LINER SHIPPING

1. Introduction

Shipping is a service industry that generally provides cargo transportation of international trade. Approximate 90% cargo volume of international is transported by sea. Often, the shipping industry is categorized into two major sectors: (1) the bulk shipping which provides services mainly in the transportation of raw materials such as crude oil, coal, iron ore, and grains; and (2) the liner shipping which provides services in the transportation of final and semi-final products such as computers, manufacturing product and other consumption goods…etc. Cargo carried by liner shipping has come to be known as general cargo. Liner shipping is to provide regular services between specified ports according to time-tables and prices advertised well in advance. The service is, in principle, open to all shippers and in this sense it resembles a public transportation service. The provision of such a service, often offering global coverage, requires extensive infrastructure in terms of ships, agencies, and equipment.

The vast majority of liner cargo is containerized – that is, it is carried in sealed metal containers from point of origin to destination. These containers come in standard sizes (typically 20', 40', and 45' in length) and may include various specialized technologies, such as refrigeration units for chilled and frozen foods, or internal hanger systems for carrying garments. Containers serve, in essence, as a packing crate and in-transit warehouse for virtually every type of general cargo moving in international commerce. The standard measure of the volume of containerized cargo is a TEU (twenty-foot equivalent unit). For example, one forty-foot long container of cargo would be counted as two TEUs of cargo.

Most of the world's non-bulk cargo travels in marine shipping containers. The worldwide fleet of marine containers in circulation at the beginning of 2005 is estimated to be about 13 million containers with overall capacity of approximately 20 million TEUs. Containers move along a network of nodes and links (see Figure 1). The nodes are physical locations where container movement is interrupted and/or containers are handled. Many of these concern multimodal transfer points where containers are transferred from one mode to another. The links between nodes are characterized both by a mode of transport (road, rail, inland

waterway) and a supporting infrastructure (roadway, canal/river, railroad track, rail marshalling yard, etc.). As containers move along this network they can either be empty, loaded with a single consignment (Full Container Load, FCL) or loaded with multiple consignments (Less-than Container Load, LCL).

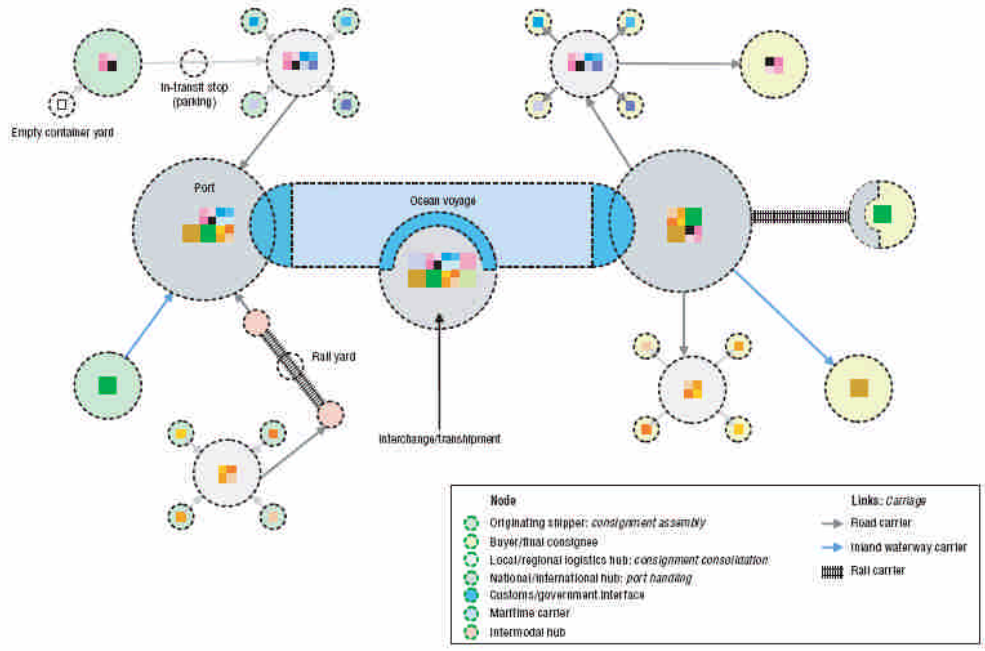

Figure 1. Container transport chain

The Containerized cargo moves from inland point to inland point via a multi-modal network linking vessels, port terminals, trucks and trains. At the heart of this service network is the planning, tracking and delivery of cargo and state-of-the-art information systems needed to provide certainty and reliability to shippers. These standardized boxes have revolutionized the international transport of goods involving a sea leg since their first appearance in the 1950s and have given rise to a multitude of specialized road, barge and rail carriers, a fleet of over 2,700 cellular container ships and the emergence of a global network of several hundred highly automated port handling facilities. The basic shipping container is nothing more than a reinforced steel box with one double door providing access on one side. These “dry box” containers are supplemented by many other container types including tank containers for gaseous or liquid cargoes, open frame containers for transporting odd-sized consignments, soft-top containers, containers fitted with special garment racks and/or refrigeration units (“reefers”) for transporting chilled food. All of these containers share standard fittings on all corners that allow them to be stacked and racked on board vessels,

train wagons, truck chassis, etc.

