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**HUB PORTS
A Case Study of Port of Singapore**

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Monografia de Conclusão dos Cursos MBA International Affairs e Master 2 International Commercial Negotiation, apresentada ao Programa de Pós-Graduação em Administração da Universidade Federal do Rio Grande do Sul, como requisito parcial para a obtenção do título de Especialista em Administração.

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SUMMARY

The concept of hub ports has been more developed since the second half of the last century due to the rapid increase in the international trade, the vessel getting every time bigger and the necessity of the carrier to reduce the port of calls and consequently, the costs. East Asia is the most blooming area among global hub ports. Most of the shipping lines select ports in the region in order to tranship the cargos to feeder vessels. Singapore has retained its post as the biggest hub port in the world and one busiest port in the world during the last years. This work aims to explore how the port achieved this position. Singapore has developed, since its independency in 1965, strategies to encourage shipping lines to use Singapore as transshipment hub, besides the initial factor of favourable location to the main shipping routes.

Key words: Port of Singapore. Hub ports. Shipping lines.

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1 INTRODUCTION

The changes that have occurred within the liner shipping and ports over the past decades are into a context of significant evolution in the structure of the world economy. In the past, many economies developed strategies that emphasized self-sufficiency and the protection of domestic markets. However, in the recent years there has been a growing consensus that the route to prosperity lies in integration within the global economy.

According to Nations Unions (2005), total maritime trade increased 70% in 2004 over 1980 volumes and containerized cargoes grew at an annual average growth rate of 8.6% over the same period. The number of containers handled in the world's port grew at any even faster rate around 9.6%, especially due to the increasing of trans-shipments movements.

Container traffic to and from Asia is expected to grow more rapidly than the world average. Asia's share of containerized exports is expected to rise from 55% of the world total in 2002 to 64% in 2015; the share of containerized imports is expected to rise from 46% to 53%. It is also expected the growth of Asia-Europe trade at an average rate of 5.6% per year until 2015.

It has become clear that there are no insurmountable technical barriers to the future increase in the international trade. The move to larger and larger vessels, driven by a constant search for economies of scale, will continue and, and if anything accelerate. The need to maximize the utilization of these large vessels will in turn drive a radical reduction on the number of port calls on major routes, and feed the development of global hub port served by fully integrated global networks.

Singapore's history suggests that it has always functioned as a port with a regional, if not global orientation. From the 14th century, when the island functioned as a feeder port to regional trading networks to the present time, when Singapore seeks to position itself as a hub for the Asia region, its status as a port which integrated global networks has never changed.

Singapore had a fluid hinterland, and its economy and social hinterlands were defined by maritime trade that it conducted and the networks that were developed as a result of its commercial activities and the increase of the international trade.

With a land area of 710.2 square kilometres and population of 4,839.4 million (2008 data), Singapore is one of the smallest countries in the world. Despite its size and shortage of natural resources, Singapore has been able to survive and succeed. Its location at that corner

of the world where round-the-world traffic turns to pass south-eastern Asia, and its position in the centre of a rich insular region, has made it a highly important port of call for trading vessels of world-wide origin and destination.

This study intends to provide an overview of the Port of Singapore, presenting its history, statistics and facilities, Singapore's position as an International Maritime Centre, and the port performance through its strengths and weakness and external threats and opportunities. The objective is to describe the trajectory of country from a small piece of land to the world's biggest hub port.

The first chapter has the objective to present the purpose of this work: identify question-problem to be analyzed and based on the pointed question problem indicate the objectives to be achieved. In this chapter the subject delimitation will be presented as well as the reasons to develop the work about this subject. The methodology with which the work was developed is also treated in this chapter.

In the second chapter, is developed the review of literature using the concepts of seaport, its types and development. It is also pointed out some concepts about logistics evolution more focused on the maritime field. In this chapter is also presented the literature available about hub ports and the influence in the logistics era. This chapter has the objective to provide the theoretical basis for the subject studied.

Then, in the third chapter are presented the data and information collected through the documental research about the Port of Singapore. This chapter is written building up a link to the review of literature developed in the second chapter.

As last, the fourth chapter is in charge to present the conclusion where the main points developed in this work will be highlighted. In this chapter the results and contributions of this work are described.

1.1 SUBJECT DELIMITATION

This study limits to analyze the main points related to Port of Singapore as a hub port as its history, the main statistics, port infrastructure and administration and the port performance exploring its internal strengths and weakness and external threats and opportunities.

Although the development of the state-city of Singapore is closely linked to the port and during the research development several points are mentioned, this study does not have the objective to analyze social, political and cultural aspects of Singapore. All information provided about these subjects has the objective to create the proper background to develop the port's research.

1.2 RESEARCH QUESTION

How has Port of Singapore become the current world's biggest hub port?

1.3 STUDY OBJECTIVES

In order to reply the research question above, it is necessary to list down some specific points to be developed about the Port of Singapore.

1.4 GENERAL OBJECTIVE

The study presented aims to describe and analyze the development of the Port of Singapore under the patterns of a hub port.

1.5 SPECIFIC OBJECTIVES

The specific objectives of the present study are:

- describe the history of the Port of Singapore;
- present the main statistics number of the global port industry;

- present the Port of Singapore's infrastructure and administration;
- analyze the Singapore's position as an International Maritime Centre (IMC);
- analyze the performance of the port of Singapore using the SWOT analysis method.

1.6 STUDY JUSTIFICATION

This paperwork is justified by its relevance and viability.

The subject Port of Singapore was chosen due to its importance in the international port industry. Singapore is one of the leading global ports in the world, and due to its strategic location and government's strategies, it is the world's busiest transshipment hub. The port is also among the top ports in several statistics of container and cargo handling and vessel sailing and arrivals.

With regard to viability, the researcher is located in Singapore where several sources of research are available.

1.7 METHODOLOGY

This study was developed under the patterns of a case of study. Yin (1984) defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-like context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple source of evidence they are used.

Once this subject can be further developed, the case of study was conducted under the illustrative method which helps to interpret data, especially when there is reason to believe that the subject is not well known.

Data gathered is qualitative, that, according to Denzin and Lincoln (2003), allow the researchers to study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them.

The data collection was basically the available literature about the port of Singapore and the sites from the port authority, terminal operators and other sites specialized in maritime issues. It was not possible to collect primary data due to non availability of the port of Singapore authority to reply an interview conducted by the researcher.

2 LITERATURE REVIEW

The purpose of the literature review chapter is to introduce and stress a few basic points about ports and its evolution through the last decades. Many of these points are used as a base for the analysis of this study's subject: The Port of Singapore.

Throughout this chapter are included some definitions and historical details about ports and their relation with international logistics development to give an understanding about how and why a modern hub port operates, and its functions.

2.1 PORT – DEFINITIONS AND DESIGN

Ports are generally known as areas where vessels load and unload goods but some more complex definitions are required.

Port can be defined as a place where ships may tie up and discharge their cargoes. The definition distinguishes port from harbour, which is a stretch of water protected by man or by nature from the open sea beyond, in which ships may lie at anchor in safety (POUNDS, 1981).

A port can also be defined as a town with a harbour where there is equipments for the transfer of goods from the vessel to shore or shore to vessel (ALDERTON, 2008).

However some of these terms are often used with considerable variations, ports features are common designed as follows:

- Harbour: a shelter, either natural or artificial, for ships. Sullivan (1996) affirms that it is enclose safe water area which offers enough deepness for vessels anchor, berth and shelter for purpose of loading, discharging, repairing and other requirements. It must provide to vessels protection against storms and also be fully equipped to attend the purpose of vessels stop.
- Berth: it is the water area alongside a wharf where a vessel sits to load and unload its cargo (TALLEY, 2009).

- Wharf: also called quay, is a structure built along the harbour where vessels can berth alongside (ALDERTON, 2008).
- Breakwater or Mole: a long solid structure built outside an open harbour which intends to protect the harbour against the large sea waves. It makes it possible for vessels to berth safely (SULLIVAN, 1996).
- Yard: it may consist in several terminals. Various buildings for administrative activities and the stuffing and unstuffing of containers are placed in the yard. It is also the area with roadways and pathways for the movement of cargoes within the port by truck and other types of yard equipments (TALLEY, 2009). The cargoes are also storage in the specific terminals for transshipment, export or import customs clearance. Talley (2009) says that a port may have several marine terminals, for handling the same type or different types of cargo. The port's marine terminal can be common-user or dedicated; in the second case it is restricted to vessel calls by shipping line that owns or leases the marine terminal.

Port definition goes beyond the area, which permits berthing or anchoring ships. A port is a node in a transportation network, which is a spatial system of links over which the movement of cargo and passenger movements occurs. Port users, shippers and importers, demand port services and use the port as part of the transportation process of moving cargo to and from origin and destination locations. The port itself or terminal operator is the primary service provider of a port (TALLEY, 2009).

The service and facilities provided by a port aim to meet either vessels necessities as berth, supplies and repairs either the needs of importers and exporters. In the second case it is related to the cargo handling and the services among many other are warehousing, customs, weighing, repacking, labelling and transporting (ALDERTON, 2008).

Although all the development and increase of services provides in the port, the term ports industry is not at all an industry in the accepted sense because there is no final product. It is as a multi-faceted service industry, which provides for the movement of goods in and out of that country, and in this respect it is vital to the economy of that country (NETTLE, 1988). A port is an “engine” for regional economy by increasing development, labour incomes, business earnings and taxes in the region (TALLEY, 2008).

Hence, ports also can be defined as place where required service providers as ship agents, stevedores, freight forwarders, third-party logistics firms, custom broker, ship pilots

and ship towage firms are gather together in order to allow the movement of vessels and goods.

2.2 TYPES OF PORTS

The classification of types of ports is not a consensus among the available literature about ports. The main classifications found are described below.

2.2.1 By Product Handled

Ports can be classified by the product handled: cargo or passenger.

Ports are typically cargo ports and it includes containers, bulk, break-bulk cargoes and neo bulk cargo (TALLEY, 2009). The port can have one terminal for each type of cargo:

- Container cargo: it is general cargo stored in standardized containers. The most common containers are the ones with 20 or 40 feet in length. There are also 40 feet high cube container, refers containers, ventilated containers, open top containers, flat rack containers and some other few times of containers;
- Break-bulk cargo: it is a general cargo that is packaged on pallets or in wire or rope slings for lifting on and off a vessel. Before the containerization it was the only way of load and unload cargoes on vessels and move it inside and out of the ports;
- Neo bulk cargo: miscellaneous goods and commodities shipped packaged and transferred as units. It includes automobiles, lumber in stacks and heavy machinery.
- Bulk (dry and liquid) cargoes are neither packaged nor of uniform sizes and weights. Examples of bulk cargoes include coal, grains, crude oil and refined petroleum products.

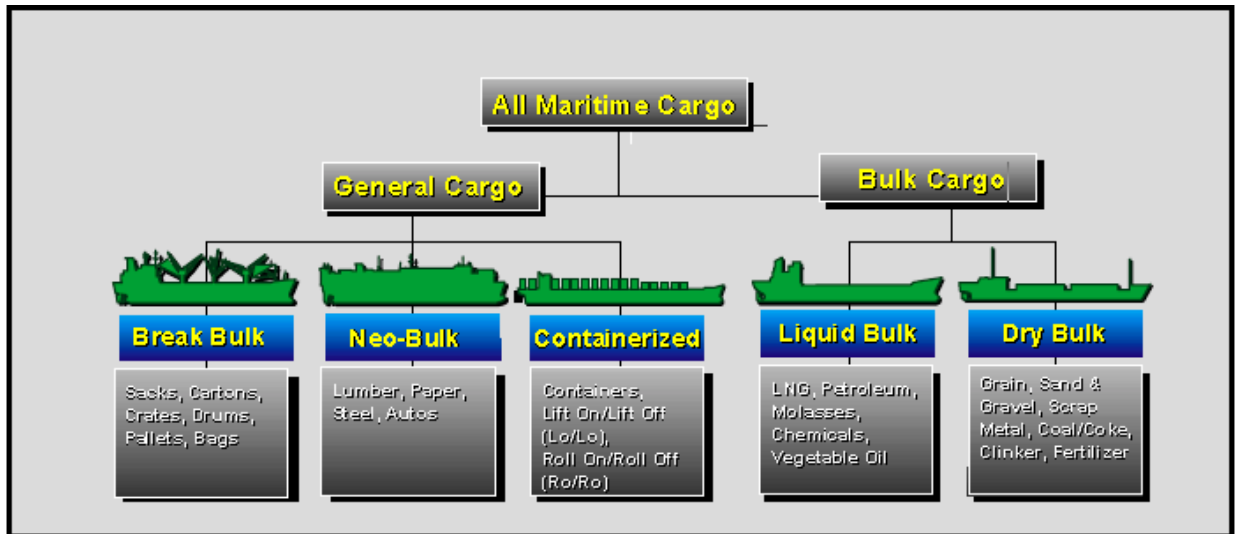


Figure 1 - Terminal types.

