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An Analysis of Liner Shipping Network Efficiency through the Network of Contracts and Operational Processes

by

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ABSTRACT

Seaborne shipping is the backbone of global trade, transporting about 90% of the world's global trade. Container shipping has also come to assume great importance in fuelling global trade. In 2019, 18% (2 billion of the total 11.08 billion tons) of the maritime trade volumes was attributable to container shipping (United Nations Conference on Trade and Development (UNCTAD), 2020). Yet, the role of container shipping was barely evident to an average consumer. This soon changed with the COVID-19 pandemic and Suez Canal blockage, and the supply chain disruptions they catalysed in 2020 and 2021. The industry which, formerly was described as 'invisible', assumed global limelight status. Accordingly, it became not only interesting but also instructive to analyse the efficiency of the liner shipping network.

The research question asked is 'Is the liner network efficient?' This question was analysed through an operational as well as contractual perspective. Thus, the sub questions explored are 1. How can the liner shipping be viewed as a system? 2. How can contracts in liner shipping be viewed as a network? 3. What are the measures of (operational) efficiency of the liner shipping system? 4. How can the network of contracts be accessed on these efficiency metrics? 5. How can the operational performance of liner shipping be assessed based on these efficiency measures? In order to answer these questions, a triangulation methodology, consisting of expert interviews (of liner shipping experts and shippers), independent analysis and secondary sources was deployed.

Efficiency metrics explored were service reliability, vessel capacity availability and the freight. It was found that the liner network as it stands today is very inefficient. Outside of disruptions created by the COVID-19 pandemic, including poor hinterland connectivity, port congestions, etc, several practices by liner networks such as setting and negotiation of unrealistic transit times/schedules, blank sailings, poor contractual reliability, inefficient acquisition of bigger vessels, arbitrary surcharges mean that the network is inefficient. This is also exacerbated by the fact that there are poor international legal frameworks which support these positions taken by liner companies. Liner shipping companies are important to global trade, so are shippers. Accordingly, the recommendations shared in Chapter 6 and 7 below such including international legal framework updates, better understanding of the role and importance of shipping in the supply chain by shipping companies will ensure that both parties are adequately protected, and the continuity of global trade guaranteed.

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LIST OF ABBREVIATIONS

BER	Block Exemption Regulation
BBC	British Broadcasting Corporation
COVID-19	Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)
CNN	Cable News Network
CPS	Container Protection Surcharge
EU	European Union
EC	European Commission
EIS	Emergency Imbalance Surcharge
FMC	Federal Maritime Commission
LWS	Low Water Surcharge
GCSN	Global Cargo Shipping Network
Hague Rules	International Convention for the Unification of Certain Rules of Law relating to Bills of Lading, 1924
Hague- Visby Rules	Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading, 1968
Hamburg Rules	United Nations Convention on the Carriage of Goods by Sea 1978 (the Hamburg Rules)
Incoterms	International Commercial Terms
Maersk	AP Moller-Maersk
MFAT	Ministry of Foreign and Trade Affairs
MSC	Mediterranean Shipping Company
PSS	Peak Service Surcharge

Rotterdam Rules	United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea 2009 (the Rotterdam Rules)
SCA	Slot Charter Agreement
TEU	Twenty-foot Equivalent Unit
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollar
VGM fee	Verified Gross Measurement
VSA	Vessel Sharing Agreements

CHAPTER 1: INTRODUCTION

1.1 Background

In 2015, the British Broadcasting Corporation (BBC), in an article, described the container shipping industry as 'the invisible network that keeps the world running' (BBC, 2015a). However, the COVID-19 pandemic and more specifically, the Suez Canal blockage incident changed this narrative of the shipping industry as 'invisible' less than a decade after.

By March 2020, most of the countries of the world had gone into lockdown following the global break out of the COVID-19 pandemic. The pandemic, although a health/medical phenomenon had monumental impact on global trade and global supply chains. The lockdown brought to fore issues in the maritime industry such as centralised supply chain systems, causing supply chain disruptions as companies around struggled to source goods, deal with increased demand for medical supplies, and increased demand for personal consumption goods such as home improvement products. Most of these goods are transported via containerships and thus brought the role of the containerships to the fore. The lockdown caused by the pandemic also meant that many countries restricted access to their ports, further exacerbating supply chain bottlenecks. The effect of this was certainly to put the maritime industry and the central role it plays in global trade in the forefront of most media. There was an increased consciousness of the global population on how their goods get to them and why there were shortages in some instances.

Yet, the COVID-19 pandemic in all its exposure arguably failed to match the exposure which the Suez Canal blockage of March 2021 had on the container shipping industry. For 9 days straight, the world watched as salvage efforts of the Egyptian Government and Dutch company (Boskali) attempted to free the 20, 388 TEU Ever Green vessel (Ever Given) from the Suez Canal. The Suez Canal is critical trade route for East-West trade. It is one of the most important and busiest trade arteries of the world, thus representing a strategic nexus for trade for countries across the world (New Zealand Ministry for Foreign and Trade Affairs (MFAT), 2021). Approximately 12% of global trade passes through the Suez Canal (representing 30% of all global container traffic, and over USD $1 trillion worth of goods per annum. of world trade per day) (NewZealand MFAT). Thus, this blockage which amounted to monumental impacts for the global supply chain and global trade, also caught the attention of the world - arguably much more than any other maritime incident in recent times. Several commentaries from

industry practitioners, trade experts and the rest of the world - with social media memes engagements, were generated. (The Washington Post, 2021b) Even children got the opportunity to engage with this incident with news media videos seeking their comments on how to unblock the Suez Canal (CNN, 2021).