Table 1. Actors in the container transport chain

Role	Actors involved
Primary customers	Seller (manufacturer/originating shipper/exporter)
	Buyer (consignee, importer)
Transaction facilitation	Buying agent
	Freight forwarder or NVOCC
	Customs broker
Transport task (physical movement of container)	Empty container depot operator
	Warehouse/container freight station operator
	Inland terminal operator (*e.g.* road-rail, road-barge, rail-barge)
	Road carrier (local, long-distance)
	Rail carrier[1]
	Barge operator
	Ocean carrier
	Port terminal operator
	Other port service operators
Authorising/regulatory	Transport authorities
	Customs authority
	Import/export licensing authority
	Phytosanitary, sanitary and veterinary control licensing authority
	Port authority
	Import/export statistical agency
	Other actors (chambers of commerce, consulates, etc.)
Financing	Bank (seller's or advising bank, buyer's or issuing bank)
	Insurance provider (carriage insurance)

2. The trade and container flow

Most container moves involve an international sea leg. Figure 2 illustrates global flows of containers along the principal trade routes in 2002. These flows accounted for 37.7 million TEUs or roughly 24.3 million actual box moves concentrated in the dominant Trans-Pacific, Asia-Europe and trans-Atlantic trades. Container traffic figures for world ports from Containerization Online indicate that over 264 million containers were handled in 2002. These figures account for all containers handled at the various ports including transhipped containers, empty container moves on both the export and import sides. These trade volumes are expected to increase in coming years as world trade increases.

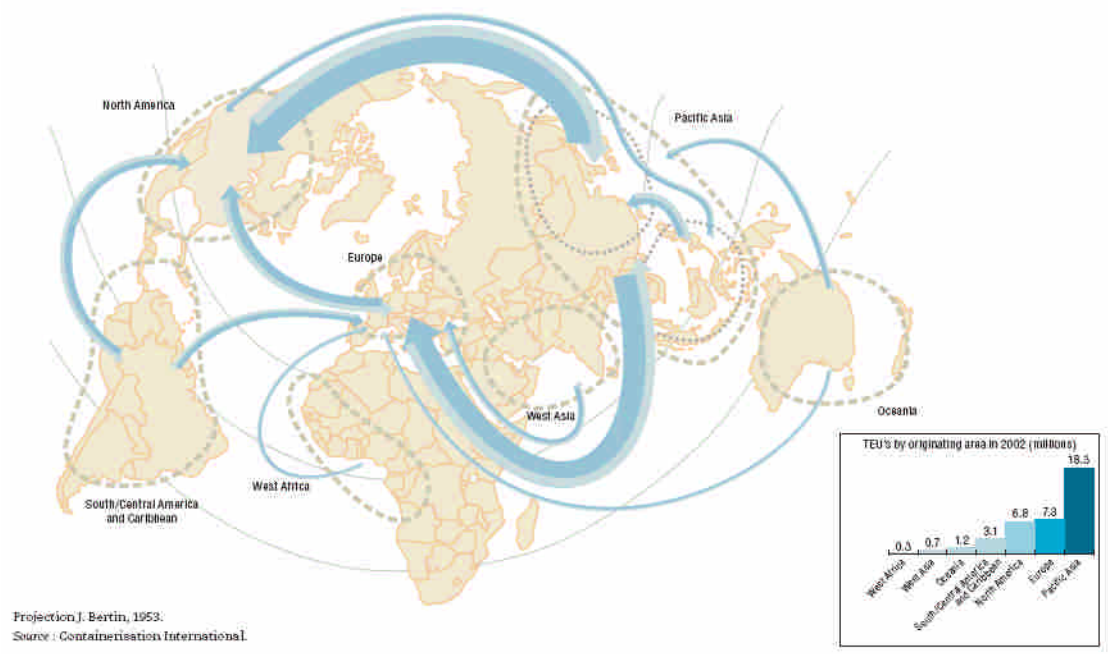

Figure 2. Global flows of containers along the principal trade routes in 2002

A closer look at Figure 3 shows that cargo flows are not balanced on the most important trade routes. Flows from Asia to the USA exceed those in the opposite direction; likewise, flows from Asia to Europe and from Europe to the USA are significantly higher than the respective flows back.