Source: Center for the Commercial Deployment of Transportation Technologies available at <www.ccdott.org>.

Passenger ports are named cruise ports. Cruise ports are similar to cargo ports in which they have harbours, berths, wharfs and aprons. However cruise ports do not have yards and interchange gates as found in the container ports. Unlike container ports, cruise ports have passenger ashore support facilities as shops, tourism information office, restaurants and luggage interchange (TALLEY, 2009).

Most of the big ports, like Singapore and Rotterdam, have separate terminals to handle different times of cargo and also passenger ships.

2.2.2 By Ownership

Ports also can be divided as commercial or public.

Commercial ports are privately owned, seeking to make profit (TALLEY, 2009).

A public port is owned by government (municipal, state or federal) and generally not looking for to make profit. The objective of public ports may include promoting regional employment, economic development and the export of commodities produced in the region.

The state-owned ports can be called Service port. In this type of operation the port authority wishes to provide all the services and facilities for ships and cargo within the port (ALDERTON, 2008).

In many cases, the public port authorities take over the administration of private ports, which were unable to continue or expand operations due to financial problems (NETTLE, 1988).

In many modern ports the classification commercial and public might be considered simplistic, as the ownership in fact consists of a combination of two or three types (private, municipal, state or federal), especially because many state-owned ports are considering moving away from this type of operation (ALDERTON, 2008).

The governments in many countries have adopted the policy of promoting the development of infrastructure projects through the private sector.

One of the most common growing forms of ports ownership is the Landlord port (ALDERTON, 2008). In this type the city, state or country own the land and lease out the terminals to private stevedoring firms to operate. The landlord must provide the infrastructure (i.e. paved terminal with deep water access) and tenant provides his own superstructure (i.e. cranes and cargo-handling equipment). The port authority in this case is charge of the management of the port according to the rules defined in its constitution.

Another variation is called BOT (Build-Operate-Transfer). In this type, the private sector is involved in building, financing and operating a port facility for a certain period of time. The ownership is transferred to the public sector at the end of the agreement. 19% of the ports privatised used this method (ALDERTON, 2008).

Some governments prefer to sell the land and all the infrastructure and superstructure but they have few imitators elsewhere.

There is no standard pattern for the ownership of ports. The decision how to manage functions in a port is very relevant and can determine its continuity and explanation.

2.2.3 By Function

Ports can also be classified in three large groups: cargo interface, Maritime Industrial Development Area (MIDAS) and specific ship/shore interface. This classification seems to better fits in the current level of port development (ALDERTON, 2008).

a) Cargo interface

Hub port: also referred as mega port, hub and load centre port, megahub, superhub etc.

Hub port is an area serving as a transshipment centre and a gateway for the larger hinterlands by connecting mainline services with various feeder networks.

Hub ports are further analyzed in a separately chapter due to the importance of the theme for the presented study.

Feeder port: it is known as smaller ports which feed and distribute cargo for hub or centre port.

One of the major points of discussion concerning ports is the division of feeder and hub ports. If the volume of trade is large enough, distribution via feeder is obviously not the optimum solution due extra costs and potential delays caused by having to re-ship the containers on to feeder vessels (ALDERTON, 2008).

In the cases, which the volume is not large enough, the transit time and shipping frequency between hub and feeder port can be improved by the use of feeder vessels.

The feeder ports are benefits from hub ports once they do not need to invest in expensive berths and other port facilities for large vessels.

b) MIDAS (Maritime Industrial Development Area)

Industries such as petrochemicals, oil refineries, steel works located themselves in port areas after the Second World War to take advance of cheap transport of bulk raw materials. The location must provide deep-water access and available land and the demand for the product must justify the investment (ALDERTON, 2008).

A MIDAS can be one or more of the following:

- Large industrial zone: in this case the industry or the industries owned a marine transport terminal;
- Customs free port: it is commonly a segregated part of the port at which cargo can be discharged and reloaded without incurrence of dues or Customs formalities.

The benefits are for shippers who have to hold the goods in transit and do not need to deposit large sums with customs;

- Oil port: ports which offers the required equipments and premises to load and unload products from the oil industries.

c) Specific ship/shore interface

- Naval port,
- Fishing port,
- Specific Commodity Export Port: coal, iron ore etc.

Large ports as Singapore, Rotterdam and Hong Kong can be many of these types of ports described above.

2.3 PORT DEVELOPMENT

Ports, as a commercial activity, are constantly changing.

Port development has been progressive, in line with the demand for goods since they were first established (NETTLE, 1988).

According to Alderton (2008), ports have been changing their design, infrastructure, cargo-handling technology, labour requirements and culture. This development might have been evolving over 200 years for London ports, for example, but some other ports in the world may have gone through the same process in just a few decades.

It is important to say that some ports were simply closed or changed to another area during the evolution seen in the two centuries.

Alderton (2008, p. 14) points out some factors which can cause ports to change, evolve or die:

- Changes in the inland transport infrastructure: the coming of the railways tended to make large ports larger and small ports smaller. Road transport had the opposite effect in the post-Second World War motorways saw a revival in many smaller ports.

- Changes in trade patterns: the effect of co-operation between countries or regions can have negative or positive effects on some ports.
- Changes in financial and logistical thinking: from simple warehouses, some ports areas have become industrial areas which are able to provide value-added activities. They are sophisticated marketing and distribution centre.
- Length of life: ports often last a long time, sometimes centuries. Therefore, they have to adapt and change over the course of time.

Nettle (1988, p. 4) says that original sites might also have been changed because of local geography which did not benefit the roads developments, for example. An important reason for changes in the port locations was based on the proximity to larger settlement where more manpower was available. Later, artificial shelter was constructed by arms, jetties or breakwaters to hold back heavy seas in sites where everything but the geographical factors dictated a port development.

In fact, the factors which constrain the port development have not changed much in the last two centuries. Indeed the world trade grow and the greater parts involved in the ports operations make these factors more relevant when considering a port development.

Alderton (2008) presents these factors in the figure below, relating them with the port development:

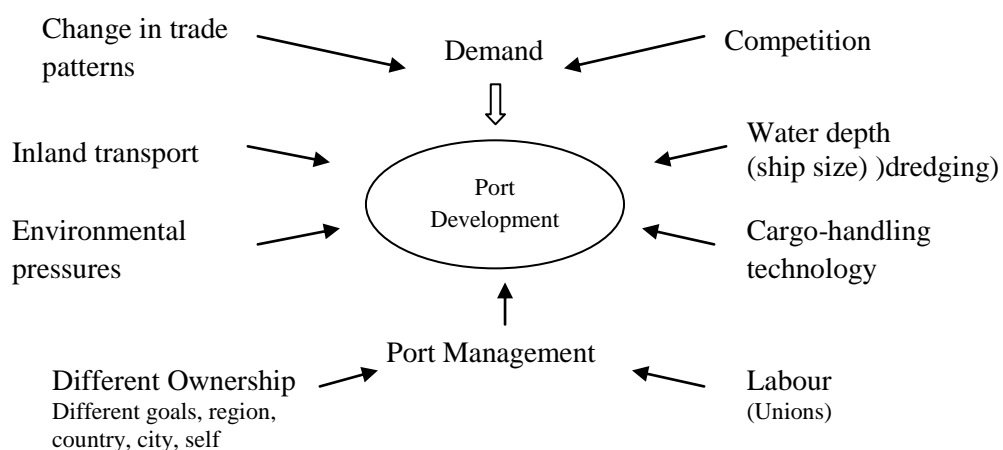


Figure 2 - Factors constraining port development.

Factor conditions are basically factors of production: labour, land, natural resources, capital and infrastructure. However, the factors that are most crucial to port development are not inherited but are created within a nation, like technological know-how.

The description of the evolutions of the ports below does not represent the development of all ports in the world considering the timeframe. It attends specially the port development in Europe and United States and has the objective to present progress of the ports features and handling services.

Before 1800

In the early days, ports were simple landing places on river banks where the shallow draught vessels of the time could come alongside and load or unload their cargoes. The essential factor was the weather conditions (NETTLE, 1988). Prior to 1800 port operation had remained in general unchanged for centuries. The standard ship in these years was about of 300 tons and sail-powered (ALDERTON, 2008).

The movement of cargo on and off the vessels was manual and inland transportation was along tracks over grassland or through forest. As time passes and the movements increased, commonplace pack animals were used. Later came wheeled transport, first hand-propelled then animal drawn and, finally, mechanical (NETTLE, 1988). In 1780, in UK, was developed a 2-horsepower operated dredger capable of shifting 22 tons per hour (ALDERTON, 2008).

1800-1900

The development of the ports created reasons to the building of houses around the port areas and gradually, complete towns. Small industries grew around the towns or close to the port area. Roads were also constructed and, in the latter half of the 19th century, one of the major breakthroughs in the history of transport modes was made with the advent of rail links to the thriving ports in Europe (NETTLE, 1988).

In the first year of 19th century, the steamships appeared but due to inefficient engines and high coal consumption, they could only be used for short distance and coastal traffic.

However in 1818 the *Savannah* was the first ship to cross the Atlantic and by 1837 the steamships *Great Western* and *Sirius* established a regular trans-Atlantic service. Therefore, the sailing ships were still the predominant commercial long-distance carrier (ALDERTON, 2008).

Alderton (2008) says that in this period, the ship discharged the cargo on the wharf and some warehouse had cranes fitted to the walls to lift the cargo to the required floor. Cargo movement on the wharf or in the warehouse would be by hand truck and distribution to and from warehouse would be by horse and cart or railway.

According to Nettle (1988, p. 4) there was, naturally, an evolution in handling methods by mechanical means and the simple devices such as levers, parbuckles and pulleys the systems progressed to the cranes of today. A structured form of management was also beginning to emerge alongside the improvements in the package and handle packages process.

1900-1960

In this period the port had reached a stage of development that is easily recognisable even today.

Pinder and Slack (2004) describe the twentieth century as a period of transformation for ports and shipping:

At the dawn of the last century, coal-fired ships were the norm; tramp steamers scoured the world for business; European-registered vessels dominated seaborne commerce; ships of all kinds spent much time in port; ports themselves were labour-intensive; complex and extensive port communities were consequently distinctive elements of urban docklands; and concerns over the environmental impacts of ports and shipping were virtually non-existent.

During the twentieth century, each of these features changed, some steadily, others rapidly.

The Second World War gave many ports the opportunity to start again. This new start combined with a new surge in growth in ship size, improved transport and commercial communications and the increased demand for raw materials, gave rise to a change in the basic port function (ALDERTON, 2008).

From simple definitions of seaport as a link between sea and land, it has reached a much more complex concept which includes all the services and port premises. Port became a place at which terminal services are provided to transport carriers such as shipping lines, railroads and trucking firms (TALLEY, 2009). The services include, for example, vessels maintenance and carrier may also have administrative offices at ports.

Along with the development on the landward side consequently came the requirement of more and larger ships with the need for more quay space to receive them. So the landing place had developed into a port. In some cases it was not possible due non sufficient shelter or depth of water for larger vessels and the port had to be moved to a more suitable site (NETTLE, 1988).

1960 onwards

It is considered a new era especially for dry cargo shipping and the ports. Many aspects of the port development are related to the great increase in the size of the vessels. The new concept of specialized ships has played an important role in the development seen in the last decades.

Alderton (2008) says that specialized ships are built and designed to fit a specific or dedicated purpose. They can transport liquefied gas, chemical, oil, liquids, refrigerated cargo, general cargo... General cargo moved to container ships and bulk cargo to bulk carriers. In the most cases a specialized ship type will require specialised terminal facilities to handle and store the cargo.

