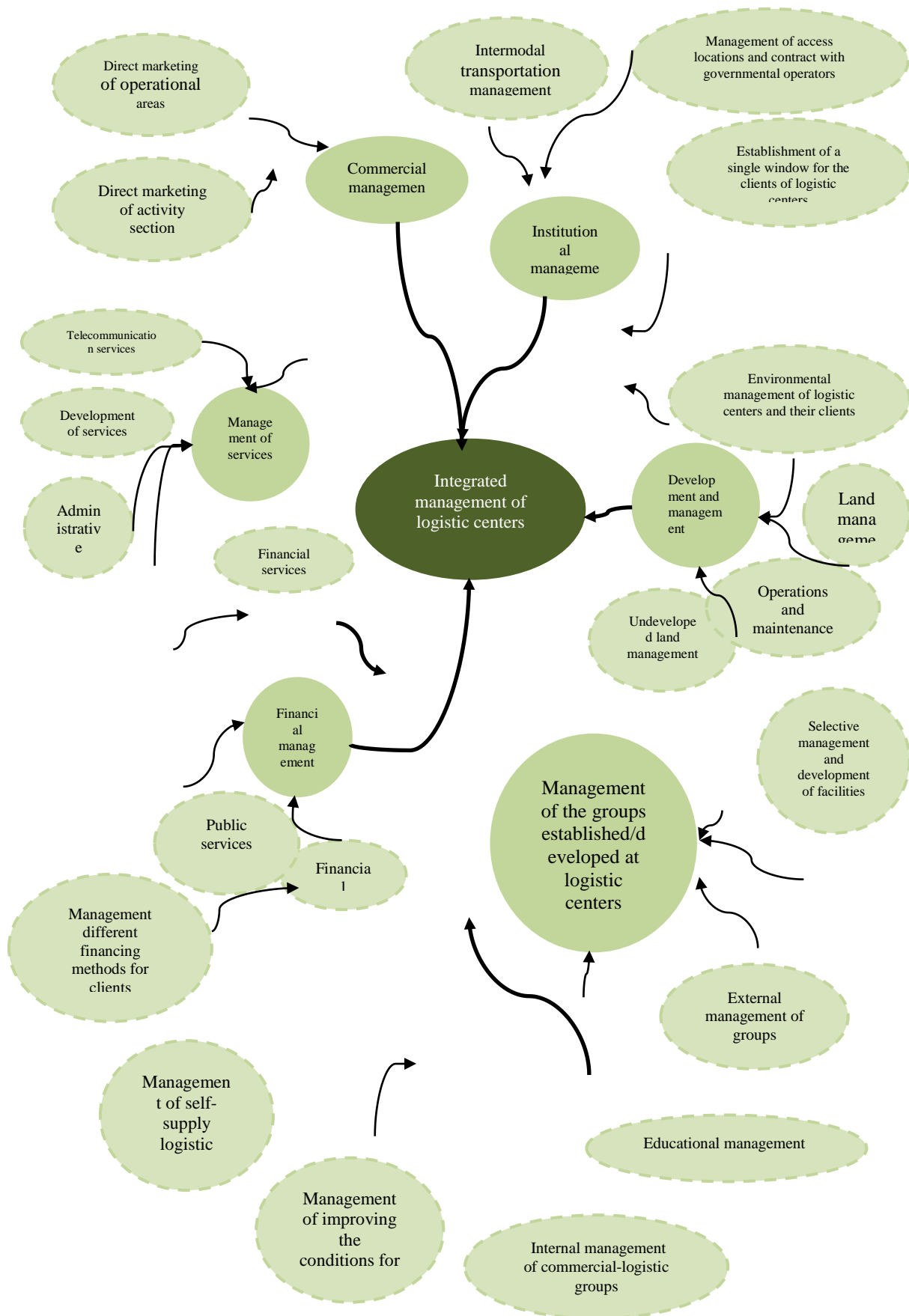


Figure 3.20) Central lines of logistic centers management from the integrated management angle (ESCAP, 2002) (ESCAP, 2005) (Hegering, Abeck, & Neumair, 1999)

3.7.2) Planning for port logistic centers

Analysis of port logistic development should be addressed as a reference for planning of logistic centers. What we should know about the successful planning of logistic centers in a port includes port logistic development stage which is under study and that how it is considered as a long term approach. The necessity to place port logistic development in the framework of a broader logistic approach of logistic activity factor forms the important element. According to Lee, Song, & Ducruet (2008), performance and potential of this zone affects the port strategy and essentially depends on the general level of logistic development of the port that should be actually determined. Logistic development, i.e., demands for socioeconomic development of the ports and logistic development of a port – port operations in the transportation and logistics chains – mainly affect the works that are performed in the port. The areas adjacent to the port and their capacities attract value added activities and their potential attraction leads to production and commercial activities. This security in the preliminary stage of logistic development process is limited to technical and basic activities while in the advanced stages, value added activities are increasingly addressed. Establishment of an increased traffic, customer loyalty and investment integration are usually some of the goals of a port. Demands for logistic development in a port leads to an increasing pressure by the area economy.

3.7.3) Planning process for port logistic centers in a general framework

Designing a logistics center is a coordinating element in the total strategy of port logistics. Planning process of port logistic centers is usually made by considering general criteria and goals (traffic sustainability, socioeconomic development, etc.) based on which the construction of a logistics center becomes necessary. However, one cannot be quite sure that logistic centers project may be executed in other port strategic goals. A logistic center should be defined and planned in a framework and conceptual generalization which is related to the port general strategy and its total logistic goals. (Almotairi, 2012)

3.8) Development problems of logistic centers in the ports

Development problems for logistic centers in the ports are presented in five sections. Each section and the type of problem should be understood so that a working procedure can be provided.

3.8.1) Limited Infrastructures

60% of total container exchanges of the world are estimated to be made in Asia. On the other hand, the demand for loading and unloading has significantly increased by the economic growth of Asia along with the increase of traffic in its ports and there is a need for sustainable development of infrastructures. By the continuation of the present process, it had been estimated that the volume of container exchanges of ESCAP zone would increase from 155,000,000 TEU in 2006 to 216,000,000 TEU in 2011 and it went up even more. To meet such a level of container exchange, 569 new piers with an investment of about 36 billion Dollars will be needed in 2015. Of course, investment level for development of logistic centers should also be taken into account. Considering the limited resources and financial investment, shortage of infrastructures will be the main problem of ports in the near future. (ESCAP, 2005)

3.8.2) Poor performance of specialized logistic services companies

The companies supplying logistic services have a key role in the efficient function of logistic centers of the ports. However, poor supply of specialized logistic services in most countries has a negative effect on the development of value added services (ESCAP, 2002). Therefore, the ports of developing countries should concentrate their efforts on the strengthening of logistic companies and especially on those companies that work in the logistic service sector. Training of skilled labor is also necessary in logistic centers management.