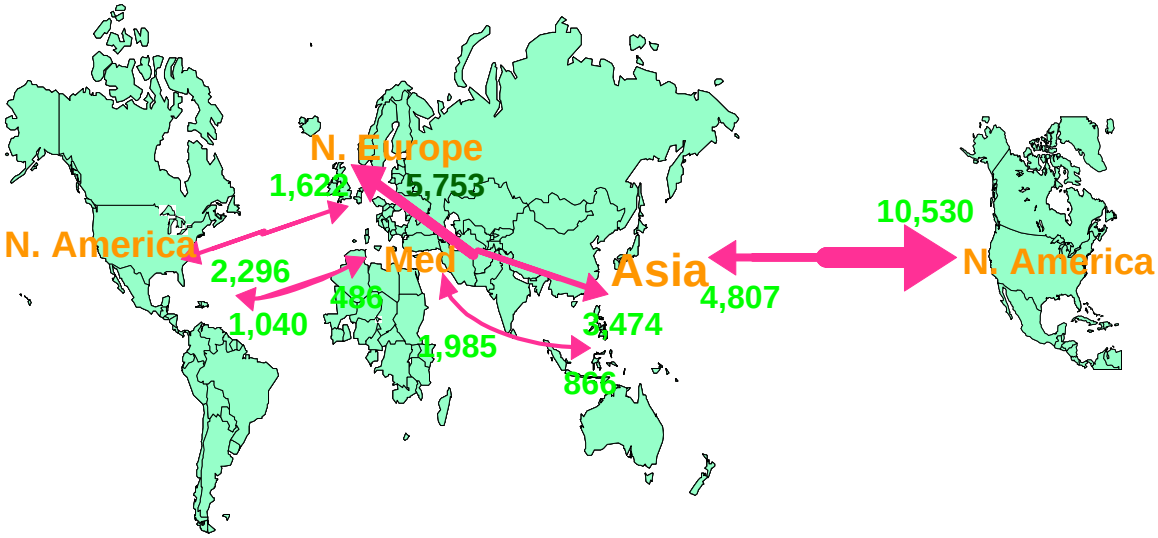

Figure 3. Container trade flow volumes of east/west axis in 2004 (unit: 1000 teu)

3. The shipping lines and strategic alliances

Strategic alliances have formed in order to extend economies of scale, scope and network, through strategies such as the integrating of individual service networks, vessel sharing, slot-chartering, joint ownership and/or utilization of equipment and terminals and similar endeavors on better harmonization of operations. Liner carrier alliances are developing at least two different types: (1) core alliances with a set of global partners, (2) multi-consortia networks of slot exchanges covering individual traders. Through this kind of global alliance arrangement, a lot of scale benefits can be achieved: more frequent service, shorter transit times, wider port coverage, lower slot costs and a stronger bargaining position in negotiating with terminal operators, container depots and inland/feeder transportation carriers. Liner alliances operational cooperation are summarized as follows: (1)Joint terminals or terminal contracts, (2)Joint mainline services, (3)Joint feeder services, (4)Joint purchase or ownership of ships, (5)Joint purchase and usage of containers, (6)Joint intermodal, rail or trucking operations, (7) Joint container depots, (8)Jointly-managed pools of containers and equipments, (9)Joint EDI systems, (10)Joint bunker purchase, and (11)Interchange of empty containers.

Table 2. Top 10 shipping lines

Liner	Country	Number of Ships	Capacity in TEU*	Share of world capacity
Maersk/Sealand	Denmark	305	848,611	9.4%
MSC	Switzerland	250	649,403	7.2%
P&O Nedlloyd	UK/Netherlands	144	412,519	4.5%
CMA CGM	France	124	353,678	3.9%
Evergreen	Taiwan	124	344,285	3.8%
APL	Singapore	96	307,094	3.4%
Cosco	China	110	274,465	3.0%
Hanjin	Republic of Korea	68	271,644	3.0%
CSCL	China	103	247,812	2.7%
NYK	Japan	74	243,339	2.7%
Sum		1,398	3,952,850	43.6%
World fleet		7,594	9,070,065	100%

*TEU: Twenty foot equivalent unit.
Source: Containerization International online database accessed 29 January 2005.

Table 3. Top 40 shipping lines

Rank	CONTAINER LINE *(Owner)*	Annual TEUs Carried
1.	MAERSK SEALAND	2,673,606
2	APL	1,452,312
3.	EVERGREEN LINE	1,440,974
4.	HANJIN SHIPPING	1,416,947
5.	MEDITERRANEAN SHIPPING	1,115,360
6.	P&O NEDLLOYD	971,012
7.	OOCL	940,310
8.	COSCO	900,637
9.	HYUNDAI MERCHANT MARINE	890,754
10.	NYK LINE (NIPPON YUSEN KAISHA)	864,206
11.	HAPAG LLOYD	841,020
12.	K LINE (KAWASAKI KISEN KAISHA)	812,924
13.	YANG MING LINE	748,949
14.	MOL	642,322
15.	CHINA SHIPPING CONTAINER LINE	552,472
16.	ZIM CONTAINER	552,323
17.	CMA-CGM	495,111
18.	LYKES LINES *(C.P. Ships)*	404,393
19.	LLOYD TRIESTINO *(Evergreen)*	399,474
20.	CROWLEY LINER SERVICES	259,260
21.	HATSU MARINE *(Evergreen)*	242,208
22.	DOLE OCEAN CARGO EXPRESS	237,885
23.	GREAT WHITE FLEET LTD	183,682
24.	TMM LINES *(C.P. Ships)*	175,355
25.	COLUMBUS LINES *(Hamburg Sud)*	154,056
26.	WAN HAI LINES LTD	117,407
27.	COMPANIA SUD AMERICANA DE VAPORES	116,627
28.	ATLANTIC CONTAINER LINE	112,949
29.	SAFMARINE *(Maersk-Sealand)*	<100,000
30.	CONTSHIP CONTAINERLINES *(C.P. Ships)*	"
31.	AUSTRALIA NEWZEALAND DIRECT LINE *(C.P. Ships)*	"
32.	UNITED ARAB SHIPPING	"
33.	NORASIA (CVSA)	"
34.	CROWLEY AMERICAN TRANSPORT *(Hamburg Sud)*	"
35.	ITALIA LINE *(C.P. Ships)*	"
36.	LIBRA NAVEGACAO	"
37.	EMPRESA DE NAVEGACAO *(Hamburg Sud)*	"
38.	WALLENIUS WILHELMSEN LINES	"
39.	HOEGH UGLAND AUTO LINERS	"