However, the most important change in the cargo handling seen in the last decades was the containerization. Before the containerization, the ocean transportation of freight generally depended on the break-bulk method, which made the ocean freight transportation a long and costly process (BONACICH; WILSON, 2008).

During the 19th century to the middle of the 20th, the development of handling technologies especially for general cargo was concerned the labour intensive conventional cargo handling. Due to the resistance to new technologies, which could decrease the necessity of labour, improvements in the handling process faced a big resistance. Elements of conventional handling were characterised by poor productivity and slow ship turnaround in port (GREENHILL, 1995).

Containerization has revolutionized this system. According to Nettle (1988), it meant a total rethink of methods and facilities. Containers were first used in door-to-door deliveries across the United States and the first haul to include a sea transit, on an experimental basis took place in 1955. Discharging these boxes by heavy lift crane reduced the handling costs by around 75%.

Steamship companies pushed the containerization more than the ports. Ports had to invest billions of dollars in new equipment and terminal designs as well as ships also need to be developed to carry containers safely. The conversion was fairly rapid, given the expenses involved (BONACICH; WILSON, 2008).

Since the main aim of the container revolution is to speed up deliveries and cut costs, the industry demands a very tight administrative structure. The right numbers of boxes must be in the right place at the right time. Also, speed in the handling of containers has become a promotional point for many ports because of the rapid turnaround wanted by ship-owner (NETTLE, 1998).

A gang of 20 dockworkers could load 20 tons of cargo per hour on a break-bulk ship, whereas one crane could load 400 to 500 tons per hour on a containership. The vessel time at the port also reduce from around one week to unload and reload break-bulk cargo to only 12 hours for the same amount of cargo in case of containership (TALLEY, 2009)

Containers greatly reduced the cost of ocean transportation, making it more cost-effective. Part of the savings was found in the reduction of labour costs, but containers also saved on insurance costs as well as on the cost of maintaining inventory (BONACICH; WILSON, 2008). Also, the use of container allowed a vast increase in the speed with which cargo could be moved from one corner of the earth to another.

Bonacich and Wilson (2008, p. 50-51) say that containerization was a prerequisite to global production and that, without it, globalization would have been immensely slowed down.

As per chart above, it is possible to see the increase in world maritime trade in the second half of last century, which coincide with the start of container using:

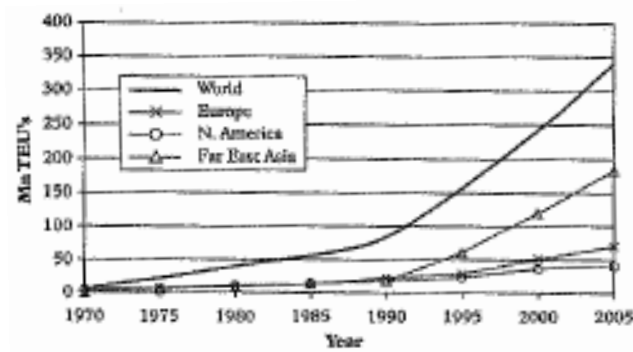


Chart 1 - Growth in world container tonnage.

Source: Alderton (2008).

Although the great increase in the quantity of cargo transported by sea, containership has required less time in port which meant not only lower charges but also fewer ships were needed to transport cargo. A significant trend in containerization is the increase in the size of vessels employed. The size of the largest containership in service increased from 4,500 TEU to 8,400 TEU between 1992 and 2002. New vessels, ordered nowadays exceed 14,000 TEU (TALLEY, 2009).

The increasing in the ship size has influenced directly the ports infrastructure in two main elements:

- Depth water: depth water was not a major issue until the 1960s. In 1970, there were only eight ports in Europe which could accept the new class of vessels and no ports with sufficient depth of water on the east coast of North America. Many ports have invested in dredging which is a very expensive activity or developed new terminal in an area, which enjoys deeper water. Virtually all major ports have 10 metres but few can offer over 15 metres (ALDERTON, 2008).

The chart below shows the increasing size of container ships in GT (gross tonnage):

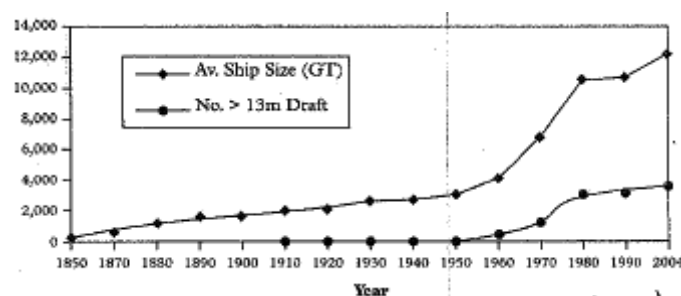


Chart 2 - Growth of the average ship size (GT).

Source: Alderton (2008).

- Container terminal: if container ship size rises container terminal must change to service such vessels. Large gantry cranes which allows to lift the containers from the dock into a ship with slots to hold them in place and unload of the containers from the ship to the dock must have been seeing in the ports every time in greater numbers. Beside dockside cranes, containers ports had to become more capital intensive investing in various types of infrastructure and mobile capital. Warehouses were removed and land cleared for open-land storage containers (TALLEY, 2009).

The increase in the supply of ship tonnage, the specialisation in ship types and the increasing in ship size are main factors to the development of hub ports in the last decades.

2.4 LOGISTICS EVOLUTION

Currently, the term “Logistics” is used in all segments on management or operational level as a key-factor in business competitiveness.

According to Dornier *et al.* (1998), until some decades ago, many companies focused their attention on the functions of marketing, finance and production. This approach fails to recognize the importance of activities that must occur between point of production (supply) and point of product purchase (demand). Logistics activities affect the efficiency and effectiveness of both marketing as production due to the costs and time depending on them.

The concern now given the logistics activities started in the last century, but that does not mean that the issue has not been part of the societies since ancient times. The logistic system has been improved since the consumptions and production were placed geographically separated. Excess of productions could be transported in an economical way to consumers or to other productive areas, while the necessary products that were not produced locally would be imported (BALLOU, 2004).

In other words, the logistics have provided greater accessibility to people wishing to consume goods without the need for immediate consumption and large displacements.

According to Ballou (2004), until 1950 there was no dominant philosophy to guide the field of logistics. At that time, the military logistics activity in the Second World War was a beginning for many of the logistical concepts used today. Keeping an army adequately

supplied, especially during the chaos of a distant war, is a huge and complex undertaking. The concept of logistics was borrowed by commercial enterprises to describe their own challenges in keeping customers properly supplied (BONACICH; WILSON, 2008).

The period between the years 1950 and 1960 is the time of takeoff to the theory and practice of logistics. Four key conditions were identified for the development of the subject: changes in attitudes and patterns of consumer demand, pressure on costs in industries, advances in computer technology and influences of dealing with military logistics (BALLOU, 2004).

Also in this period, considered the starts of logistics revolution, the containerization was developed and as per described in the previous chapter brought huge reductions in the handling and transportation cost and benefits in the time dispended to these activities.

Containers allow for intermodal transportation, that is, the movement of goods access ship, rail, and truck without having to unload and reload the cargo (MÜLLER, 1999). Liner shipping should no longer be considered simply as part of sea transport but as an integral part of logistics systems. The liner ship now becomes just one of the modal carriers as the container moves between modes on its uninterrupted journey from source to destination. Once the cargo arrives at a port it will be moved on by other modes (ALDERTON, 2008).

Until recently, the term logistics was generally limited to the transportation and warehousing functions but its meaning has expanded to refer to the management of the entire supply chain: design, ordering, production, transportation, warehousing, sales, redesign and reordering (BONACICH; WILSON, 2008).

Supply chain management is considered the next level of the term logistics due to the global integration of supplier, manufacturers, retailers and customer. However the carrier and the logistics service providers also play an important part in the global chain. Such a broad definition of supply chain is useful when seaport and ocean freight transportation are included as elements of the chain (CARBONE; GOUVERNAL, 2007).

Bonacich and Wilson (2008) say that logistics experts operate on the principle that capital not in motion ceases to be capital. They look at ships as floating warehouses. The flow from sale to ordering to production to shipping and to the next sale should occur in one smooth motion.

2.5 HUB PORTS IN THE LOGISTICS ERA

Port development has been progressive, in line with the demand for goods since they were first established. In the latest decades of last century, the term globalization gained popularity and its focus was clearly in global economic restructuring. As per Pinter and Slack (2004), shipping and port developments were key enablers of the globalization process.

World trade may grow naturally as a consequence of growing industrial activity and several other factors part of a nation's economic development. Further, ports may be either the natural gateway through which this growth in trade is channelled or they may be developed to create access to a virtually new market. In other words port may be developed by trade or vice versa (ALDERTON, 2008).

The definition of port goes beyond its site and services itself. It is a node located at the land/maritime interface within the global transport network that is affected by the global patterns of international trade and the characteristics of the foreland areas beyond the sea with which the port is linked to other ports (HILLING; HOYLE, 1984).

As globalization progresses, the world become increasing borderless with the expansion of the world trade reaching an unprecedented scale.

Shipping, ports and globalization were terms easily linked in 1981, but technological change lay at the heart of almost everything that had driven the unprecedented advance of shipping and port systems between the 1950s and the 1980s.

Well developed transportation infrastructure is a precondition for efficient logistics, as well as for continued economic growth and international competitiveness. Port plays a pivotal role in handling a wide variety of goods that are critical to the global economy, like petroleum, grains, steel and machineries.

Nations cannot exist on a basis of self-sufficiency. The international trade, whether of natural resources or manufactured goods, must happen among the countries. Ports have developed to provide the facilities for this interchange (NETTLE, 1988)

In the past ports tended to be either simply large ports dealing with international trade or smaller local ports serving the needs of their own hinterland with mainly costal or short-sea shipping (ALDERTON, 2008, p. 7). The high-order shipping network has deployed fewer ports of call and building of bigger vessels (LUN; LAI; CHENG, 2010) and this fact changed the economy of international transport.

The development of intermodal transport became possible to ports be hauled anywhere by truck or train. Beside to this fact, the vessels are becoming bigger, which requires heavy investments and to maximize the returns the ship lines prefer to stop at fewer ports (BONACICH; WILSON, 2008).

The concept of hub ports has developed since it was first introduced a couple of decades ago. As the container concept grew, the economics of vessel operation dictated that a large vessel could not have a series of ports of call and sail. Then the cargoes were then load or discharge at one port of call and transhipped to other ports on smaller vessels, called feeder vessels (NETTLE, 1988).

Originally, the general consensus was that hub port would naturally be formed by the largest container port in the region or the port for which vessels had the most cargo. However, ideas are changing and hubs are mostly located at intermediate point along a pendulum route with maybe zero local cargo to offer. The hub ports are also becoming interchange ports for large vessels rather than for large vessels and feeders (ALDERTON, 2008).

The development of hub ports is closed linked to the rapid increase in world container port traffic which has led to ongoing demands for additional container port capacity. Transhipment has been growing more than three times as fast as the port-to-port segment in the last decades, making transhipment the fastest growing segment of the container port market (NOTTEBOOM *et al.*, 2007).

According to Goh *et al.* (2003), the requirements to create a hub port are based on the points below:

- Location: ports located along the main trade routes and surrounded by industrialized regions are considered natural ports. They must also have deep-water berths to accommodate large vessels.
- Capability: the port must have modern equipments, harmonized procedures, requirements of minimum documents and high level of computerization and technological developments in its operating system in order to minimize the turnaround time of the vessels.
- Safe environment: the port must provide a well-established and well-organized port security and policing functions, port safety and dangerous cargo functions. Harmonious industrial relations with the harbour unions are also required.
- Conducive commercial environment: rates and charges must be attractive, transparent, sensible, simplified and flexible in the hub ports.

- Free commercial (trade) zones: in order to minimize transit time and procedures, the hub port must provide zones for distribution, consolidation, value-added and re-export services.
- Ancillary services: the hub port must provide plenty support to the vessels and their staffs as telecommunications services, water supplies, ship repairs, waste disposal and medical services.
- Port-related government agencies and commercial services: in the port premises must be available 24 hours and 7 days a week services as port regulatory authorities, customs, immigration, health, agriculture, veterinaries, banking, insurance and surveyors.