3.8.3) High price of land for development of logistic centers

Some countries such as Japan, Singapore and South Korea face several problems in development of logistic centers due to high price for lease or purchase of land. Despite this subject and due to necessity, some of the countries have developed broad areas of the lands of ports coasts for logistic centers; however, the cost of development in these zones is still very high (ESCAP, 2002).

3.8.4) Inefficiency of administrative procedures

Complicated administrative procedures and public bureaucracy condition are another impediment in the development of logistic centers. Often, it has been seen that bureaucracy in the developing governments is higher than in the developed countries. In case this situation continues, foreign companies will be less interested in investing in this zone (ESCAP, 2005).

3.8.5) Low level of service supply in the ports

In addition to the problems of infrastructures, service level in the ports of developing countries is quite lower as compared to the advanced ports of the world. For this reason, upon increase of the volume of goods exchange, most of the ports have poor structures in supplying services. This poor structure reduces their competitive capability and will be an impediment for establishment of logistic centers (ESCAP, 2005).

3.9) Development process of ports logistic centers

Considering the subjects discussed in the previous sections, the policy and strategies which are the results of the studies made on the ports of developed countries as well as on the existing conditions of the ports in the developing countries are provided (Rondinellia & Berry, 2000):

3.9.1) Systematic planning and development of logistic centers

One of the most important reasons for lack of any efficient logistic center in the Asian ports is the lack of governments' understanding of the importance of the hinterlands of ports for establishment of logistic center. Therefore, utilization management of ports lands should be focused on the following goals: (ESCAP, 2002)

- Allocation of the lands to relevant operational uses
- Suitable utilization of the assigned lands in the relevant marine industries

- Assurance of economic utilization of assigned lands
- Utilization of the lands with old use for new development plans
- Conclusion of land assignment contracts within stages

According to Jun & Yi (2005), the activities of logistic centers may be followed by environmental effects such as water contamination, dust, traffic, etc. which will impose heavy social costs on the cities. An interaction between the development plan of logistic centers and comprehensive plans for urban development is the basic strategy for sustainable development of port and city. For example, Yokohama port has used its old pier for establishment of hotels, administrative offices, shops and logistics centers under the supervision of port authorities through interaction and coordination with the development plan of Yokohama. In the planning and development of ports logistic centers, all beneficiaries (central and local governments, port authorities, shipping lines, logistic companies, etc.) should participate in all decision making processes and therefore, coordination and interaction between them towards sustainable development is necessary. Codification of legal framework for organization of public partnership and collection and documentation of opinions are among preliminary measures in this respect.

3.9.2) Organizing incentive mechanisms

The interest in investment and land purchase depends on the supply price, easy payment terms and investment security. In case appropriate conditions are prepared, foreign companies will begin to invest. The goal of planning is to attract foreign logistic companies through providing necessary incentives such as tax exemptions towards supply of logistic centers of the ports (Tongzon J. , 2007).

3.9.3) Development of free trade zones

The goal of development of free zones is to provide free trade zones towards port comprehensive plan and increase of income employment. Free trade zones are considered as a part of macro policies for economic development. At the same time, there is no unique pattern for establishment and development of free trade zones in the world and different conditions govern each country (ESCAP, 2007). Of course, considering domestic conditions in each country, reduction of costs and facilitation of trade rules, which is a complicated problem and requires investigation, specialized review of organizational procedures, will facilitate the establishment of free trade zones. Free trade zones are usually considered as the zones adjacent to the ports in which the goods may be kept for a long time without paying any customs duties or tax. Moreover, manufacturer will be able to perform storage, sales, exhibition, separation, packaging, assembling, distribution, arrangement, gradation, labeling and production activities in these zones. The most important advantages of free trade zones are as follows (ESCAP, 2005):

- Direct and indirect employment
- Entry of currency to the country (as the result of the added value exported through the goods)
- Increase of exportation capability
- Increased utilization of domestic resources, services and capitals for exportation
- Technology transfer
- Increase of foreign investment
- Development of local labor skills
- Development of marketing/sales opportunities for free zones and domestic products

- Increase of goods transit

By establishment of these centers, 50 to 80% of the established added value will remain in the host country. South Korea had estimated a value added income of 1.3 billion dollars for the Busan port free zone along with more than 15000 new jobs by the year 2011, which was nearly fulfilled. Different free zones are presented in table 3.7. Currently, there are more than 1500 free trade zones in the world. Some of the ESCAP economic powers like Japan, Singapore, Hong Kong and Taiwan have established their own free trade zones in the ports and have established logistics centers within these zones to provide value added services and to enhance logistics activities of the ports (ESCAP, 2002).

Table 3.7) Different free trade zones (ESCAP, 2002)

	Free port	Free economic zone	Free industrial zone	Free trade zone
specific ations	Including the whole city	Including the whole city/district/province	Industrial park	Large warehouses near the ports or airports
Economic goals	Development of trade centers	Private sector investment	Industrial exportation development	Facilitation of trade and importation
Tax free goods	The whole trading/industrial/consuming goods	Selective	Capital/production equipment	The whole stored goods/re-exportation & importation
Other activities	Trade/services/industry/consumption	All industrial and service fields	Light production industries	Warehousing/packaging/distribution
Incentive	Easy establishment of business/minimum tax and legal constraints	Discounted taxes/free job classification/reduction of foreign exchange control	Reduction and facilitation of profit tax/exemption of foreign exchange control	Exemption from importation formalities
Domestic sales	Within the unlimited zone/outside the zone with payment of all duties	Strict constraint	A small part of production	With complete payment of duties, without constraint
Example	Hong Kong/Singapore/Macau	China	Taiwan/Malaysia	Jebel Ali (UAE)

3.9.4) Investment for the development of infrastructures

As the first step, investment for development of infrastructures including port equipment and logistics centers is considered to remove the increasing needs due to logistics activities. Local and central governments in some of the developing countries lack necessary capital and capability to develop and purchase equipment for the ports. As a result, establishment of logistic centers in such ports are not in priority. It is especially important to improve efficiency for optimal use of investments and by considering the fact that the capitals of public sector can only supply the infrastructures and it is the capital and investments of private sector that provide most of the equipment and facilities. Moreover, codification of rules and regulations to protect the private sector is necessary and will prevent from any monopoly (Peck, 1996).