Note: Annual TEU figures for May 1, 2003– April 30, 2004

Alliances, acquisitions and mergers have been seen as elements of an industry-wide strategy to return to profitability via cost cutting and rationalization. While intense competition and low profitability have encouraged rationalization, the preferred method of achieving the objective has changed over time. Strategic alliances were preferred in the late 1980s and early 1990s, culminating in the formation of the Grand and Global Alliance. More recently the emphasis has switched to merger and acquisition.

Co-operative ventures in container shipping began with the formation of consortia in the late 1960s and 1970s in order to raise the capital required to mount container services. However, the services provided by these consortia were marketed collectively, restricting the ability of member lines to differentiate their product. Strategic alliances of the late 1980s and 1990s differ from the early consortia so far as the geographical scope of their operations and marketing practices are concerned. Whilst consortia of the 1970s operated in a single trade, alliances of the 1980s and 1990s are global in scope.

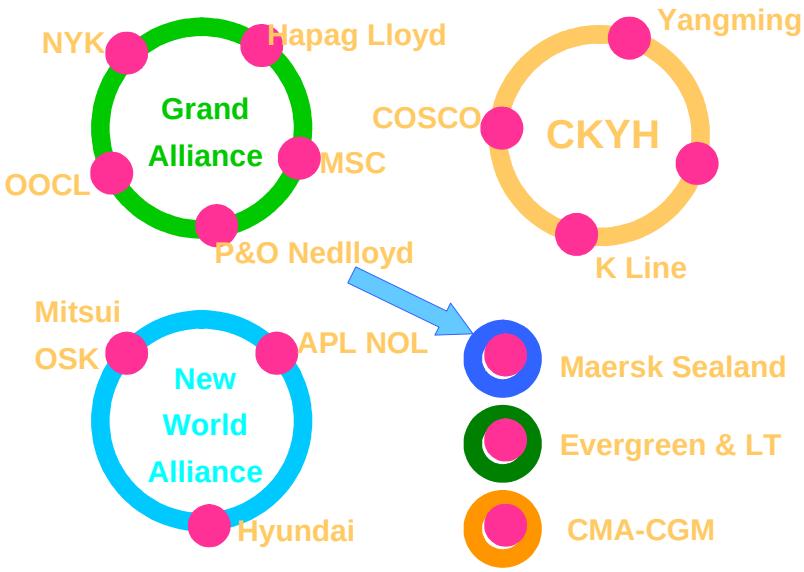

Figure 4. Mega carriers and shipping alliances

Thus, Hapag-Lloyd, NOL, NYK and P&O formed the so-called ‘Grand Alliance’ in 1995 to operate services in both the Europe-Asia and Asia-North America trades. APL, MISC, Mitsui-OSK, Nedlloyd and OOCL responded by forming the short-lived ‘Global Alliance’, while Maersk and Sea-Land created a global operating network featuring vessel-sharing agreements in the Europe-Asia, trans-Atlantic, trans-Pacific and intra-Asian trades. Note also that today’s alliances leave marketing in the hands of individual member lines.

Mergers Supersede Alliances. To achieve the desired scale economies, liner shipping companies have begun forming global alliances since the beginning of the 1990s. These have been less stable than initially expected because members of different alliances have merged, forcing the alliances to adjust their schedules. This instability prevents alliances from making long-term investments, especially in land-based activities. As a consequence, the full cost saving potential cannot be realized, which in turn reduces the willingness of carriers to make

long-term commitments.

Mergers and acquisitions have resulted in some very large liner shipping companies; the top 20 carriers now control more than half of the world's container slot capacity. Since the beginning of the 1990s, liner companies have begun to form global alliances; the largest 10 groupings now control about two-thirds of the world's container slot capacity.

4. The containerships

The average container ship size has increased by two-thirds from 955 TEUs in 1980 to more than 1,600 in 1996. One of the factors contributing to this trend is the introduction of the so-called post-Panamax containerships. The first post-Panamax containership was built in 1988, yet only in 1995 did the worldwide container-carrying capacity of post-Panamax vessels start to increase significantly. So far, post-Panamax vessels are employed only on two major routes: (1) trans-Pacific and (2) between Europe and the Far East. The latter is sometimes part of a pendulum service that reaches the U.S. East Coast.

The historical tendency for ship size to increase re-emerged in the mid 1990s, several owners choosing to order vessels that were too large to transit the Panama Canal, thus sacrificing operational flexibility. Hyundai, Maersk, Mitsui-OSK, NYK, OOCL and P&O Nedlloyd ordered ‘post-panamax’ tonnage in the latter years of the 1990s. Maersk commissed several 6,000-6,600teu post-Panamax vessels, while P&O Nedlloyd introduced four 6,700teu vessels and NYK five 5,700teu vessels into Europe-Asia service. Post-Panamax vessels operate exclusively on the Europe-Far East and US West Coast-Asia-Europe routes.