Lee and Cullinane (2005) also point out some other factors affecting hub port quality, together with the influence of logistics development:

- Port infrastructure: number of berth and yard area size;
- Port services: load and discharge speed, pickup and delivery service, information availability and customized services;
- Carrier's service in port: the calling frequency, the freight rate and carrier's participation of inland transport;
- Hinterland accessibility: intermodal operating time consume and cost, custom clearance procedure and cargo tracing serve;
- Distribution centre (DC): total operation area of DC, the equipment and information system of DC and service scope;
- Info-structure: port community system, information interchange with custom, information exchange between the intermodal organizations.

It can be said that the development of hub ports are related to the following factors and strategies taken by the country's government or operator in case of commercial ports:

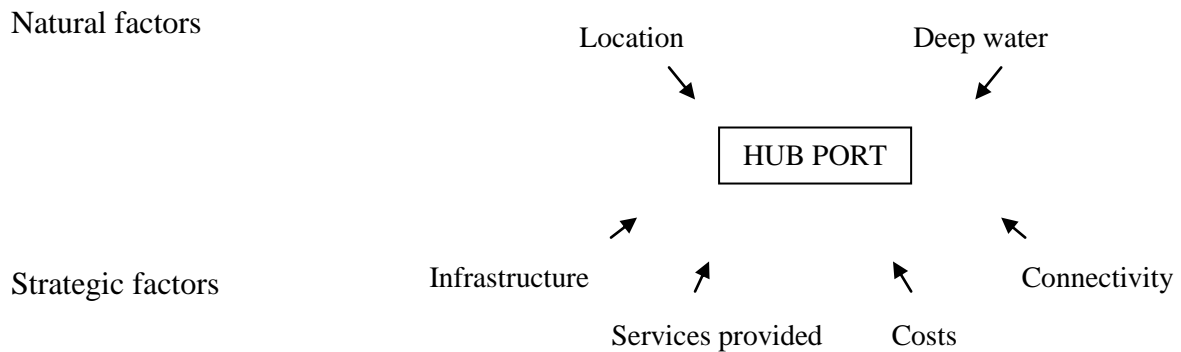


Figure 3 - Main factors for hub port development.

Source: Researcher.

Distribution centres and info-structure are dimensions appearing in the new logistics era. All of the dimensions are also reassessed in the context of logistics development.

Before containerization and intermodalism, the primary customers of the ports used to be the importers and exporters. After door-to-door service these parts have had less interest in which port was selected. Their major concern is inexpensive and timely delivery and, once door-to-door service is offered, it is up to the ship lines to decide which are the most efficient ports for discharging cargo. The primary customers of the ports switched to the ship lines (BONACICH; WILSON, 2008). And ship lines prefer to work with few ports which can offer the required infrastructure and services for the big vessels, the hub ports.

The trend in supply chain business models is the integration organizations from upstream to downstream, from JIT (just-in-time) in the early 1970s to the latest management tools. Shipments become more frequent, fewer in volume and more stringent with regard to delivery time (LEE; CULLINANE, 2005).

Today, it is clear that ports, in particular hub ports, are important links in supply chains and some of the benefits of good hub ports are argued by Goh *et al.* (2003, p. 56) as follows:

- Hub ports reduce the complexity of shipping services: for example, suppose there are ten ports in Asia trading with ten ports in Europe. In an extreme scenario of direct calls between each pair of ports, the result would be 100 complex combinations requiring 100 individual shipping services. With a hub port, this

number could be cut down to 20, with ten ports on each side calling at the hub (LEONG, 1997).

- Enable economies of scale: consolidation of containers at hub ports enables large vessels to be completely filled or almost fully utilized. Economies are achieved as relatively more containers are transported on the large vessels over a longer distance. Over shorter distance between the feeder ports and hubs, cheaper, faster and smaller vessels are used. For example, containers travelling from the east coast of South America (Brazil, Argentina and Uruguay) to Asia will stop in Singapore where will be spread out into small vessels to final destination ports. The use of large vessels, which are needed for long hauls, is minimized and fully utilized. The result is the reduction of the cost per container shipped.
- Hub ports provide a wider shipping selection, fast transit time and high shipping frequency: in hub ports, containers may be connected to hundreds destinations via several shipping lines. For example, two ports in far distance have only weekly sailing directly vessels with transit time around 40 days, but a hub port in a middle position offers almost daily services for these two points. In this case, the transit time will be shorter than directly services for a similar freight cost.

Hub port has gradually turned into a logistics platform (ALDERTON, 2008). They intend to reduce the complexity of shipping services, enable economies of scale and provide fast transit time and high shipping frequency. These are, no coincidentally, the goals of the logistics or supply chain management in the transport step and which affect the whole supply chain.

3 HUB PORT OF SINGAPORE

East Asia is the most blooming area among global container shipping service. Most of the oceangoing lines select major ports as Busan, Shanghai, Hong Kong and Singapore as hub ports. In the last year, Singapore has been reached a prominent position among the ports in Asia, but also among the main ports in the world.

The status as the world's biggest hub port is analysed throughout this charter starting from the History of the port which is closed linked with the History of Singapore. Secondly, an overall presentation of the port statics is developed, followed by the port structure and administration. Starting a more strategic view of the port, it is described the position of Singapore as International Maritime Centre (IMC). Finally, it is analysed the performance of Port of Singapore through the key factors in hub port selection. This analysis of the performance is developed through the SWOT analyst toll.

3.1 THE PORT OF SINGAPORE HISTORY

In order to understand the present of Singapore as the world's biggest hub port in the world, it is necessary to see back the past. It can be said that Singapore born as a port and its history has developed based on the trade though the port facilities.

The role of the port of Singapore reflects to a large extent the nature of Singapore's economy, having served as a link between its geographical neighbours and their trading partners since colonial times.

3.1.1 Before 1819 – The Born of a Global Port

Located at the southern end of the Strait of Malacca, the shortest sea route between China and India, the island of Singapore was known to mariners as early as third century. The trade winds of the South China Sea brought Chinese junks laden with silks, damasks,

porcelain, pottery, and iron to seaports that flourished on the Malay Peninsula and the islands of Sumatra and Java. There they met with Indian and Arab ships carrying cotton textiles, glass, incense and metal ware (LEPOER, 1991).

One of the earliest mentions of Singapore is said to be in a Byzantine map of the Indian Ocean drawn around A.D 1100. It is believed that island has been called “Sabena” which means “emporium” or a place where trade is conducted under government auspices.

By the 7th century, the Sri Vijayan empire (800 – 1300), the first of the maritime states in the Malay archipelago, linked ports and cities along the coasts of Sumatra, Java and the Malay peninsula. Singapore was probably one of the outposts of Sri Vijayan, an *entrepôt* and supply point for Chinese, Thai, Javanese, Malay, Indian and Arab traders (LEPOER, 1991). The island was included in a marauding attack in 1025 by the powerful Cholas from southern India.

In the late 13th century, a settlement later known as Old Harbour was established on the north bank of the Singapore River. It was the only port in the southern part of the Strait of Malacca and performed two functions. First, it made available products that were in demand by international markets, like hornbill casques, lakawood and cotton. Secondly, Singapore acted as a gateway in the region for the international market. Singapore was the main source of foreign products to the region.

One of the first-hand accounts of Singapore appears in a geographical handbook written by the Chinese traveller Wang Dayuan in 1349. Wang noted that the place was a haven for several hundred boatloads of pirates who preyed on passing ships. He also described a settlement of Malay and Chinese living on a terraced hill know in Malay as *Bukit Larangan* (Forbidden Hill) (LEPOER, 1991).

The Malay Annals, called *Sejarah Melayu*, recorded that the island was attacked twice by the Javanese, the last time in 1397. A Malay seventeenth-century counts the founding of a great trading city on the island in 1299 by a ruler from Palembang, Sri Tri Buana, who named the city *Singapura* (lion city) after sighting a strange beast that he took to be a lion (LEPOER, 1991).

LePoer (1991, p. 6-7) also says that the *Sejarah Melayu*, as well as contemporaneous Portuguese accounts, note the arrival around 1388 of the King Paramesvara from Palembang, who was fleeing Majapahit control. Although granted asylum by the ruler of Singapore, the king murdered the Majapahit host and seized power. However, within a few years, Majapahit

or Thai forces again drove out Paramesvara, who fled northward to found eventually the great seaport and kingdom of Malacca.

In 1414, Paramesvara converted to Islam and established the Malacca Sultanate, which in time controlled most of the Malay Peninsula, eastern Sumatra, and the islands between, including Singapore. Fighting ships for the sultanate were supplied by a senior Malaccan official based at Singapore.

When the Portuguese captured Malacca in 1511, the reigning Malaccan sultan fled to Johore in the southern part of the Malay Peninsula, where he established a new sultanate. Singapore became part of the new Johore Sultanate and was base for one of its senior officials in the latter sixteenth century (LEPOER, 1991).

The directions of the Singapore Strait were detailed in 1595 and it became a familiar route for the Portuguese ships travelling between Cochin and Macau. By 1604 Portuguese cartographers had produced a map which showed a Malay settlement and a Port master had also been identified. This could be the first pilot services in Singapore where the local Malays were paid in Spanish dollars.

In 1613, the Portuguese burnt down a trading post at the mouth of the Singapore River and in the following two centuries, the island was largely abandoned by the Johore Sultanate (LATIF, 2007).

Latif (2007) also say that during this period, Singapore was positioned within the cycles of Asia's trading world in the centre of the *mandala*, circle of kings created to control trade in the Malacca Straits. However the evolution of Singapore's maritime role in Asia, interrupted by the Portuguese, was only restored in 1819 when Thomas Stamford Raffles set up an outpost on the island.

3.1.2 1819-1963 – Founding of Modern Singapore

A young and ambitious company officer named Thomas Stamford Raffles and his party arrived in Singapore in January 1819 under the command of the British East India Company, at this time the largest corporation in the world. The small expeditionary force found the island as home to pirates, fishermen and farmers (DISCOVERY CHANNEL, 2010).

When Raffles' ship approached the island, Britain already possessed a powerful trading empire around the globe, but was challenged in Southeast Asia by the Dutch. In order to expand their commerce with China from their bases in India, the British has occupied a small settlement at Bencoolen on the western coast of Sumatra since 1684. Raffles decided that a British port on the southern end of the Strait of Malacca was necessary to stop Dutch development in the region. Raffles knew of Singapore Island from his study of Malay texts and determined to go there (LEPOER, 1991).

At that time Singapore was part of the territory ruled by the Sultan of Johore and a little more than a week after the arrival in Singapore, Raffles signed a treaty giving the British rule over the island against annual payments to Sultan of Johore (LEPOER, 1991).

With the intention of establishing a trading station for the East India Company, one of Raffles' earliest tasks was to deploy a survey vessel to conduct a hydrographic survey of the port. Subsequently the East India Company issued the first of its charts of Singapore Harbour in 1820 (PSA, non-dated).

Port of Singapore Authority (1990) says that the Singapore Strait thus gained importance as the main shipping channel. In 1823, the earliest port regulations promulgated Raffles' declaration that:

[...] the Port of Singapore is a Free Port and the Trade thereof is open to ships and vessels of every nation free of duty equally and alike to all.

Raffles departed to Bencoolen, leaving his friend and Malayan expert, Colonel William Farquhar in charge, with instructions to clear the land, construct a simple fortification and inform all passing ships about the Free Port rules (LEPOER, 1991).

Besides laying down the procedures for reporting the arrivals and departures of ships and their passenger and cargoes, the regulations also stipulated the charges for wooding, watering and ballasting ships calling at the port. Provision was also included for register of cargo vessels.

The port relied on three main networks of trade that existed in Southeast Asia at that time: the Chinese network, which linked Southeast Asia with the southern Chinese ports of Fujian and Guangdong; the Southeast Asia network, which linked the islands of the Indonesian archipelago; and the European and Indian Ocean network, which linked Singapore

to the markets of Europe and the Indian Ocean coast. These networks positioned Singapore as the transshipment point of the regional and international trade.

At that time, Singapore hardly produced any goods for sale to other countries. For many years, only gambier, pepper and pearl sago were produced locally and exported or sent out from the port of Singapore for sale to other countries (YOONG, 1994)

Records of local shipping in the Master Attendant's report book show that for the year 1822 a total of 139 square-rigged vessels entered the Port of Singapore. In 1834 a total of 517 square-rigged vessels totalling 156,513 NRT were recorded.