Table 3.8) Comparison of investors' incentive taxation policies in private sector in the ports logistic centers (ESCAP, 2002)

Country	Tax exemptions and other incentives
China	15% tax exemption for legal entities. There is a definite period of complete tax exemption for the companies with more than 10 years of work record and after the expiry of the definite period; tax exemption will be 50%.
Hong Kong	16% tax exemption for legal entities and 15% exemption for capital
Taiwan	Complete tax exemption in the exportation zone and four complete years of tax exemption for legal entities specially during development of equipment
Japan	Five complete years of exemption for fixed capitals in case of employment of more than 20 persons and 35% tax exemption for legal entities
Singapore	10% tax exemption for legal entities plus a broad range of other incentives

According to Peck (1996), an accurate planning and suitable investment should be made to use the surplus capacity (improvement of capital efficiency) and to omit low efficiency operations towards optimal use of investments made in the logistics of primary ports. Furthermore, improvement of participation of private sector in the development of logistic centers will be inevitable in removing the equipment shortcomings. In the first stage, an accurate planning will be necessary for initial investment and omission of inefficient operations. Optimization of the efficiency of investments and maximization of the effectiveness of processes can be the consequence of this procedure.

3.9.5) Development of the professional companies supplying logistic services

In parallel with globalization process, outsourcing of logistic services still continues. Specialized companies that supply logistic services provide the customers with advantages such as reduced volume of investment and working capital and the capability to influence on new markets with high speed and low cost. About 65% of the logistic services in EU and 50% in the US are provided by these companies. Improved quality of logistic companies' services and education of specialized skilled labor are resulted by professional companies that supply logistic services (ESCAP, 2002). Ports may be changed into logistic

centers only when they allocate suitable resources to the education of professional logistic experts and skilled labor. These educational programs should provide the individuals with IT and supply chain management skills along with warehousing management, stock management, clients' services, transportation, purchase, budgeting and accounting. Skilled personnel are highly required due to the shortage of specialized labor in the logistic services. Educational systems (universities – short term and middle term) in the countries of this zone should provide and develop the capability to educate logistic experts capable to meet specialized requirements of logistic centers operations in different levels (ESCAP, 2005). Use of information technology in the logistics centers is being developed; however, in most ports it is not possible to transmit necessary data to the clients through websites of the ports.

3.9.6) Governance issues

Like any other development, the process to change the second generation ports into logistic centers requires a driving power. Therefore, driving power as well as control, direction and supervision on its performance should be sufficiently addressed. In this respect, the main duty is to establish an operating organization for planning and coordination that will be an efficient assistance in the effective execution of this process. On the other hand, government's participation in the construction of ports, road and railroad as well as energy supply will be a key element due to the necessity of easy access of the ports and logistics centers to the land transportation modes. Development of a legal framework for establishment of logistic centers in the ports may be addressed for targeting the transportation sector of countries. The role of the Netherlands as an international logistics and distribution center has been planned and executed by two key governmental institutes, i.e., foreign investment agency and international distribution council. Similarly in Singapore, commercial development institute and economic development institute have been the driving powers (ESCAP, 2002)

3.10) Conclusion

Today, the increase of global trade has made managers in the ports to increase their operational power by providing new methods for value added services. Establishment of services in the ports will increase the traffic and this is one of the advantages of using such services. The main goal of establishment of logistics centers in the ports includes integration and more comprehensive management and control of logistics and transportation centers. In this chapter, the position of ports logistics centers was defined by providing the concept of logistic platform. Investigation of centralized logistics chains in the ports as well as their demands is another factor that shows the importance of establishment and development of these centers. A logistics center can be considered both as a platform for regional and trans-regional distributions and an international center for goods transportation in which different necessary services and facilities for the activities can be established. In another part of the chapter, duties and different services in the logistics centers of ports were studied with an emphasis on the establishment of intermodal terminals to increase the speed of goods process and to reduce the costs. Planning and management were considered as one of the most fundamental issues of this chapter that confirms workgroups between all the institutes and organizations that are related to the logistics centers of ports under an integrated management by considering the positioning of these centers and the impediments for establishment and development. Use of a systematic approach for planning and development of ports in the logistics centers is

highly important. This will be fulfilled by an accurate planning for the incentives, establishment of a modern technology in the management of goods process including information technology and providing subsidiaries to the companies settled in the ports and logistics centers.

4) Chapter Four: Function of Port Logistics Centers

4.1) Introduction

After understanding the issues related to logistics, transportation chain and establishment of logistics centers in the ports, in this chapter we investigate the function of these centers from different viewpoints and approaches. There is no general standard for evaluation of the functions. It has been attempted to investigate the function of these centers and their influences by a general and comprehensive approach. One of the most important viewpoints by which the function of port logistics centers could be studied is the function of port activities and its influence on the port. The viewpoints addressed in this chapter include the effects of ports logistics centers on port areas, services and traffic, as well as effects on commercial and transportation networks. Additionally, economic effect of the centers is being discussed. At the end, this chapter will also take a look at competitive advantage gained as a result of logistics center in a real case.

4.2) Investigating the effects of logistics centers

According to Notteboom & Rodrigue (2005), setting up a logistics center affects its surrounding area and anticipation of these effects is quite helpful. If the logistic center is in the course of planning, its anticipation will help in financial and economic efficiency of logistics centers and will plan its development in the future. If there is no logistics center, the preliminary estimations may be compared to the actual data by studying its effects and the future can be re-planned based on the obtained differences. In both cases, the goals of studies should be quite clear. At first, it is recommended to divide a logistics center into two stages with different effects to explain the related concepts (Lee, Song, & Ducruet, 2008):

- 1) The stage for execution of logistics centers plan: Effect on the land reserve and performance of construction work related to infrastructure and equipment;
- 2) Management-operations stage: Effect on the activities and services that are supplied during the Utilization of infrastructure and equipment.

To organize the estimation made on the effects of each stage, we should distinguish the differences between the existing logistics centers and those that are in the course of planning.

The goals concerning a logistics centers include the followings (Daganzo, 2005):

- Analyzing the existing condition;
- Anticipating the future processes;
- Simulating given scenarios that are different from the existing one.

The effects of logistics centers can be classified as following:

- The effect of logistics centers on the port areas: A logistic center may affect on the structure of port service area, efficiency and quality of the services provided by port in short term, middle term and long term growths of port traffic (Notteboom & Rodrigue, 2005);

- The effect of logistics centers on the commercial logistics: A logistic center affects the supply and demand. It will eventually result in reducing the logistics costs (Bonacich & Wilson, 2008);
- The effect of logistics centers on transportation: A logistic center affects on the traffic in the vicinity of urban and metropolitan environments as well as inter-city transportation due to the fact that it centralizes the traffic in a specific zone (Hesse & Rodrigue, 2004);
- Economic effect of logistics centers: A logistic center helps in the economic development of the surrounding area and provides the economic dependence. This fact affects the port in which the logistic center is located (Klink, 1998);
- The effect of logistic centers on the competition of the ports: the advantages of the centers persuade the ports to develop their logistics centers to be able to compete with the other ports (Cullinane, 2011).