Table 4. Growth in size of containerships

Year Size	*Class or Type*	*Capacity (TEU)*	*Constraints on Ship*
1964-67	1st Generation	1000	None
1967-72	2nd Generation	1500	None
1972-84	3rd Generation	3000	Panama Canal width (32.3m)
1984-95	4th Generation	4500	Panama Canal length (294m)
1995-channels	5th Generation (Post-Panamax)	6000+	Depth of port

While the average size of container vessels employed in the major trades continued to

increase after 1985, the size of the largest vessels stabilized at the 4500teu level for almost a decade. Why didn't owners invest in larger tonnage? Two explanations have been suggested. First, it has been argued that vessel size was constrained by limitations of length (294m) and width (32.3m) imposed by locks on the Panama Canal. Second, it has been argued that Vessel Sharing Agreements, which encourage owners to take full advantage of economies of ship size, remained relatively uncommon until the 1990s.

Technological developments in ship design and construction, and the ensuing economies of scale of larger ships, have also promoted trade, particularly that of developing nations, by making economical the transportation of goods over long distances. Nowadays, containers are increasingly carried by specialized container ships many of which are able to carry more than 5000 TEUs, while designs for 8000, 10000, or even 15000 TEU ships are already on the drawing boards of naval architects.

Table 5. World containership fleet by size range

Size Range (Teu)	No. of Vessels	%	Total Capacity (Teu)	%	Average Speed (Knots)
<500	447	14.0%	137,859	2.1%	14.0
500-999	587	18.3%	415,973	6.4%	16.7
1000-1499	510	15.9%	605,583	9.3%	18.4
1500-1999	405	12.6%	687,206	10.5%	19.5
2000-2499	267	8.3%	606,025	9.3%	20.6
2500-2999	231	7.2%	628,765	9.6%	21.5
3000-3999	277	8.7%	949,527	14.5%	22.5
4000-4999	238	7.4%	1,046,353	16.0%	23.9
5000-5999	131	4.1%	720,159	11.0%	25.4
6000-6999	80	2.5%	517,378	7.9%	25.2
7000-7999	27	0.8%	197,610	3.0%	25.0
8000+	2	0.1%	16,126	0.2%	26.0

Source: Fossey et al., 2004.

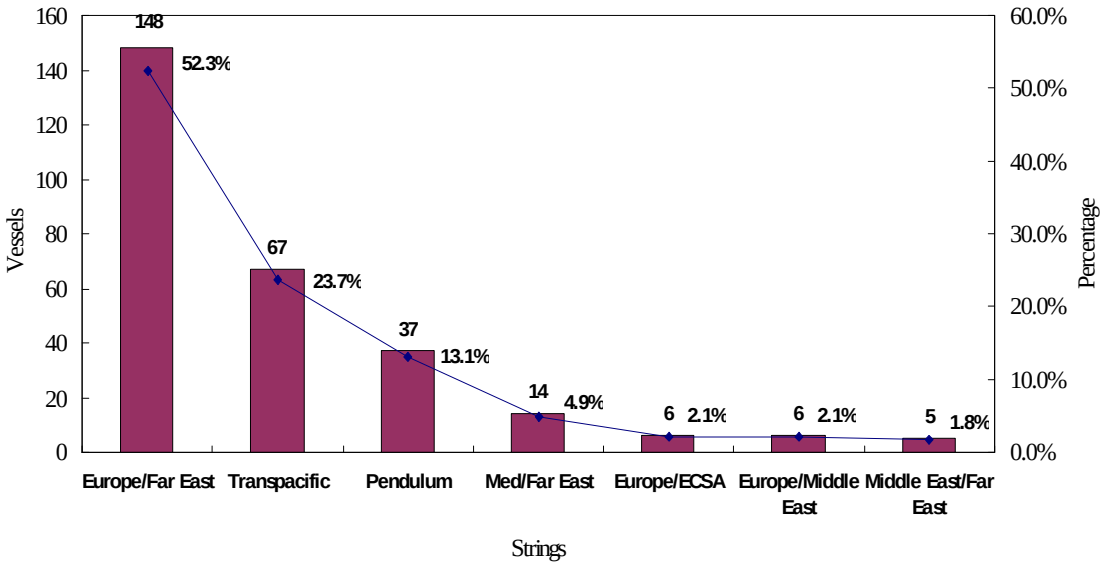

Figure 5. 2004 Post-Panamax containership deployment patten

Of the 84 post-Panamaxes afloat, or on order, 50 have been ordered in batches of five or six, a number suggesting use on 35-or 42-day transpacific round voyages, at least initially. It looks, however, as if 40% of the declared ships will, in the event, find employment on the Far East/Europe run. The operators intending to use them on the Pacific all operate multiple strings there: the big ships are likely to be employed on the most prolific routes. The opportunities for mixing and matching on Far East/Europe are less, because of the essentially linear nature of the route.