With the great increase of ships, the Singapore River became overcrowded. There was not enough space along the banks of the river to build warehouses or build dry docks for ship repairing. The Old Harbour did not have enough port facilities to cope with the increase in trade activities.

In 1852, a new deep harbour called the New Harbour was built at the strait between the south coast of Singapore Island and two smaller islands – Pulau Brani and Sentosa, former Pulau Blakang Mati (YOONG, 1994).

The development of New Harbour, renamed Keppel Harbour in 1900, was rapid during the next fifty years. Wharves, warehouses, coal stores, dry docks were built up in different places around the island. Regular steamship services were implemented and the tonnage of shipping rose to 375,000 NRT in 1860.

The construction of the Suez Canal in 1869 represented a great increase in the steamship tonnage and changed the structure of trade between Europe and Asia forever. The opening of the Suez Canal signalled the start of Singapore's development as a hub of Southeast Asia (DISCOVERY CHANNEL, 2010). Singapore became the first port of call for any Western ship operating in the region. Cargoes were unloaded in Singapore and these wares would be divided into smaller lots and routed to their destinations.

Until 1874, cargo at the Tanjong Pagar wharves was loaded and unloaded manually at the rate of 200-300 tons per day of 10 hours. In that year steam winches and cranes were installed and working of cargo was increased to 500-800 tons per day.

By 1887, fortunes were being made in Singapore. More than half a century of free trade policies had created a prosperous and cosmopolitan community of traders and merchants. In 1897 electricity was introduced into the entire wharf frontage, roadways and docks, and working hours were virtually doubled. The total shipping tonnage rose to 5.7 million NRT in 1900.

A number of events beginning in the late nineteenth century strengthened Singapore's position as a major port and industrial centre, besides the opening of Suez Canal. The replacing of sailing ships by steamships increased the sea-born trade. At that time, most of the major European steamship companies had established offices in Singapore (LEPOER, 1991).

In the early twentieth century, Singapore had expanded its financial institutions, communications, and infrastructure in order to support its booming trade and industry. European, Indian and American banks were placed in Singapore. Telegraph and telephone service have already reached the country. Trucks gradually replaced ox carts for transportation goods from the harbour to the town (LEPOER, 1991).

The mile-long Mole, an artificial breakwater of granite rubble, was completed in 1914 and it offered protection for some 40 coastal vessels during the north-east monsoon. On the landward side Telok Ayer Basin (now, Telok Ayer Wharves) took form as a line of wharves for coastal vessels with an opening in the centre leading into a tidal basin for lighters. Thus by 1932, when Telok Ayer Basin was formally declared open, the Port of Singapore encompassed the Singapore River, Telok Ayer Basin and Keppel Harbour, and the port limits covered some 36 ¼ sq miles (23, 168 acres).

By-law and a tariff of rates and charges were formally introduced. The ports limits were extended and re-defined by the Government in accordance with the Singapore Port Rules of 1936.

The British had begun building a naval base at Singapore in 1923, partly in response to Japan's increasing naval power. The base was completed in 1941 with a great infrastructure to receive the British navy but the armed force was fully committed in Europe and the Middle East and could not be spared to deal with a potential threat in Asia.

The confidence of most Singaporeans that the II World War would not reach them was broken when in December, 1941 the Japanese troops arrived in Singapore. The Japanese occupied Singapore from 1942 until 1945. They designed it the capital of Japan's southern region and renamed it Shonan, meaning "Light of the South" in Japanese (LEPOER, 1991).

During this period, about 70% of the warehouses in Keppel Harbour suffered damage from bombing raids and much of the machinery and equipment in the dockyards fell into a state of disrepair. Port waters became encumbered with sunken craft and maintenance of port installations and ancillary facilities came to a standstill.

The abrupt end of the war took the British by surprise. The British returned to find Singapore with many structural and social problems. There was shortage of water, food and

medical supplies. Electricity, gas and telephone services were in serious disrepair. In September 1945, Singapore became the headquarters for the British Military Administration under Mountbatten and by April 1946, it was managed to restore gas, water and electric services to above their pre-war capacity.

The port was returned to civilian control (Singapore Harbour Board), and seven private industrial, transportation and mining companies were given priority in importing badly needed supplies and materials. Japanese prisoners were used to repair docks and airfields due to the problem of restoring the full complement of port workers.

With the restoration of port facilities and the eventual resumption of passenger and cargo services, the shipping tonnages steadily mounted from 20.4 million NRT in 1947 to 82.9 million NRT in 1963.

The Port of Singapore Authority (PSA) was established in December 27, 1963 to replace the Singapore Harbour Board and a new era in the history of the Port of Singapore had begun.

3.1.3 1965 Onwards – New Evolution Era

After a short period of two years under the Malaysian control, Singapore became an independent nation on August 9th, 1965. For the first time in its history, Singapore was on its own.

Britain announced plans to withdraw all its military forces from Asia by 1971 dealing the country's economy yet another blow. In Singapore, it was considered an economic catastrophe and resulted in the decreasing of job offers.

In the same year, PSA took over part of the ex-British naval base in Sembawang and turned it into Sembawang Wharves (YAP, 1990). The expansion of port facilities were crucial at that time to create more job positions and also respond to the competition from the other ports in the region which have started their development. In 1974, Sembawang was proclaimed a Free Trade Zone and nowadays it handles mostly volume cargo.

To create more jobs, the government set up new industries based on an export-oriented economy for value-added manufacturing. Foreign investors were largely attracted by the

labour offer and by tax incentives. The port contributed to, and gained from the development of industries in Singapore (YAP, 1990).

Jurong Port started its operation in 1965 to support major industries in newly developed Jurong area. In 1969 a Free Trade Zone was established in Jurong (DANAM, 2003) and it was one of the region benefited by the industrial development.

Singapore's economic and industrial strategy was the brainchild of Prime Minister Lee Kuan Yew, finance minister Goh Keng Swee and Albert Winsemius, a Dutch United Nations development economist who served as chief economic advisor to the Singapore government from 1961 to 1984.

Among several points, Winsemius recommended Singapore's development as a transport hub. Changi Airport opened July 1 1975 and during the first year moved 193,000 tons of airfreight.

Another early investment by the Singapore government was Neptune Orient Lines (NOL), which was founded by the government in 1968. By the mid-1970s, the company had a fleet of 20 ships and began making investments in the container shipping, the new technology in those days. In the 1980s, it offered shares to the public and, in 1997, it took over the US company APL. By 2008, the government still owned about two thirds of the company and Neptune Orient Lines was operating about 130 ships and sat among the global leaders in container shipping and logistics.

Under the PSA the port underwent what many people consider its most spectacular years of growth. PSA took Singapore into the top 10 rankings of the world's busiest ports. In 1982, Singapore overtook the port of Rotterdam (YAP, 1990).

One of the milestones in the history of the port was the opening of the first container berth on 23 June 1972, at the Tanjong Pagar Terminal (TPT). Singapore became the first port in South-East Asia to accommodate a third-generation container vessel. The M. V. Nihon arrived at TPT with 300 containers from Rotterdam (DANAM, 2003). Over 100,000 TEUs handled annually in the 1970s, the terminal achieved 4 million TEUs in 1989. To maintain this expansion, new container berths have been built almost every other year since 1980 (YAP, 1990).

Aiming to expand the global position, overseas promotion missions were conducted. Besides marketing strategies, incentive were offered to ports users as discounts for vessels operating pioneer routes, calling at off-peak hours or achieving a fast turn round time.

During the 60's and 70's several port facilities and terminal were build up or expanded to receive the increase of world trade. However by the early 1980, the port had to deal with the success of its marketing efforts. The sheer volume of container traffic at Tanjong Pagar Terminal and the overall increase in cargo handled was already stretching the capacity of its staff (YAP, 1990). In those days, the port was run by hand and it depended in the sheer brute force of gangs of stevedores working long hours to clear cargo.

So the port decided to go high-tech with a commitment to harness productivity and the latest technology through comprehensive staff training. Capital investments in automated machinery have resulted in today's highly computerized port operations. Currently, the transformation into a "techno port" was gaining impetus.

The first on-line Container Handling Information System became operational in 1973, a year after TPT started operations. This system enabled a speedier location of containers so that port users could take delivery of their goods in a shorter time. Six years later, other two computer systems were introduced: Vessel Information System: provided information to shipping community about vessels in the port; and Ship Stowage Planning System, which cut down ship planning time (YAP, 1990).

The DATABOX system was introduced in 1984 and shipping lines and freight forwards could get information on their container directly from PSA's computer. The system was superseded by Portnet in 1989. This new system enables freight forwarders, shipping lines, hauliers and consignees to communicate electronically with PSA and customs.

Since the second half of the 1980s, when Southeast Asia started to experience remarkable economic growth largely aided by the relocation of investments and manufacturing activities from its Northeast Asia neighbours, the role of Singapore as the region's hub port has further strengthened (LOW; JOHNSTON, 2003).

In 2 February 1996, the Maritime & Port Authority (MPA) of Singapore was formed and took over national maritime and port regulatory functions from PSA.

By 1997 PSA corporatizes and is succeeded by PSA International which is a leading port group with investments in 28 port projects in 16 countries across Asia, Europe and the Americas by the year of 2008. PSA International runs PSA Singapore Terminals (PSA) the world's biggest container port.

3.2 PORT OF SINGAPORE OVERVIEW

This chapter presents main statics related to the Port of Singapore as well as the current port structure and management.

3.2.1 Statics Information

The smallest nation in Southeast Asia has the largest and busiest port in the world and also one of the most business-friendly and efficiently run countries in world trade. It considered the world's easiest place to do Business according to World Bank 2010 and the second most competitive economy by the World Competitiveness Yearbook 2007.

Singapore's land area is 710.3 sq km and homes a population of almost 5 million according to government's official statistics. Although the shortage of natural resources the city-state holds impressive social and economical indicators. The home ownership rate is 88% and unemployed rate in 2009 was only 3%. The annual inflation rate in 2009 was 0.6% and in the last 10 years the average annual economic growth have being 5.71%.

Since its independence, Singapore has been a leading country in terms of creative innovation and thought leadership. Singapore has already achieved status as one of the major banking and financial centres in the region and currently operates the largest port in the world – the birthplace of regional hubbing (GATTORNA, 2009).

In the national context, the port has been a major contributor to national income and employment, and despite the recent economic crises the port has shown a certain degree of resilience and determination to maintain its premier port status (LOW; JOHNSTON 2003).

For many years, Singapore was positioned behind Hong Kong, but in 1998 its container movement grew by about 7% to 15.3 million TEUs, surpassing the port of Hong Kong. In that year, no less than 140,922 ships called at the port of Singapore, equivalent to 858 million gross registered tonnes (GRT). At any one time, as many as 800 ships can be waiting to berth at the port.

As can be seen in the table below with figures from 2008, Singapore is in the top of the list as the world's busiest port for cargo tonnage and also container traffic:

Total Cargo Volume				Container traffic			
Thousands of tons				TEUs - Twenty-Foot Equivalent Units			
Rank	Port	Country	Tons	Rank	Port	Country	TEUs
1	Singapore	Singapore	515,415	1	Singapore	Singapore	29,918,200
2	Shanghai	China	508,000	2	Shanghai	China	28,006,400
3	Rotterdam	Netherlands	421,136	3	Hong Kong	China	24,494,229
4	Tianjin	China	365,163	4	Shenzhen	China	21,416,400
5	Ningbo	China	361,850	5	Busan	South Korea	13,445,693
6	Guangzhou	China	347,000	6	Dubai Ports	UAE	11,827,299
7	Qingdao	China	278,271	7	Ningbo	China	11,226,000
8	Hong Kong	China	259,402	8	Guangzhou	China	11,001,400
9	Qinhuangdao	China	252,000	9	Rotterdam	Netherlands	10,783,825
10	Dalian	China	246,000	10	Qingdao	China	10,024,400

Table 1 - World Port Ranking 2008.

Source: American Association of Port Authorities available at <www.aapa-ports.org>.

A large component of the container traffic flows at the Port of Singapore is transshipments. This fact is not surprising, given the limited size of its domestic market and the cargoes originating from Singapore's neighbouring countries. According to the chart below, the port of Singapore is ranked as a port with more transshipments handled positioned with considerable distance from Hong Kong, the second port ranked.