4.3) Effect of logistic centers on the ports

Setting up a logistics center has some effects on port that can be divided into 3 groups which are presented in the following figure and will be explained in details:

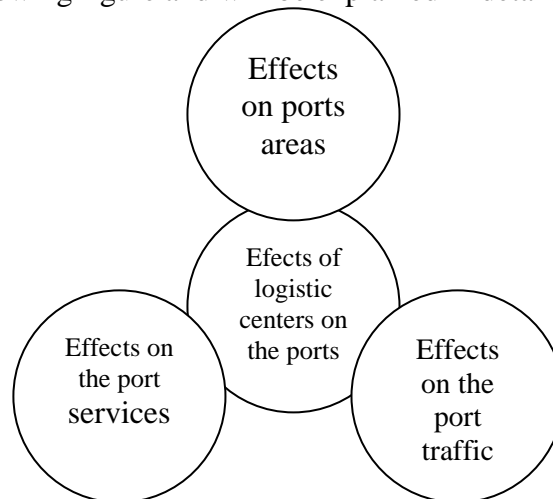


Figure 4.1) Classification of the effects of logistic centers (Notteboom & Rodrigue, 2005)

4.3.1) Evaluation of the effects of logistic centers on the port areas

Centralization of logistic activities on a specific area of ports (whether inside or outside the ports) helps in the allocation of suitable applications to the port. A port service area supports most of the logistic and transportation activities. It is a place on which non-dynamism of traditional applications, operation privilege system and the pressure of urban environment are imposed. Most of the activities are centralized in a limited space and put pressure on the port. Logistic centers help in removing such pressure and facilitate logistic processes in the ports (Notteboom & Rodrigue, 2005).

- Whenever there are suitable trading opportunities, port land management is usually improved through participation of private sector in using the port. Utilization privileges are considered as a vital tool in the development of a port. They enhance the participation of private sector according to a contract (with a definite period) between port department and licensor. For the port departments, a “Host Port” model that provides the port area needs an accurate planning before allocation of applications to different sections of the port and applying a managerial control.

Development of a logistic center is related to this type of process since its concept is coordinated with the host pattern. In addition, the goal of logistic centers plan is to encourage private sector to take port land management (Tongzon , 2007).

- Integration with urban and regional environment: In most conditions, urban environment pressure on the ports leads to the joint use of a part of port area. Setting up a logistic center can release the port spaces that can be physically related to the city (Taniguchi et al., 1997). In addition, setting up a logistics center helps in strengthening the operational relation between transportation networks and port that are related in the urban or metropolitan area. As a result, by establishing a logistic center, the port increases its integration with the domestic managerial policies governing the regional environment (Juhel, 2001).

4.3.2) Logistic centers and their effect on the port services

According to Chapman, Soosay, & Kandampully (2003), development of a logistics center facilitates the change of port logistic operations into customer-oriented operations. The possibility to supply value added services makes the port closer to the quality conditions requested by its customers. This method increases the port's competitiveness. Here, efficacy of port services, increases based on outsourcing of direct supply of these services to the third party. The supplier of port services appears in the port as a specialized and experienced company trying to have its capital returned through optimization of fixed and variable costs. Vertical integration process may occur in the commercial organization. This means that a company or a group provides a series of relevant port services (ESCAP, 2002).

As an illustration, according to a case study done by Lu (2000) about services in Taiwanese logistics centers, revealed that value-added service, together with promotion, equipment and facilities as well as speed and reliability are the most important strategic dimension that logistics centers can gift to port areas. The author mentioned nine service attributes in Taiwanese ports, namely; good financial condition, high frequency of sailing, on-time pick-up, courtesy of inquiry, prompt response to claim, good condition of containers, ability to provide computer system for cargo tracing, ability to provide door-to-door service, and ability to provide customs clearance service.

4.3.3) Evaluation of logistics centers in the port traffic

Performance of logistics centers in the traffic is investigated based on maintaining the existing traffic and development of a new traffic. In such a competitive environment, the development of logistics centers might be a determinant to keep the clients and to attract more goods to the port. Applying this approach, there are three types of clients that are directly related to the port traffic (Slack, 1993):

- Clients, for whom the logistics centers, improve the quality of port services and as a result they keep their cooperation with the port. In this case, port traffic goes completely under control.
- Clients who are authorized by logistics centers to improve their general logistics situation. These clients act in two ways; they either increase the movement speed of goods beside logistics centers or direct new logistics chains through the port. In either ways, the clients who have improved their relations with the port will increase the traffic.

- New clients that develop new port traffic; this traffic is absorbed by the new logistics complex of logistics centers.

These three actual/potential relations between the port and its clients specify the difference between the effect of (existing) increasing traffic and the new traffic.

4.3.3.1) Increase of the existing traffic

Increasing of port traffic is significantly important, especially when we consider the main clients of the port. Ports have traditionally applied policies to increase the loyalty of clients through supplying privileges. On the other hand, most of the large industrial companies have established their production centers near the ports in order to strengthen the relations (Slack, 1993).

According to Slack (1993), flexibility of logistics center leads to its growth up to the extent intended by the clients. As long as there is sufficient land and suitable conditions, a logistics center may develop gradually and may adjust its supply with the actual demand. In this way, the risks related to this type of investment project will be minimized. In fact, establishment of a logistics center is a gradual process which is fulfilled gradually during the evolution phase and while it continues absorbing new clients to different operational areas, warehouses and equipment.

For anticipating the port traffic, not only the preliminary plan of logistics centers should be considered, but also actual planning of the port should be focused. The following development factors should be completely taken into consideration (ESCAP, 2002):

- Geostrategic condition of the port
- The capacity of marine-land equipment, infrastructure and ports areas
- Cost/quality ratio of port services
- Land access through road and rail
- Information systems and conclusion of service contracts, and policies of the port

To have a better understanding on the fact that logistics centers can increase the port traffic, I can exemplify a case study which is done by Cheraghi et al. (2012). The author revealed that port owner's policy, logistics system in the form of logistics center, hinterland condition, availability, shipping maritime service, port regional services including value added services within the logistics center, shipping agreement and port connectivity are determining factors in Shahid Rajee port in Iran, which led the port to absorb more traffic and gain competitive advantage through marketing strategies.