Intense competition and economies of vessel size lie behind recent increases in the size of container ships. Economies of vessel size arise from the technical characteristics of container shipping: the capital cost per container slot falls as vessel size increases, while the ratio of crew to carrying capacity and the consumption of fuel per unit of cargo carried also decline as vessel size increases.

5. The Service Routes

Currently, shipping lines operate three general types of deep-sea itineraries: end to end, pendulum and round the world service routes, which are shown in Figure 6. End to end services schedule vessels back and forth between two continents. Pendulum services schedule vessels back and forth between three continents with one of these continents as a fulcrum, with the points at either end of the pendulum swing linked only through the fulcrum. This

type of service offers a way to fill container slots four times on the same voyage and to eliminate certain overlapping port calls in the fulcrum area. The merging of separate end-to-end services into a pendulum or round the world service serves the two main purposes of broadening the range of through services and reducing the number of ships required to provide the same coverage. This gives a major cost saving by merging the previously duplicated port calls in the central region of the pendulum. Also round the world services can overcome the problems of end-to-end operations, by accommodating the needs of global corporations. The world's three principal trade corridors are tied together into one and this type of service can move in either direction, moving westward or eastward or in both directions.

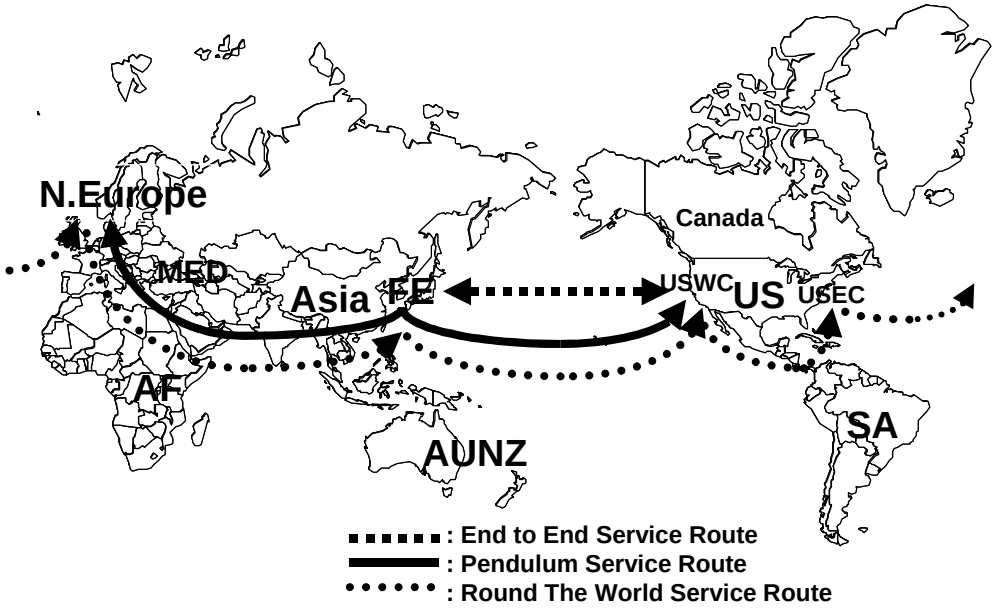

Figure 6. Three types of liner service routes

(Source: Ting and Tzeng, 2003)

Intense competition in container markets not only makes it necessary for ship owners to offer high quality services between major trading regions but also makes it imperative for them to optimize fleet utilization. Such pressures have led to the development of multi-route operating patterns, notably 'Round-the-World' and 'Pendulum' services, enabling carriers to maximize vessel employment and slot utilization.

North America-Europe-Asia, with vessels continually circling the globe in an eastbound or westbound direction. 'Pendulum' services, operated by a large number of carriers including

Hanjin and Yang Ming, typically operate over all or some portion of the route linking the East Coast of North America, via Europe and Asia to the West Coast of North America, returning via the same route. Since vessels employed on 'Pendulum' services, unlike those employed in RTW services, are not required to transit the Panama Canal, post-Panamax vessels may be used.

The number of multi-string services expanded greatly during the 1990s. Owners offering multi-string services broaden the scope for direct calls by operating a number of strings stand-alone services with dedicated vessels each of which offers different port calls and/or a different port rotation. There is a tendency for vessels employed in each string of a multi-string operation to call at common or 'core' ports Singapore, Hong Kong, Oakland and Long Beach in the case of the trans-Pacific trade as well as a range of 'non-core' ports. Non-core ports may be served by only one string of a multi-string service. Containers consigned to and from non-core ports are transhipped at core ports. Since a multi-string operation requires a rather large number of vessels a trans-Pacific string requires a minimum of five vessels owners typically co-operate to provide services.

There was a substantial re-engineering of multi-string services in 1998 and 1999 in response both to the volatility of trade flows during and after the Asian financial crisis and to the continuing growth in the volume of Chinese exports. In the trans-Pacific trade, the Grand Alliance added a seventh string, while Maersk/Sea-Land, Cosco and Evergreen also added strings. The introduction of new strings was encouraged by highly competitive time charter rates for container ships. The trend was sharply reversed in 2000-01. A weakening in demand for container shipping services led to the consolidation of multi-string services.