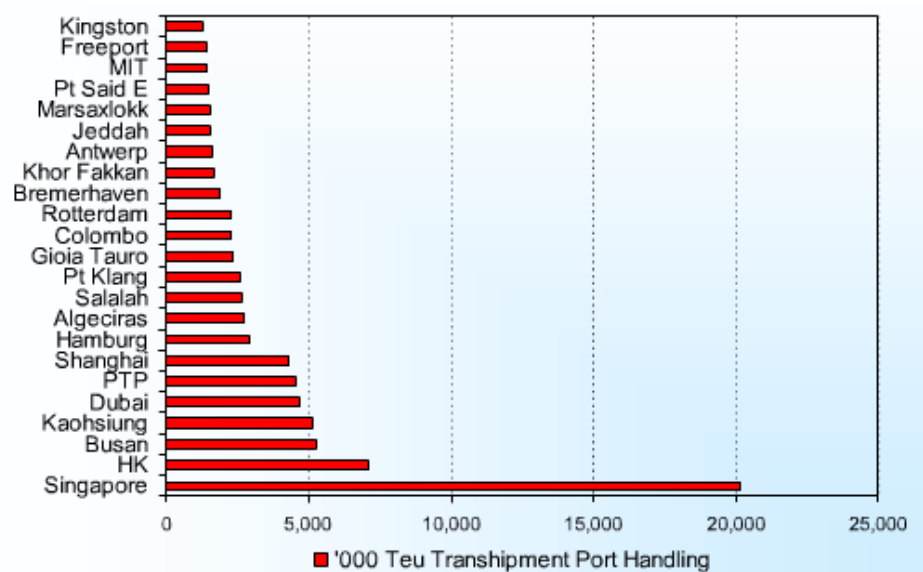


Chart 3 - The transshipment league table, 2006.

Source: 5th ASEAN Ports & Shipping Conference Johor Bahru (2007), available at <www.docstoc.com/docs/19596137/Transshipment-and-global-container-traffic-growth>.

Singapore emerged in the late 1980s as the first port in the world that was dependant primarily on transshipment cargoes for its existence, not coincidentally at the same period of increase in the use of containers and when Southeast Asia started to experience remarkable economic growth.

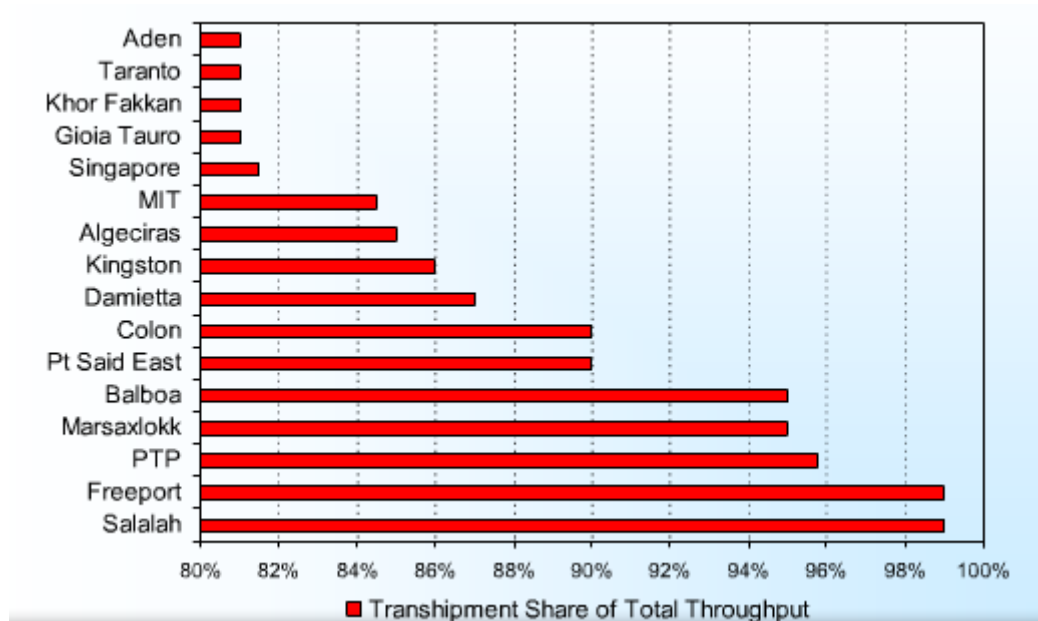


Chart 4 - The transshipment incidence league table, 2006.

Source: 5th ASEAN Ports & Shipping Conference Johor Bahru (2007), available at <www.docstoc.com/docs/19596137/Transshipment-and-global-container-traffic-growth>.

As presented in the chart above, almost 82% of the traffic in Singapore is related to transshipments. Large ships do not have to call at every port within the region, but only at the port of Singapore to unload into, or load cargoes from feeder ships. This enables the shipping lines not only to cut their costs but also to provide a high frequency of service, maximise the utilisation of space of the mother vessels and to have a wide choice of feeders.

3.2.2 Port of Singapore Structure and Administration

The Port of Singapore comprises seven terminals accommodating all types of vessels: container ships, bulk carriers, cargo freighters, coasters, lighters and passenger liners. Depending on their cargo, these vessels with either call at the oil terminals run by the petroleum companies or the terminals run by the PSA Corporation and the Jurong Town Corporation (JTC).

Throughout this chapter the physical and organizational structure of Port of Singapore is presented focused in the main players: Maritime and Port Authority of Singapore (MPA), PSA Singapore Terminals (PSA) and Jurong Port (JP).

3.2.2.1 Maritime and port authority of Singapore (MPA)

The Maritime and Port Authority of Singapore (MPA) was established on 2 February 1996. MPA has been driving force behind Singapore's port and maritime development, taking on the roles of Port Authority, Port Regulator, Port Planner, IMC Champion, and National Maritime Representative.

The mission, vision and values are stated at MPA website (<www.mpa.gov.sg>) as follows:

Mission

To develop and promote Singapore as a premier global hub port and an international maritime centre, and to advance and safeguard Singapore's strategic maritime interests.

Vision

A leading maritime agency driving Singapore's global maritime aspirations.

Values

Forwarding thinking: to be proactive and innovative. We will harness the best technologies and practices so as to stay relevant, efficient and competitive.

Integrity: to act responsibly, honestly and to be morally courageous in carrying out our duties. We will be fair and above board in all our business dealings and relationships.

Respect: to respect the feelings of the individual and to appreciate his dignity and self-worth, his time and effort, and his need to balance work and family time.

Service Excellence: to strive to serve our customers competently, courteously and efficiently. We shall persevere to excel in all areas of our work through continual learning and a positive work attitude.

Teamwork: to value teamwork, harmony and unity in our working relationships. We shall do our work with steadfastness and consideration for our colleagues and customers.

MPA aims to achieve its vision through 5 “Ps”:

- People: nurturing competent and committed people;
- Partnership: building strong partnership with others (it does not specify who the others are);
- Pro-business environment: developing a pro-business environment as a facilitator for the growth of the industry;
- Processes: improving operational processes in order to react quickly to external environment;
- Prominence: achieving international prominence.

In the chart below it is presented the current organizational structure of MPA:

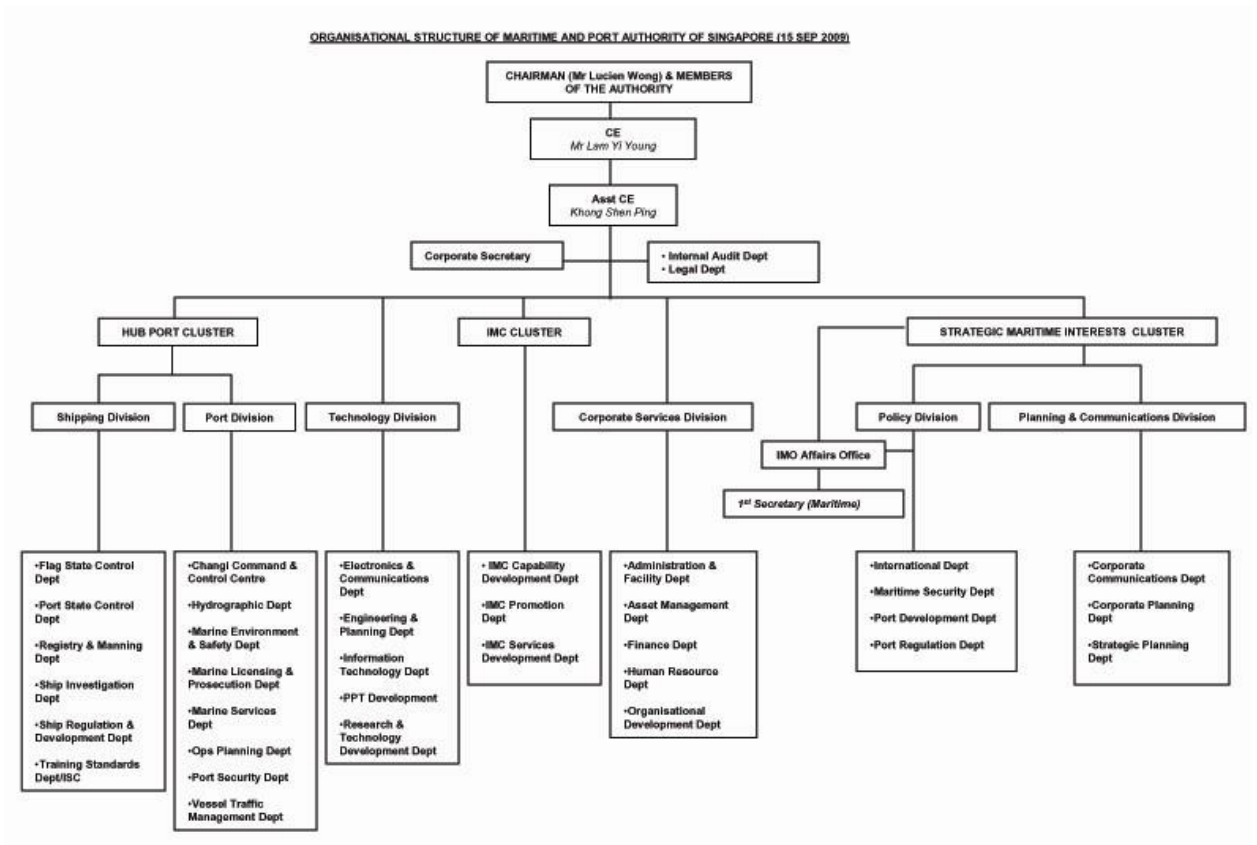


Figure 4 - Organizational Structure of Maritime and Port Authority of Singapore.

Source: Maritime and Port Authority of Singapore available at <www.mpa.gov.sg>.

The MPA Board consists of a chairman and 11 other members from private and public sector, as Bank of Singapore and Singapore Navy. It is under the purview of the Ministry of Transport.

MPA undertakes the following key functions:

- Port Authority: regulates and licenses port and marine services and facilities, such as containers terminals, pilotage, towage and bunkering services. MPA is in charge to manage vessel traffic in the port, ensure navigational safety and the smooth movement and operations of ships, which includes conducting maintenance dredging of fairways and anchorages.
- Port Planner and Facilitator: MPA demarcates fairways, channels and anchorage to cater to the increasing vessel traffic calling to Singapore.
- Port Authority of Singapore (MPA) is responsible for the overall development and growth of the port of Singapore, which includes terminal operators, such as PSA Corporation and Jurong Port Pte Ltd.

3.2.2.2 PSA Singapore terminals

PSA Singapore Terminals (PSA) operates the world's biggest container port, handling about a fifth of the world's transshipment traffic. In 2008, PSA handled 20 million TEUs and transshipment accounts for about 85% of this volume.

PSA Singapore Terminal is a flagship terminal of PSA International, one of the largest ports group in world with operations in 28 ports in 16 countries in Asia, Europe and Americas.

PSA SINGAPORE TERMINALS FACILITIES	
Container Berths	54
Quay Length (metres)	16,000
Area (hectares)	600
Maximum depth (metres)	16
Quay cranes	190
Design capacity	35,000 TEUs

Table 2 - PSA Singapore terminals facilities.

Source: PSA International available at <www.internationalpsa.com>.