4.4) Effect of port logistics centers on the commercial network

Port logistics centers influence on commercial logistics or commercial network which is directly or indirectly related to these centers. This influence may be investigated by a view to the costs and revenue based on the level of supplied services. In fact, the severity and diversity of the effects caused by logistics centers are different considering the following trading groups (Ramounas & Bazaras, 2004):

- Supply by companies established in the logistics centers to provide logistics services concerning the port goods.
- Demand by companies that are actual/potential clients

Direct logistics effects of a logistics center on the commercial network are divided into two groups (Meidutea, 2005):

- 1) Cost saving is the result of optimizing logistics process and will be continued due to redirection of goods processes towards new logistics chains located at the

- logistics centers as well as performing optimal logistics activities at the logistics centers, by the service providers.
- 2) The client companies having utilized the centers manage to reduce costs and increase the quality of productions and services.

4.5) Economic effects of logistics centers

Based on the previous studies on ports, investment in infrastructures concludes the economic growth. Although this general theory might be more relevant to developing countries as compared to the countries with sustainable economies, investing for logistic centers can also advance the economy of the developed countries especially during economic deflations (Ramounas & Bazaras, 2004).

4.5.1) Characteristics of economic effects

In economic development, investment is a factor that has recently led to studies on economic effects of several investment projects especially large scale projects. When logistics centers perform operations, the logistics services they supply will increase the value of the port goods. In addition, according to Tavasszy et al. (2003), the economic effect resulted by new supply of logistics centers has an increasing importance and should be calculated in respect of its importance in the local, regional or national economic environments. Here, we point out three main items of economic agents in the study of economic effects of logistics centers (Guangyi & Chaoyang, 2008):

- 1) Logistics centers in which a group of economic agents are centralized: these agents supply auxiliary and logistics services. Logistics centers administration, loading companies, exporters/importers, and logistics operators that perform the operations are a part of this group
- 2) Dependent economy: Companies are considered as the group of economic agents that supply services in the logistics centers (supplying companies) or request for the services supplied by logistics centers (demanding companies)
- 3) Regional or national economy: The study of economic effects should specify the geographical region of the economic system in a national, regional or local level.

For instance, according to a case study made by Grossmann (2008) regarding the Hamburg port, impacts of economic development of the port have been unveiled. The study consists of a survey in Hamburg harbor to consider changing the port in terms of costs and benefits in order to plan the processes. The most obvious consequences of logistics center in the port were recognized as the technological change, new requirements for ports, and the economic shift towards service industries. The center should consider the port's changing costs and benefits in order to meet expensive new requirements. Some new requirements are difficult to meet for the Hamburg port due to high costs, so that this situation may include a risk of losing the market share. Moreover, as value-creation is continuing to shift to service sectors, value creation will reduce. At the extreme increases in container throughput, the job losses expected due to tendency towards automation. At the same time, port maintenance and development entails significant visible or hidden costs.

4.6) Competition of port logistics centers

According to Cullinane (2011), one of the most important issues related to establishment of logistics centers is the emergence of competitiveness between the ports and other transportation and logistics platforms. Considering the functions of the ports, establishment of these centers places the port in a high level of logistics and transportation services accompanied by reduced costs and facilitated displacements. For instance,

intermodal services face increasing demand due to its certain benefits. Competition of port logistics centers is for sustaining the position in the existing logistics chain.

For instance, a case study written by Yapa and Lam (2006) about the competitive dynamics between the major container ports in East Asia reveals that Hong Kong and Pusan are the distinctive beneficiaries from inter-port competition in the region for the past three decades. The reason can be found by investigating the concentration of services at the logistics centers that led to intense competition between the primary load centers and ports located in vicinity that share their hinterlands, like Hong Kong versus Shenzhen, Pusan versus Kwangyang, Shanghai versus Ningbo, Qingdao versus Tianjin.

4.7) Effect of logistics centers on transportation

Most ports are located in urban areas due to historical reasons. Cargoes processed in the sea ports pass through urban streets to reach the destinations. In some case, there is a direct relation from ports which is through single purpose roads with limited access. But in normal cases, the roads and even the rail lines which are used by ports are those of urban traffic. Generally, trucks cause heavy traffic. Heavy traffic is caused as the result of passage of several vehicles through urban roads and streets. Low maneuvering possibility of heavy vehicles make driving in the cities difficult. (Guangyi & Chaoyang, 2008).

According to Visser et al. (1999), the problem of heavy traffic is not exclusive to urban/metropolis zones. Most of the inter-urban roads face the problem of a heavy traffic. Rail networks face the same problem when the infrastructure formed by rail lines and terminals have insufficient capacities (Guangyi & Chaoyang, 2008).



Figure 4.2) a road network in Antwerp Port (Port of Antwerp, 2009)

According to Roso et al. (2009), existence of logistics centers, as for instance in the dry ports provides the freight volumes with the shift of traffic modes, from road to more energy efficient modes, for example we can point out railway that is less harmful to the environment. In this regard, the cities and the roads get released from congestion and shippers in the hinterlands of ports will be served with more improved logistics solutions.

4.8) Contribution of logistics centers to achieve a competitive advantage

Having identified the functions of logistics centers and their effect on ports now is the time to investigate whether the implementation of the logistics strategies has contributed to get a competitive advantage or not. According to Xu (2011), an evaluation of the current situation of Port of Shanghai and Port of Rotterdam in terms of the performance and efficiency will be investigated. The author revealed that each port has its own strengths and weaknesses in the logistics system. Therefore, a comparison of the two ports can be evaluated by different factors, namely infrastructures, operation processes, business environments and logistics services with an emphasis on logistics development which can define the necessity of changing role of the ports from traditional transport hub to value-added logistics center.

Focusing on the performance of the two ports, the following results appeared;

Port of Rotterdam as the world-class port has high standard of offering logistics value added services in form of logistics centers. While, Port of Shanghai is still remaining at a developing level, even though its container throughput is relatively high, and it surely is because of benefiting from China economy's growth and geographic advantages.

Shanghai fails to meet the fast growing demand, due to inefficient logistics strategies involved in port development, which could be an outcome of under-investment and lack of innovation. In other words, Shanghai port is lacking modern logistics which provides rapid, reliable, flexible and wide-ranging services in the form of a logistics center. As it can be seen, clearance time in Shanghai is about twice or even three times more than Rotterdam, which will end up with delays.

Table4.1) Comparison of two ports clearance time and services (Xu, 2011)

	The average Clearance time(days)	Transparency of customs clearance
Port of Shanghai	2.54	35.29%
Port of Rotterdam	0.785	87.50%

In addition, port efficiency is directly affected by turnaround time. Turnaround time is based on hours, which should normally be much less than a day. When the port is facing low operation speed or port congestion problems, vessels have to stay longer in the port. In Port of Shanghai, the turnaround time is longer than what it is in port of Rotterdam. The possible reason could be shortage of logistic warehouses resulting in congestion.