6. The container ports and ‘hub-and-spoke’ networks

Container lines have sought to minimize costs by limiting the number of port calls. In so doing they have re-emphasized the importance of regional hub ports, notably Singapore and Hong Kong. Cargo to and from the region served by a hub port is handled by feeder shipping and/or by land transport. In archipelagic South East Asia, an extensive network of regional feeder services has evolved. The emerging pattern of mainline and feeder services is analogous with the `hub-and-spoke' system.

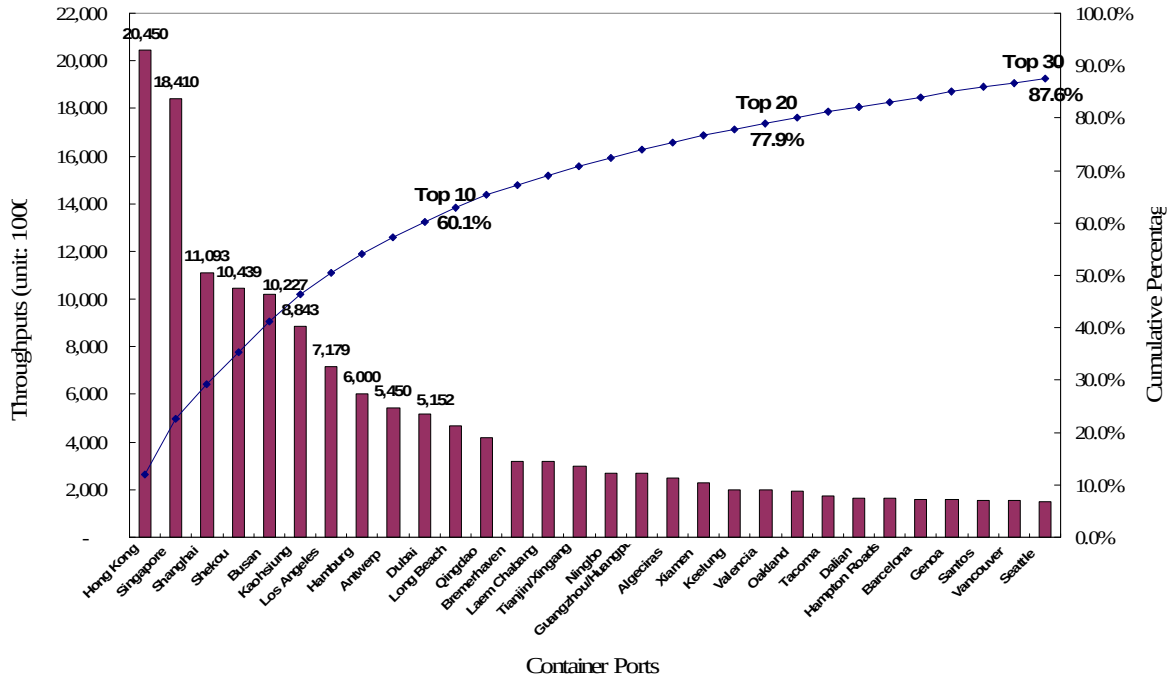

Figure 7. Top 30 container port throughputs

(Source: Compiled from Fossey et al., 2004)

The feeder networks based on major hub ports are expanding geographically. Thus, the feeder network operating from Singapore, developed to serve South East Asia (Malaysia, Indonesia, Thailand), has spread eastward to Vietnam and the Philippines, westward to the Indian sub-continent and the Gulf, as well as southward to Australasia. In some cases feeder links into major hubs have replaced direct services. For example, Hapag-Lloyd abandoned its direct Europe/Indonesia service in 1990, preferring to feeder cargo via Singapore into its Europe/Far East service. Economic forces appear to be favoring the emergence of ‘super-hubs’: the changing pattern of port calls by vessels in the Europe-Far East trade

suggesting that Singapore, Hong Kong and Tokyo are strengthening their competitive position vis-a-vis other hubs in East Asia.

Frequent changes in the pattern of mainline and feeder services suggest that the system is still evolving; that the economic forces driving change have not as yet been fully accommodated. Rapidly changing trade patterns, especially in East and South East Asia, add to this instability. Hence we would expect to see further modifications to the pattern of mainline and feeder services, as well as changes in the absolute and relative status of regional ports, over the next decade.

A likely long-term future scenario implies the use of container ships with 8,000-15,000 TEU capacity on the major east-west routes, calling at just four or five mega hubs, i.e. only one or two on each continent. These mega hubs will be almost entirely based on transshipped cargo, implying various levels of regional and sub-regional transshipment centers. Containers are increasingly transshipped, and hub ports that provide transshipment services have experienced particularly high growth rates.

7. The mega trends

Arguably, such intense competition stems from:

- The cost characteristics of container shipping, especially the high level of fixed costs;
- The continuing imbalance between the supply of and demand for container shipping, stemming from a high level of entry and widespread and continuing subsidization of both shipping and shipbuilding;
- The ease and efficiency with which containers can be transhipped, enabling shippers to route containers via a number of paths through a dense transport network.