PSA operates four container terminals at Tanjong Pagar, Keppel, Brani and Pasir Panjang. The last one is considered the most advanced terminal. Pasir Panjang Terminal is equipped with berths up to 16 metres deep and with quay cranes able to reach across 22 rows of containers to accommodate the world's largest container ships. The terminal's bridge crane system allows each operator to handle up to six cranes.

At Pasir Panjang is also located the Pasir Panjang Automotive Terminal (PPAT) which started operation in January 2009 and is the Singapore's first dedicated car terminal. PPAT operates as a vehicle transshipment hub with three dedicated berths. It is supported by an open car yard and multi-level car storage yard, which together provide some 20,000 car park slots.

PSA also operates Multi-Purpose Terminal Sembawang Wharves where handles break-bulk and specialized cargo including heavy equipment, steelworks and cables. Sembawang Wharves also offers long and short-term warehousing and open storage facilities.

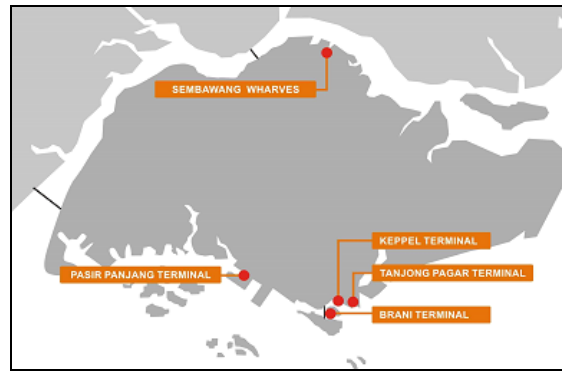


Figure 5 - PSA terminals location.

Source: PSA Singapore Terminals available at <www.singaporepsa.com>.

In its website, PSA Singapore states that its core business is transshipment using Singapore strategic location to develop a worldwide connectivity:

Daily Sailings to:		Connectivity:	
United States	2	No. of Shipping Lines	200
Europe	4	No. of Ports Connected	600
Japan	5	No. of Countries Linked	123
China, Hong Kong, Taiwan	9		
South and Southeast Asia	70		

Table 3 - Port of Singapore connectivity.

Source: PSA Singapore Terminals available at <www.singaporepsa.com>.

As can be seen in the figures above, Singapore has developed a massive offer of routing to the main destination in the world.

PSA uses intelligent systems as Terminal Operations System (CITOS) and PORTNET to enhance its customer's hubbing operations and competitiveness.

Besides the port IT services, PSA complement its global port and terminal business providing a comprehensive range of ocean and harbour marine services and terminal-related logistics services, as reefer care and dangerous cargo handling.

Over the last years, PSA was awarded by several authorities in the maritime sector as the Best Container Terminal Operator and Best Seaport Asia, among other many related awards.

3.2.2.3 Jurong port facilities

Jurong Port was established in 1968 to be the primary gateway for the Jurong Industrial Estate. Today, it is a comprehensive, multi-propose port for bulk, break-bulk, palletized and project cargo serving the demands of an expanding customer base.

Jurong Port was corporatized on 1 January 2001 and became a fully-owned subsidiary of JTC Corporation.

On average it received 19,000 vessel calls each year, ranging from small wooden crafts to large over 8,000 TEU container ships.

The Port's General Cargo Terminal and Bulk Cargo Terminal are the hubs for steel products, metals, mechanical appliances and machinery, cement, copper slag, sugar and project cargo, among others. In addition, there are ample column-free warehouses and open yards to support cargo storage, handling, consolidation and distribution activities. The Bulk Cargo Terminal is one of the world's largest common-user cement facilities and consists of two dedicated berths equipped with three cement screw unloaders linked to a fully enclosed air-slide, non-pollutive conveyor system.

Its Container Terminal started operation in mid-2001 fully equipped with 14 row quay cranes and 4 to 7 high rubber-tyred gantries.

In the same year, Jurong Port also launched Jurong Logistics HUB (JLH), a SGD 220m multi-storey, common-user warehouse complex providing storage and handling services.

JURONG PORT FACILITIES	
Port area (hectares)	152
Berth length (metres)	5,629
N.° of berths	32
Maximum draft (metres)	15.7
Warehouse (sq. metres)	> 174,000
Open Storage Yard	> 215,000
Container Yard	>35,000 TEUs
Equipment	
Mobile harbour cranes	1
Grab unloader (bulk)	2
Screw unloaders (cement)	2
Quay cranes	14
Rubber-tyred gantry cranes	34

Table 4 - Jurong Port facilities.

Source: Jurong Port available at <www.jp.com.sg>.

Its last expand was the opening of Penjuru Terminal in 2008, with 150 metres of berths and 10,000 square metres of land area. Within the first few months of operation, Penjuru Terminal had already handled about 15,000 lighter calls totalling over 365,000 metric tons.

With the completion of Penjuru Terminal, JP is now home to Singapore's lighter and ships-chandling operators who provide a basic but essential service delivering sea-stores and ship spares to ocean-going vessels passing through Singapore. Currently, it houses about half the 20 lighter operators and over two-thirds of the 300 ship's chandlers in Singapore.

The purpose-built terminal is equipped with mooring facilities, biometric-based security and dedicated on-site facilities. JP also has a Small Crafts Terminal of 665 metres in length for wooden crafts and two Mechanical Ro-Ro Ramps for landing crafts.

3.3 SINGAPORE AS AN INTERNATIONAL MARITIME CENTRE (IMC)

An international maritime centre is a complex combination of many different aspects which, if taken together, can produce a level of service and commitment to the shipping and maritime industries.

Singapore's position as an International Maritime Centre (IMC) is built upon its status as a global maritime hub. But whole range of services does not include only the Singapore's traditional service strengths such as its port and its shipyard. The main wave of expertise has come in the shape of banks, lawyers, insurers, surveyors and a host of other professional services available in the country.

The announcement about the aim at boosting its status as an International Maritime Centre was made in October 2003 and since then government has co-ordinate efforts to foster the development of a host of shipping-related services in Singapore, including maritime arbitration, research and development, training, ship management and ship financing/broking. It is the aim of MPA to attract a core group of ship owners, operators and maritime services providers to set up operations in Singapore.

Singapore has leveraged on this unmatched capability in port services to develop the broad spectrum of maritime services. In 1989, the Approved International Shipping Enterprise Scheme, or AIS Scheme, was introduced to enhance Singapore's appeal as a centre for shipowning. According to MPA, in 2009, 12 new international shipping groups joined the AIS bringing the total number of AIS companies to over 120. The AIS companies are awarded with tax exemption on qualifying income for vessels registered under the Singapore Registry of Ships (SRS).

The SRS has grown in tandem with the growth of the AIS. Administered by the MPA, it is now the fourth largest in the world with average age 10 years. In 2008, 3,843 ships totalling 43.7 million gross tons were registered with the SRS. They comprised mostly tankers, bulkers and container ships.

The Singapore flag also has one of the best safety records. Port State Control (PSC) inspections rates are low, as it is in the white list of both the Paris and Tokyo Memorandum of Understanding.

The ever-expanding shipowning base has contributed to the development of auxiliary services such as training, insurance, brokerage and finance, and raised Singapore's profile as an international centre for maritime business.

A companion scheme, the Approved Shipping Logistics, was launched in 2003 to encourage ship management companies and ship agencies to undertake more activities from Singapore.

Singapore's ambition to be a key maritime received a further boost with the launch of the Maritime Finance Incentive Scheme (MFI) in 2006. It aims to attract alternative ship financing entities such as ship leasing companies, shipping funds and shipping trusts by providing tax exemption for ship investment vehicles and a 10% concessionary tax rate for ship investment managers. Assets managed by companies under the MFI rose to almost US\$ 2 billion in 2008, up from US\$1.2 billion in 2007 (Singapore Maritime Directory 2009/2010).

One of the services provided by IMC is the Maritime Arbitration. It was established the Singapore Chamber of Maritime Arbitration (SCMA) in November 2004. It is a non-profit organization which aims to Singapore be the Asia's centre of maritime legal expertise and dispute resolution. Operating as a specialist sub-division of the Singapore International Arbitration Centre (SIAC), SCMA offers arbitration expertise for disputes of maritime nature including bunker disputes through a specially selected and distinguished panel of established maritime arbitrators.

The shipbroking, maritime arbitration and legal sectors have seen steady growth in recent years. In 2009, some 20 leading shipbroking companies and about 30 law firms with maritime practice were placed in Singapore. The presence of large number of regional headquarters for major shipping companies, in addition to the significant number of Singapore companies operating in the regional and global shipping markets, also attracts international law firms. Many of the decision-makers who need legal services from maritime law firms are now based in Singapore.

With strong economic links and connectivity to all major world markets, over 4,200 foreign multinational corporations have regional activities in Singapore and some 26,000 international companies maintain offices in the country according to MPA.

The training of maritime manpower is also one of the areas focused. As part of continuous efforts to develop talent for the industry, MPA has worked closely with various partners to support manpower development and training initiatives. The ICS-ITI Shipping Programme, jointly offered by the International Trading Institute at Singapore Management

University and the Institute of Chartered Shipbrokers Singapore Branch, was introduced with the objective of raising professional standards and knowledge across shipping industry. In 2009 was held in Singapore two-week Maritime Law & Practice Course by the Institute of Maritime Law, University of Southampton. It was the first time the course was conducted outside of the United Kingdom.

Singapore has also been a member of the International Maritime Organization (IMO) since 1993 and in 2009 an IMO Affairs Office was set up in MPA aiming the consolidation of MPA's focus on key IMO issues.

According to MPA, in the past years some \$45 million extra funds were allocated to facilitate the setting up and expansion of new lines of maritime-related businesses and around \$25 million to support maritime research and development efforts.

The Singapore Government's current policy aims to build on the strength and reputation of the Port of Singapore by developing a comprehensive cluster of shore-based maritime service industries, including brokering, maritime arbitration, maritime insurance, ship management, ship repair, training and legal services.

3.4 THE PORT EFFICIENCY OF SINGAPORE

Among the three major global shipping routes, including the Trans-Pacific, Far East-Europe and Trans-Atlantic, the first one carries the highest percentage of worldwide cargo volume (Containerization International Feb, 2004). East Asia is the intermediate district connecting Trans-Pacific and Far East-Europe which brought our shipping lines to expansion of their service networks and size of fleet in this booming area.

In East Asia, it becomes more complicated for shipping lines to deploy the shipping routes and select hub ports because of the fast growth in cargo volume and port expansions of China and other countries in the region. In earlier days, most major liners have few options for hub ports in Asia selecting Busan, Hong Kong, Shanghai or Singapore (TAI; HWANG, 2005). But with vast investment on expansion and modernization of port facilities additional ports in China as Yantian became available to shipping companies for selection as a hub.

Singapore's neighbouring countries are also making a concerted effort attracting more local and international cargoes. Some nearby ports, such as the port of Klang in West

Malaysia, the port of Laem Chabang in Thailand, and the port of Tanjung Pelapas at the southern tip of Malaysia are also aspiring to be hub ports in the region, and thus may take away some of Singapore's regional market share (LOW; JOHNSTON, 2003). Malaysia and Thailand not only aim to share the transshipment volume in East Asia with Singapore but also reduce the dependence relation created during the last years.

Other ports as Kaohsiung in Taiwan and Colombo in Sri Lanka are also a locational advantage to attract vessels on the trans-Pacific route and European route. Although all these port are currently far behind Singapore in throughput and infrastructure, they are well located to service Asia and with adequate investments in technology and infrastructure can become a real threat to Singapore as a regional port hub (LOW; JOHNSTON, 2003).

The reason why Singapore has achieved the position of world's biggest hub port and has retained this status for many years although the relevant competition can be answered by the key criteria considered as important factors influencing the hub port choice decisions of shipping lines.

A survey was conducted by Jose Tongzon (2003) with a sample of 25 shipping companies, representing major shipping lines, at the port of Singapore. The questionnaire was designed mainly to find out how the shipping lines would rate the seven identified factors in determining the choice of a hub port.

Determinants	Shipping Lines (Rank)*
High port efficiency	First (1.78)
Adequate port infrastructure	Second (2.27)
Wide range of port facilities	Third (2.53)
Low port charges	Forth (3.65)
Adequate infostructure	Fifth (3.67)
Connectivity to other ports	Sixth (4.06)
Location	Seventh (5.18)

* The values in brackets refer to the mean scores. The lower the value, the higher is the relative importance of the determinants.