Table 4.2) the container ship turnaround time in two ports (Xu, 2011)

	Port of Shanghai	Port of Rotterdam
Turnaround time for container vessels	23 hours and 14 minutes	4 hours and 37 minutes

The congestion level of any port is calculated based on the delay of containers to be processed, as an illustration, Luojin Terminal in Shanghai normally has 2-8days delay, and EMO terminal in Rotterdam only has 0-2 days.

Hence, the port of Shanghai is losing huge share of profit due to lack of a logistics center. On the other hand, investing in infrastructures specifically in logistics centers in Port of Rotterdam turned the port to super hub with a super high competitive advantage.

5) Conclusion

Ports in each country, as the important link of transportation networks, should be able to meet the incurred demand and also equipped to adjust supply and demand. Global trade growth has led to execution of value added activities in the fields of logistics and in the form of logistics centers. What was investigated in this study was the effect of these centers from different approaches. The following results are presented considering the collected studies:

- Logistic center has effects on port areas: it assists in eliminating the pressure imposed by the centralized activities in the limited space of the port and also facilitates logistic processes in the port. Furthermore, logistics center absorbs the investment of the private sector at the port areas. It also strengthens the relation between transportation networks in urban areas and port in order to integrate regional environment management.
- Logistics center influences services of the ports: the change of port logistic operations by supplying value added services makes the port closer to the quality conditions and provides more customer-oriented operations. It also practically increases outsourcing of direct supply of these services to the third party.
- Logistics center affects traffic of the port: establishment of a logistics center is a gradual process which is fulfilled gradually and continues absorbing new clients to different operational areas, warehouses and equipment.
- Effect of port logistics centers on the commercial network: service providers in the logistics centers manage to reduce costs by supplying optimized logistics services and on the other hand, the client companies utilizing the centers manage to reduce costs by increasing the quality of their productions.
- Economic effect of logistics center: economic effect is quite evident, due to new supply and general economy. Investment in infrastructures in the form of logistics centers increases the value of the port cargoes by offering the logistics services. Thus, the new supply flourishes the economy of the port.
- Effect of the logistics centers on competition of ports: the emergence of competitiveness between the ports is as a result of a high level of logistics and transportation services accompanied by reduced costs and facilitated

displacements. Therefore, ports attempt to absorb more clients by offering the logistics services.

- Effect of logistics centers on transportation: by shifting the cargo volume from road transportation to other traffic modes, namely railway, congestion of roads will be reduced.
- Implementation of the strategies to establish a port logistics center will undoubtedly contribute to get a competitive advantage. Competitive advantage of ports depends on physical and geographical features of the ports and their relations to transportation systems. As it has been investigated in performance of Rotterdam port and Shanghai port, due to implementation of efficient logistics centers, Port of Rotterdam has higher competitive advantage rather than port of Shanghai.

Reference List:

- Abdullahi, M. "the development and upgrading of ports, logistics centers." *the Eleventh Conference on Marine Industry of Iran*. Tehran: Marine Industry of Iran, 2009.
- Abrahamsson, M., Aldin, N., and Stahre, F. "Logistics platforms for improved strategic flexibility." *International Journal of Logistics Research and Applications: A Leading Journal of Supply Chain Management*, 2003: 85-106.
- Ahmadi, H. *supply chain management*. Tehran: Training and Industrial Research publication, 2005.
- Almotairi, B. *Integrated Logistics Platform The context of the port relational exchanges and systematic integration*. Gothenborg: Chalmers University of Technology, 2012.
- Aronsson, H. and Hüge Brodin, M. "The environmental impact of changing logistics structures." *International Journal of Logistics Management, Vol. 17 Iss: 3*, 2006: 394 - 415.
- Berglund, M., van Laarhoven, P., and Sharm, G. "Third-Party Logistics: Is There a Future?" *International Journal of Logistics Management*, 1999: 59 - 70.
- Bernhofen, D., El-Sahli, Z., and Kneller, R. *Estimating the effects of containerization on world trade*. 2011.
- Bichoua, K., and Graya, R. "A logistics and supply chain management approach to port performance measurement." *Maritime Policy & Management: The flagship journal of international shipping and port research*, 2004: 47-67.
- Bonacich, E., and Wilson, J. *Getting the Goods: Ports, Labor, and the Logistics Revolution*. Cornell University Press, 2008.
- Boske, L., and Cuttino, J.C. "Measuring the Economic and Transportation Impacts of Maritime-related Trade." *Maritime Economics & Logistics, Volume 5, Number 2*, 2003: 133-157.
- Bowersox, D., Closs, D., and Cooper, M. *Supply chain logistics management*. Michigan : Michigan State University, 2002.
- Brakman, S., Van Marrewijk, C., Garretsen, H., and Van Witteloostuijn, A., *Nations And Firms in the Global Economy: An Introduction to International Economics and business*. Cambridge University Press, 2006.
- Brewer, A., Button, K., and Hensher, D., *Intermodal Transportation*. Handbook of Logistics and Supply-Chain Management, 2001 .
- Brinkmann, B., *Operation Systems of Container Terminals: A Compendious Overview*. Handbook of Terminal Planning, 2011.
- Carbone, V., and De Martino, M., "The changing role of ports in supply-chain management: an empirical analysis." *Maritime Policy & Management: The flagship journal of international shipping and port research*, 2003: 305-320.
- Chapman, R., Soosay, C., and Kandampully, J., "Innovation in logistic services and the new business model: A conceptual framework." *International Journal of Physical Distribution & Logistics Management, Vol. 33 Iss: 7*, 2003: 630 - 650.

Cheraghi, H., Abdolhosseini Khaligh, A., Naderi, A., and Miremadi, A., "Gaining Competitive Advantage through Marketing Strategies in Container Terminal: A Case Study on Shahid Rajaei Port in Iran." *International Business Research*, Vol. 5, No. 2; 2012

Christiansen, M., Fagerholt, K., Nygreen, B., and Ronen, D., "Maritime Transportation." *Handbooks in Operations Research and Management Science*, 2007: 189–284.

Cooper, M., and Ellram, L., "Characteristics of Supply Chain Management and the Implications for Purchasing and Logistics Strategy." *International Journal of Logistics Management*, 1993: 13 - 24.

Crainic, T., Ricciardi, N., and Storchi, G., "Advanced freight transportation systems for congested urban areas." *Transportation Research Part C: Emerging Technologies*, 2004: 119-137.

Crainic, T., and Kim, K., *Intermodal Transportation*. handbook in OR & MS, Vol. 14, Chapter 8, 2007.

Cullinane, K., *International Handbook of Maritime Economics*. Edinburgh : Edinburgh Napier University, 2011 .

Daganzo, C., *Logistics Systems Analysis*. Berkeley: UC Berkeley Institute of Transportation Studies , 2005.