The intense competition felt in all major Northern Hemisphere container shipping trades in the 1990s and 2000s forced shipping companies to adopt innovative, productivity enhancing and cost-cutting strategies. These include:

- Employing larger vessels on routes where cargo volumes permit, especially in mainline East-West Northern Hemisphere trades;
- Developing new service patterns, including ‘Round the World’, ‘Pendulum’, and

'multi-string' services;

- Reducing the number of port calls, leading to the growth of regional 'hub' ports;
- Developing a network of feeder services linking hub and regional ports in South East Asia.

Vessel sizes, mergers, and transshipment are closely interrelated. As the maximum ship sizes go up, so does the economic incentive to transship containers from and to smaller vessels. More transshipment leads to global mainline and feeder networks. Global networks and bigger ships together require a high initial capital expenditure, which only very large commercial units can afford. Larger ships and more transshipment oblige ports to incur high investments in dredging, information technology, and gantry cranes. Simultaneously, as port productivity increases, the time ships have to spend in port decreases, which in turn encourages more transshipment and the use of even larger ships.

The mega trend for liner shipping industries is characterized as follows:

(1) More large containerships to be deployed to main trade routes

Technological developments in ship design and construction, and the ensuing economies of scale of larger ships, have also promoted trade, particularly that of developing nations, by making economical the transportation of goods over long distances. Carriers have been conducting the incessant drive to cut costs through the deployment of larger ships. Nowadays, containers are increasingly carried by specialized cellular container ships many of which are able to carry more than 5,000 TEUs, while designs for 8,000, 10,000, or even 15,000 TEU ships are already on the drawing boards of naval architects. These so-called post-Panamax ships have been deployed to east-west main trade routes, and many of similar type ships are under construction and delivered in a couple of years.

(2) Trade imbalance and surging repositioning costs

One of the major cost items in liner shipping has to do with containers. The container flow across the world does not coincide with the routing of container ships, because containers do not spend all their time onboard ships. They need to be picked up and delivered at inland locations, maintained, and repaired, or may be repositioned. On main west-east trade routes, more cargo moves in one direction compared to the other. Such a route is known as an unbalanced route, or a route with trade imbalance. This is the case, for instance, of the Far

East – Europe and Asia – U.S. west coast, two of the three main liner routes where most of the full containers travel westbound and eastbound respectively.

(3) High fixed costs and freight variable costs

To keep pre-advertised time schedules, ships of one fleet must leave ports of call regardless of whether they are full or not. Voyage costs thus become fixed (i.e. independent from the amount of cargo loaded). Next, imagine the admittedly simplified case where, minutes before the ship sets sail, an unexpected customer arrives at the port with one container to the ship. If the vessel has unfilled capacity, which is often the case in liner shipping, its operator would be tempted to take on the extra container even at a price as low as merely the extra (marginal) cargo-handling costs involved in taking the container onboard. If this were to become common practice among operators, competition among them would push prices down to the level of short-run marginal costs and consequently the liner service would not be sustainable in the long-run, as operators would not be able to cover full costs (most importantly capital costs such as depreciation allowances for the eventual replacement of the ships).

(4) Undifferentiated services

Apparently, containerization makes it increasingly difficult to justify price segmentation on the basis of the alleged need for different treatment of goods according to their particular characteristics (e.g. volume, stowage, cargo-handling). Major service quality variables are considered to be similar: the provision of information and EDI systems; logistics services; better coordination and integration with inland transport companies; ownership of terminals and equipment; frequency of service; geographical coverage; and efficient response to the requirements of customers.

(5) Price wars and destructive competition

The industry with over capacity and lower price elasticity of demand is highly competitive with freight rates fluctuating wildly even in the course of a single week. A pessimistic concept in explaining the structure of liner shipping markets is that of destructive competition (Davies, 1990). This process, whereby competition will eventually lead to the destruction of the liner service itself, provides the basis for some new perspectives on the market structure of liner shipping.

(6) Streamlining terminal operations

Port industry has invested a lot in order to cope with the technological requirements of containerization. Modern container terminals equipped more efficient quay cranes have been built, and more efficient organizational forms including privatization have been adopted in an effort to speed up port operations. Operational practices have been streamlined, the element of uncertainty in cargo flows largely removed, forward planning has been facilitated, port labor regularized and customs procedures simplified. These developments took place under the firm understanding of governments and local authorities that ports now constitute the most important link and node in the overall door-to-door transport chain.

(7) Hub-and-spoke operations

Capital intensity and large ships in this industry obliges container ships to limit their ports of call at each end to some of hub ports such as Singapore, Hong Kong, and Rotterdam, from where a great deal of containers are further transshipped with feeders to regional and local ports. A complex hub-and-spoke networks have thus developed, thus fine-tuning and optimization of service network and schedules have been demanding by carriers.

(8) Strategic alliances

Regularity and frequency of service, the two imperatives of liner shipping, combined with deploying very large container ships, can easily lead to low capacity utilization for independent carriers. Therefore, strategic alliances have formed in order to extend economies of scale, scope and network, through strategies such as the integrating of individual service networks, vessel sharing (i.e. joint fleet), slot-chartering, joint ownership and/or utilization of equipment and terminals and similar endeavors on better harmonization of operations. Alliances are also coalitions of carriers, but contrary to the route-based character and price-setting objectives of conferences, alliances aimed at rationalizing operations, rather than involving in price-setting strategies.