Table 5 - Ranking of relative importance of decision factors.

Source: Low and Johnston (2003).

The lowest ranking given to "location" seems surprising and although port charges are considered important, they did not top the rankings. It could mean that shipping lines could

and do define strategic commercial locations influenced by the logistics requirements of big customers. Then the predominance of port efficiency (the ability of the port to move the cargoes quickly and reliably) is more important than other factors. It is, therefore, essential that port authorities give top priority to improving their overall level of efficiency relation to other factors in order to attract more vessels to their ports.

Based the importance of these criteria, it is possible to determine the Port of Singapore relative strengths and weaknesses and external opportunities and threats.

3.4.1 Internal Strengths

The port efficiency is considered to be the most important determinant of port choice amongst the port of Singapore users according to the survey presented above. This factor can be measured in many ways, depending on which aspects of port operations are being evaluated. Port efficiency can be judged by ship-owners or cargo interests.

Using the methods developed by Tongzon and Genesalingam (1994) and Tongzon (1995) to classify port efficiency, the port of Singapore is classified in the same league as the ports of Rotterdam, Hong Kong and Kaohsiung. The port of Singapore does outshine all other similar ports in the area of ship turnaround time, labour efficiency, crane efficiency and in the utilisation of other assets. Moreover, the analysis has shown that as far as efficiency, timeliness and reliability go, the port of Singapore is way ahead of its regional counterparts (TOH; TAN, 1998).

The second and third factors in determining the choice of a hub port are related to port infrastructure and facilities. The port of Singapore has a well-developed port infrastructure, not only in the number of container berths, cranes and adequate storage facilities, but also in the quality of its cranes, quality and effectiveness of its port/interport information systems, approach channel provided, preparedness of port management, and a wide range of port-related and ship-related services offered (LOW; JOHNSTON, 2003).

To be a hub port requires, in particular, an adequate number of berths and other required port facilities to deal with significant volumes of cargo traffic, high frequency of ship visits and very large ships. It also requires an excellent informational network to handle the high level of coordination required as a hub port.

To meet these requirements, the port of Singapore has ensured that its port facilities are adequate to handle future increases in cargo traffic and ship visits in the region by investing in port expansion and upgrading.

The port of Singapore is fully equipped to handle almost all types of vessels, ranging from 80 TEU barges to the world's biggest vessel with more than 10,000 TEU capacity. It is one of the most automated ports in the world and uses the latest information technology in every aspect of administration, planning and operation services. Its EDI system is used to plan berth allocation, ship towage and yard management (LOW; JOHNSTON, 2003).

The city-state also offers a wide range of ship related and port related services due to its position as an International Maritime Centre (IMC). It is a relevant strength once it is offered to maritime companies services as repair, marine finance, insurance and others to create a one-stop service provider centre.

The port of Singapore is located along the Straits of Malacca, positioned in the middle of a main shipping route between East and West. It is also fortunate to enjoy natural deep waters and harbour, which allows it to service ships with deeper draughts without having to resort to expensive dredging operations. Its position also results in safe and reliable port operations due to non existence of typhoons and other natural calamities in the region (LOW; JOHNSTON, 2003).

Singapore is also located close to some of the world's dynamic economies. One example is its position between China and India which can be called the "reverse L" and allows Singapore works as a connection to both rising economic powers (GATTORNA, 2009).

Another factor in which the port of Singapore enjoys a competitive edge is the port connectivity. The port is linked by around 200 shipping lines about 600 ports worldwide. The port connectivity is mainly concentrated in Southeast Asia but it covers all parts of the globe.

Region	Number of Connected Ports
Southeast Asia	119
Northeast Asia	97
South Asia	19
West Asia	34
Africa	67
European Union	74
Other Europe	25

Continue.

Continuation.

Region	Number of Connected Ports
Oceania	52
North America	48
Central and South America	50

Table 6 - Regions connected to Port of Singapore.

Source: Low and Johnston, 2003.

This wide-ranging port connectivity allows shipping lines to maximise slot utilisation on their mother vessels by offering more choice of feeders to various trade routes. Shippers are also able to move their products to and from markets faster and at lower inventory costs.

3.4.2 Internal Weaknesses

The main weakness of the port is related to port charges. In terms of monetary cost comparisons, Singapore has higher operation charges than neighbouring lower cost ports. The port of Singapore does not fare well against other ports in the region. For instance, compared to its closest rival, port of Klang, its port direct charges, as reflected by container handling charges are higher by 35% to 75%.

Direct port charges have been under pressure due to rising labour and land costs resulting from labour and land limitations, and appreciation of the Singapore dollar against other regional currencies.

Further port expansion may not be possible without incurring higher costs of land reclamation and development, due to the scarcity of land in Singapore. Thus, it may be said that there is a short limit to a continued port expansion in Singapore compared to its regional neighbours, as the land of Singapore is small (TOH; TAN, 1998).

Labour costs and shortages of quality blue collar labour have caused many labour intensive industries to relocate to other low labour cost countries in the region, which results in logistics hub being established closer to the manufacturing sites. The used of foreign labour helps relieve this problem, but it does not substantially lower the costs due to the imposition of foreign worker levies and other add-on costs that may be incurred.

However, these direct port charges must be seen in the context of all other costs. Also, the port of Singapore adopts a market-based approach in that shipping companies are offered special offers according to the long-term contracts.

In May 1996 was introduced the 20% port due concession for container ships as an effort to enhance the competitiveness of the Port of Singapore. In July 2010 this concession was extend to June 2012 to boost Singapore's attractiveness as a transshipment hub port.

3.4.3 External Opportunities and Threats

The above analysis of the port of Singapore's internal strengths and weakness has shown that it has enjoyed a number of competitive advantages. These internal strengths are further complemented by recent developments in the external environment.

One recent development is the trend among shipping lines to use very large ships and to call at fewer ports in order to lower the costs. This trend will favour larger ports, where the economies of scale can occur. The focus is in the intermodalism, which requires a complete logistical and distribution package to meet just-in-time functions, such as warehousing, storage space, processing facilities, efficient intermodal transfer and sophisticated information services (LOW; JOHNSTON, 2003).

This fits in with the port of Singapore's current orientation as a comprehensive provider of port services and as a logistic centre. As well, Singapore offers the infrastructure for all types of vessels, including the world's biggest vessels.

Another external development that augurs well for Singapore is the increase in the production of high value-added products seen in the countries in the region during the last years. Continued industrialisation, economic dynamism and growing trade orientation of countries in the region provided ample business opportunities for the port of Singapore as transshipment point (TOH; TAN, 1998).

The port of Singapore has been in a better position to take advantage of this external opportunity because of the economies of scale developed in the last decades and scope it has enjoyed in containerised cargo operations, its high level of efficiency, and excellent infrastructure relative to other ports in the region.

PSA International also plays an important role for the external opportunities to the Port of Singapore. It was already adopted the strategy through various alliances and investments in the logistics business and port terminal development in around 16 countries. This is an effective way to ensure that there will be cargo transshipment through the port of Singapore by having greater influence on the supplies lines of transshipment cargo from other ports in the region.

There are, however, external trends that are working against the port of Singapore as a regional hub. Aggressive policies by Singapore's competitors to promote their ports and attract mother vessels by offering incentives and other measures to discourage ports users to use the port of Singapore, and the massive investments made to improve their infrastructure and technology have posed, and will continue to pose, a major trend.

Development of round-the-world shipping services, which pick up trade on two or three of the major shipping routes has increased competition with traditional end-to-end operators and widened the scope for feeder from hub ports to smaller trade areas. There is a trend towards joint service operation in order to take advantage of the economies of scale in the current highly competitive environment. These trends have reduced the bargaining power of ports, including the port of Singapore (TOH; TAN, 1998).

Economic crisis also results on adverse implications against Singapore's transshipment role. Once the transshipment services are dependent on the trade between the countries, any slowdown in the economies of the neighbouring countries results in the drop of containerised cargo traffic and an imbalance of cargo flows.

Although the competition with other hub ports, Singapore still holds the world's premier position as a hub port. Based on the performance showed by the port, it can be said that it will remain unchallenged for many years, although its market share can decline.

4 CONCLUSIONS

Ports are known as the main gateways for overseas trade but another type of port emerged in the second half of last century: the hub ports. Also called as mega ports, this kind of port has the objective to connect mainline services with various feeder networks. In other words, hub ports works as a transshipment place for cargoes coming from place where the ocean freight offers are non-well developed to big vessels which will move the shipment to final destination, probably another hub port. Transshipments also happen in the other way, from overseas main region to be transhipped to small ports in the region. The latest concept is transshipment from one hub port to a second hub ports.

Hub ports were developed due to the rapid increase in the international trade and the necessity of more efficient logistics services specially with the booming of China and other Asian countries in the last decade. The shipping lines have invested in huge vessels with great capacity. With the objective to reduce the operational costs, the number of ports of call must be decreased and also some ports are not able to handle some kind of vessels due to its size.

The port of Singapore is in the top of the list as the world's busiest port for cargo tonnage and also container leaving behind other important ports as Hong Kong, Shanghai and Rotterdam. Due to the limited size of Singapore's market, more than 80% of the container traffic flows is transshipment. Port of Singapore handles around four times more transshipments than Hong Kong, the second port ranked.

Singapore has the status as a transshipment point since the beginning of its existence but this condition was better developed after the English colonization in the 19th century. Singapore's position between South China Sea and Indian Ocean was strategy for the objectives of England at that time. Raffles determined the port of Singapore as a Free Port, where charges would not be applied to vessels which called the port. Singapore's fortunate location is still relevant factor considering the main shipping routes in world and the foreign trade growth seen in the region.

After the independency of Singapore in 1965, the government has put its effort to develop the port as a premier hub in an international level. At first, the strategy was based in improve the port and terminal infrastructure and Port of Singapore Authority (PSA) was created to head the decision related to port development.

In 1972, port of Singapore became the first one to accommodate a third-generation container vessel and more berths were built during the decade. PSA put Singapore into the top 10 rankings of the world's busiest ports and this position is hold until today.

During those first years of development, PSA also established some marketing strategies including overseas promotion missions and incentive were offered to ports users. All these actions overall increased the cargo handling and a new era has started with capital investments in automated machinery and controls systems. Singapore headed to a techno port.

PSA was corporatized in 1997 and created the PSA international which is a port group which projects in several countries in Asia, Americas and Europe, including PSA Singapore Terminals, which is the world's biggest container port. At the same time, the Maritime Port Authority (MPA) was created to supervise the operation of PSA Singapore Terminals and JTC Corporation which runs a port at Jurong area.

Considering facilities of both terminal operators, the port of Singapore has achieved a massive and efficient infrastructure awarded by several authorities in the maritime sector, like the Best Seaport Asia award. Port efficiency and infrastructure were pointed out by the carrier as the top factors in determining the choice of a hub port. The carriers expect from the hub port that the vessels can stay the shorter time possible at the port in order to reduce costs and increase the number of voyages. They also expect that the port can operate all kind of vessels and handle most of type of cargoes and they find the adequate infrastructure and port facilities and also enough deep water in Singapore.

The port has created connective with around 600 ports in 123 countries which allows offer the hub services for around 200 shipping lines. Port of Singapore offers a huge link between mother and feeder vessels allowing carriers to reduce the number of port of calls.

MPA has also aimed to develop in Singapore a centre for maritime service related. From the beginning of this century, Singapore is building it status as an International Maritime Centre. It is a complex combination of shipping-related services including maritime arbitration, research and development, training, ship management, financing and broking. The government has put its efforts to attract to Singapore ship owners and maritime service providers by the provision of tax exemption. MPA has allocated over the last years high investments to expand the maritime-related businesses.

The main weakness of the port is the port charges, which are higher comparing to neighbours ports in Malaysia, Thailand and Taiwan. Although these ports can compete in

rates, the infrastructure and services offered by them is still behind of what port of Singapore can provide to carriers which tranship their cargoes in the region.

Taking on account all the information gathered, it can be said that Singapore's success as a hub port has been due to several factors related to government's strategy or not. Its favourable location and the history always related to maritime activities has naturally created condition to Singapore develop a hub port, but mainly the ability of the port to deliver a very high level of performance allowed the port of Singapore to become the world's biggest hub port.

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