Deshpande, U., Gupta, A., and Basu, A., "Task assignment with imprecise information for real-time operation in a supply chain." *Applied Soft Computing*, 2003: 101–117.

Eagle Intermodal Services. *Eagle Intermodal Services*. 2011.
<http://www.eagleintermodalservices.com/services.html> (accessed 11 20, 2011)

ESCAP. *Commercial Development Of Regional Port As Logistics Centres*. New York: United Nations, 2002.

ESCAP. *Free Trade Zone and Port Hinterland Development*. New York: Korea Maritime Institute, 2005.

ESCAP. *Logistic Sector Developments Planning Models For Enterprises And Logistic Clusters* . New York: Korea Maritime Institute, 2007.

ESCAP. *Regional shipping and port development strategies*. New York: United Nations, 2005.

foncière Europe Logistique. *France logistics centers*. 2009. <http://www.parcfel.fr/Garonor> (accessed February 11, 2012).

Friend, J., and Jessop, W., *Local government & strategic choice : an operational research approach to the processes of public planning*. Australian Journal. of. Public Administration, 1976.

Gilpin, R., *The Challenge of Global Capitalism: The World Economy in the 21st Century*. Princeton: Princeton University Press, 2000.

Goldman, T., and Gorham, R., "Sustainable urban transport: Four innovative directions." *Technology in Society*, 2006: 261–273.

Grossmann, I., "Perspectives for Hamburg as a port city in the context of a changing global environment." *Geoforum Volume 39, Issue 6*, 2008: 2062–2072.

Guangyi, C., and Chaoyang, L., "Research on the technologies of traffic organization planning for logistic park." *International conference on intelligent computation technology and automation*. Shanghai: dept of architecture, Shanghai Jiao Tong University, 2008. 438 - 441.

Gunasekaran, A., and Ngai, E., "The successful management of a small logistics company." *International Journal of Physical Distribution & Logistics Management*, Vol. 33 Iss: 9, 2003: pp.825 - 842.

Hayut, Y., "Containerization and the Load Center Concept." *Economic Geography*, 1981: 160-176.

Hegering, H., Abeck, S., and Neumair, B., *Integrated management of networked systems: concepts, architectures, and their operational application*. Morgan Kaufmann Publishers, 1999 .

Henesey, L., *Enhancing Container Terminal Performance*. Blekinge: Blekinge Institute of Technology, 2004.

Hesse, M., and Rodrigue, J., "The transport geography of logistics and freight distribution." *Journal of Transport Geography*, 2004 : 171–184.

Hou, J., and Trappey, C., "Connecting small and medium enterprises to the global market via the global logistics service chain—sector analysis and case studies." *Journal of the Chinese Institute of Industrial Engineers*, 2002: 75-87.

Hummels, D., "Transportation Costs and International Trade in the Second Era of Globalization." *The Journal of Economic Perspectives*, 2007 : 131-154.

- Janelle, D., "Globalization and research issues in transportation." *Journal of Transport Geography*, 1997: 199–206.
- Jennings, B., and Holcomb, M., "Beyond Containerization: The Broader Concept of Intermodalism." *Transportation Journal*, 1996: 5-13.
- Juhel, M., "Globalisation, Privatisation and Restructuring of Ports." *International Journal of Maritime Economics, Volume 3, Number 2*, 2001 : 139-174.
- Juhel, M., "Global Challenges for Ports and Terminals in the New Era." In *PORTS AND HARBOR*, 17-27. International Association of Ports and Harbors/Kokusai Kowan Kyokai, 1999.
- Jun, I., and Yi, S., *Searching for Best Practices in Developing Ports as Logistics Centers*. 2005.
- Kasilingam, R., and Reddy, V., "Intermodal transportation considering transfer costs." *The Global Trends Conference of the Academy of Business Administration*. Aruba, 1995.
- Kasilingam, R., *Logistics and Transportation Design and Planning*. Kluwer Academic Publishers, 1998.
- Keahchoon T., "A framework of supply chain management literature." *European Journal of Purchasing & Supply Management*, 2001: Pages 39–48.
- Kim, D., Barnhart, C., Ware, K., and Reinhardt, G., "Multimodal Express Package Delivery: A Service Network Design Application." *Transportation Science*, 1999: 391-407.
- Klink, H., "The port network as a new stage in port development: the case of Rotterdam." *Environment and Planning*, 1998: 143 – 160.
- Korpi, W., "Power, Politics, and State Autonomy in the Development of Social Citizenship: Social Rights During Sickness in Eighteen OECD Countries Since 1930." *American Sociological Review*, 1989: 309-328.
- Lambert, D., Stock J., and Ellram, L., *Fundamentals of Logistics Management*. Florida, 1997.
- Langevin, A., and Riopel, D., *logistic systems design and optimization*,. Montreal: GERAD and école polytechnique de montreal, 2005.
- Lee, K., Huang, W., Kuo, M., and Lin, S., "Competitiveness model of international distribution park using the virtual value chain analysis." *journal of the eastern asia society for transportation studies*, 2001: 313–325.
- Lee, S., Song, D., and Ducruet, C., "A tale of Asia's world ports: The spatial evolution in global hub port cities." *Geoforum*, 2008: 372–385.
- Los Angeles Times. *Business*. October 05, 2011.
http://latimesblogs.latimes.com/money_co/2011/10/container-ships-ap-moller-maersk-axs-alpha.html (accessed January 20, 2012).
- Lu, C. "An Evaluation of Logistics Services' Requirements of International Distribution Centers in Taiwan." *Transportation Journal*, 2004 : 53-66.
- Lu, C. "Logistics services in Taiwanese maritime firms." *Transportation Research Part E: Logistics and Transportation Review*, 2000: 79–96.
- Madrid, CTM. <http://www.ctm-madrid.es/>. 2007. (accessed March 10, 2012).
- Mansouri, M. "Supporting Marine Commerce and Transportation." In *An Ocean Blueprint for the 21st Century*, by U.S. Commission on Ocean Policy, 192_201, Chapter 13. University Press of the Pacific, 2004.
- Marlow, P., and Paixão A., "Fourth generation ports – a question of agility?" *International Journal of Physical Distribution & Logistics Management*, 2003: 355 - 376.
- Meidutea, I., "Comparative analysis of the definitions of logistics centres." *Transport*, 2005: 106-110.
- Middendorf, D., *INTERMODAL TERMINALS DATABASE: Concepts, Design, Implementation, and Maintenance*, Center for Transportation Analysis, Energy Division, Oak Ridge National Laboratory. 1998 . (accessed 11 20, 2011).
- Morash, E., and Clinton, S., "The Role of Transportation Capabilities in International Supply Chain Management." *Transportation Journal*, 1997 : 5-17.
- Murphy, P., Daley, J., and Dalenberg, D., *PORT SELECTION CRITERIA: AN APPLICATION OF A TRANSPORTATION RESEARCH FRAMEWORK*. Vancouver: University of British Columbia, Vancouver, 1999.

Notteboom, T., and Rodrigue, J., "Port regionalization: towards a new phase in port development." *Maritime Policy & Management: The flagship journal of international shipping and port research*, 2005: 297-313.

Notteboom, T., and Winkelmansa, W., "Structural changes in logistics: how will port authorities face the challenge?" *Maritime Policy & Management: The flagship journal of international shipping and port research*, 2001: 71-89.

Notteboom, T., and Rodrigue, J., "Containerisation, Box Logistics and Global Supply Chains: The Integration of Ports and Liner Shipping Networks." *Maritime Economics & Logistics*, 2008: 152–174.

Notteboom, T., and Rodrigue, J., "Re-assessing Port-Hinterland Relationships in the Context of Global Supply Chains." *UC Berkeley Transportation Library*, 2007: 51-66.

Park, N., Choi, H., Lee, C., Kang, M., and Yang, J., "Port management information system towards privatization." *IAME 2005*. 2005.

Peck, F., "Regional development and the production of space: the role of infrastructure in the attraction of new inward investment." *Environment and Planning*, 1996: 327 – 339 .

Perea-López, E., Ydstie, B., and Grossmann, I., "A model predictive control strategy for supply chain optimization." *Computers & Chemical Engineering*, 2003: 1201–1218.

Port of Antwerp. *Image bank*. 2009. (accessed December 2011).

Port of Santander. *Archive*. 2008. www.puertosantander.es (accessed December 2011).

Port Reform Toolkit. *Alternative Port Management Structures and Ownership Models*. World Bank Port Reform Tool kit (Module 3), 2004.

Portvision. *dry port*. 2010. <http://www.portvision.eu/BrowseKb/18> (accessed January 2012).

Provincia.prato. *Photos*. 2008. www.provincia.prato.it/ (accessed February 2012).

Puertos del Estado. *Puertos del Estado*. 2003. <http://www.puertos.es/> (accessed 2012).

Ramounas, P., and Bazaras, D., "Logistics service development and its research aspects." *International conference RelStat*. Vilnius : Dept Of Transportation Management, Vilnius Gediminas Technical University, 2004. 119-123.

Rodrigue, J., Debie, J., Fremont, A., and Gouvernal, E., "Functions and actors of inland ports: European and North American dynamics." *Journal of Transport Geography*, 2010: 519–529.

Rondinellia, D., and Berry, M., "Multimodal transportation, logistics, and the environment: managing interactions in a global economy." *European Management Journal*, 2000: 398–410.

Roodsari, R., *Evaluation of process performance at the port of Rajai, loading and unloading using BSC*. Tehran: Islamic Azad University, 2006.

Roso, V., Woxenius, J., and Lumsden, K., "The dry port concept: connecting container seaports with the hinterland." *Journal of Transport Geography*, 2009: 338–345

Schneider National. *Schneider National*. 2011. <http://schneider.com/intermodal/index.htm> (accessed 11 20, 2011).

Slack, B., "Pawns in the Game: Ports in a Global Transportation System." *Journal of urban and regional policy*, Volume 24, Issue 4, 1993: 579–588.

Sophie. *barcelona port*. 2007. <http://sophie-g.net/photo/build/barcelona/montjuic09.htm> (accessed 2012).

Stank, T., and Goldsby, T., "A framework for transportation decision making in an integrated supply chain." *Supply Chain Management: An International Journal*, Vol. 5 Iss: 2, 2000: 71 - 78.

Taniguchi, E., Noritake, M., Yamada, T., and Izumitani, T., "Optimal size and location planning of public logistics terminals." *Transportation Research*, 1997: 207-222.

Tavasszy, L., Ruijgrok, C. and Thissen, M. "Emerging Global Logistics Networks: Implications for Transport Systems and Policies." *Journal of Urban and regional policy*, Volume 34, Issue 4, 2003: 456–472.

Tongzon, J., "Determinants of competitiveness in logistics: implications for Asian region." *Maritime Economics & Logistics* (National University of Singapore), 2007: 67-83.

Tongzon, J., and Heng, W., "Port privatization, efficiency and competitiveness: Some empirical evidence from container ports (terminals)." *Transportation Research Part A: Policy and Practice*, 2005 : 405–424.

Tongzon, J., "Determinants of port performance and efficiency." *Transport*, 1995: 245-252.

U.S. Department of Defense. "Setting an Intermodal Transportation Research Framework." *National Conference on Setting an Intermodal Transportation Research Framework*. Washington, D.C: National Academy Press, 1996.

UNCTAD. *Review of Maritime Transport*. New York and Geneva: United Nations Conference on Trade and Development secretariat, 1999

UNCTAD. *Review of Maritime Transport* . New York and Geneva: United Nations Conference on Trade and Development secretariat, 2009 .

UNCTAD. *Review of maritime transport*. United nations conference on trade and development. Geneva: United Nations, 2007.

UNCTAD. *Review of Maritime Transport*. New York and Geneva: United Nations Conference on Trade and Development Secretariat, 2011.

UNCTAD. *Review of Maritime Transport*. New York nd Geneva: UNCTAD Secreteriat, 2010.

UNCTAD. *Review of Maritime Transport*. Geneva: United nations conference on trade and development, 2005.

UNESCAP. *Commercial Development of Regional Ports as Logistics Centres*. Transport Division, 2002.

Vis, I., and Koster, R., "Transshipment of containers at a containerterminal: An overview." *European Journal of Operational Research*, 2003: 1–16.

Visser, J., Van Binsbergen, A., and Nemoto, T., *Urban freight transport policy and planning*. Cairns: First international symposium on city logistics, 1999.

Wang, T., and Cullinane, K., "The Efficiency of European Container Terminals and Implications for Supply Chain Management." *Maritime Economics & Logistics* , 2006: 82–99.

Wikipedia. *Malcom McLean and containerization*. 2011.
http://en.wikipedia.org/wiki/Malcom_McLean (accessed 12 06, 2011).

Xu, M., *A Research of Performance of Logistics System of Port of Shanghai and Rotterdam: University of Rotterdam*. 2011.

Yapa, W., and Lam, J., "Competition dynamics between container ports in East Asia." *Transportation Research Part A: Policy and Practice, Volume 40, Issue 1*, 2006: 35–51.

Zhang, A., and Zhang, Y., "Issues on liberalization of aircargo services in international aviation." *Journal of Air Transport Management*, 2002: 275–287.