This level of exposure is truly unprecedented in the maritime/shipping industry. It is therefore not an exaggeration to say that the impact of the COVID-19 pandemic and the Suez Canal blockage is to bring the importance of the maritime industry; especially container shipping to the consciousness of the global population more than ever witnessed. This is no mean feat for an industry which, less than half a decade prior, was described as 'invisible'. The Washington Post described the impact of the Suez Canal blockage as 'making plain and impossible to ignore, the extent to which global trade, and invariably the world, relies on container shipping network' (The Washington Post, 2021a). Therefore, now more than ever, the role and importance of shipping and trade routes were seen through these two incidents.

Seaborne shipping is considered to be the most important mode of transport in international trade, (Mulder, 2016) – it is the 'backbone of global trade and the global economy'(United Nations Press Releases, 2016). Compared to other means of transportation, ships are preferred for moving large amounts of cargo over long distances, because it is more cost efficient and environmentally friendly (Rodrigue et al, 2013). Ships transport about 11 billion tons of goods – representing 1.5 tons per person based on the current global population (International Chamber of Shipping, n.d). In 2019, maritime trade volumes reached a total of 11.08 billion tons, of which containerised trade was responsible for 2 billion tones (18%) (United Nations Conference on Trade and Development (UNCTAD), 2020).

Given the global demand boom, even beyond pre-pandemic levels– especially for commodity and COVID-19 related products (UNCTAD Global Trade Update, 2021), the influence of containerised trade is sure to be continued in 2021, and beyond. The Suez Canal incident also again brought container shipping, routing decisions, etc to the forefront of academic discuss and even general media. Accordingly, it becomes important to analyse certain elements of the mechanism of the container shipping industry, specifically, the liner shipping industry in order to access whether it remains efficient and effective for its purposes. It is against this backdrop that this topic was chosen and the problem definition, research questions and methodology below were decided.

1.2 Problem Definition

Liner shipping can be described as a system and there is a lot of literature analysing it as such (Caschili and Medda, 2012). In this system, there are a large number of independent rational agents, such as port authorities, shipping service providers, shipping companies, and commodity producers, whose mutual interactions create obscure but recognizable patterns (ibid). These mutual interactions among these large numbers of independent rational agents determine the growth, and thus the success, of this industrial sector. Furthermore, the interaction of these players with one another creates networks over time, i.e. recursive interactions create a *multiplier effect* (interactions between nodes generate outcomes that flow from node to node, creating a chain of changes) and a *recycling effect* (in networks cycles improve local performance and create striking global outcomes) (Ibid).

Liner shipping is usually developed through the lens of these networks, usually as sub-networks. Examples include addressing network effects of container shipping based on routes (Fraser and Nottebom, 2014, Tran and Hassis, 2014) or infrastructure (Msakni et al, 2020) or concepts (such as analysing liner shipping as a network with regard to strategic decisions made as to routes, fleet mix, planning etc (Karsten, 2015, Mulder 2016). However, there is a much broader scheme in which the container shipping is also a network- this is called the Global Cargo Shipping Network (GCSN)- in this, the container shipping industry is viewed as a whole to characterize the global movements of cargo.

Based on the description above, the importance of analysing the liner shipping from a network perspective is called into question. The objective of the liner shipping network planning in the liner industry is managing the network efficiently (Guericke, 2014). Networks depict patterns, patterns suggest predictability/reliability, and this is a hallmark of liner shipping. In carrying out network analysis and optimisation as to route for example, shipping companies attempt to manage their operations efficiently, offering certainty and predictability in services to their customers while keeping costs minimal. The importance of the ability to move goods predictably has been greatly emphasised in the recent years with COVID-19 pandemic and Suez Canal incidents.

However, in the wake of the Suez Canal incident, one thing which was evident is how much speculation and misunderstanding there is regarding the legal aspect of shipping, especially amongst the shippers. Furthermore, the impact of the port disruptions following COVID-19 and the Suez Canal incident, indicate that this predictability might not exist. It indicates that in carrying out its network optimisations, players within the industry might not see themselves as belonging to a global network, which impacts the ability for this global network to provide the stability for which network analysis is often developed.

Contracts and operations are intrinsically linked. It goes without saying that what is agreed in contracts affects, and in fact determines how operations are planned and carried out. Accordingly, we believe that an exploration of these two elements is necessary individually and collectively – hence the purpose of this thesis.

This thesis presents an advantage over other research in this area for two reasons. Firstly, to the best of my knowledge, there is yet to be an analysis of liner shipping as a network of contracts. Caschili et al (2014) analyse the shipping agreements network from the point of view of the strategic alliances between major shipping companies. However, this is limited. Therefore, this will be an important work in analysing the container shipping industry point from a contract of networks perspective. Secondly, although there is a lot of quantitative research into the container shipping industry as a network of routes, there is little qualitative research; there is limited research exploring, in reality, how operational planning takes place and whether agents within this industry operate as though in a network. This work will bridge that important gap in the liner network body of knowledge.

1.3 Research Question and Sub Research Questions

Hence, the research question which this thesis aims to answer is as follows:

Is the liner shipping system efficient?

This question is addressed specifically with regards to contracts within the system (specifically, bills of lading) and the operational processes as explained above.

In order to answer this question, we will answer the following sub-research questions:

1. *How can the liner shipping be viewed as a system?*
2. *How can contracts in liner shipping be viewed as a network?*
3. *What are the measures of (operational) efficiency of the liner shipping system?*
4. *How can the network of contracts be accessed on these efficiency metrics?*

5. *How can the operational performance of liner shipping be assessed based on these efficiency measures?*

1.4 Research Design and Methodology

To answer the question '*Is the liner shipping system efficient?'* This thesis will follow a triangulation methodology with a combination of expert interviews, independent analysis and secondary sources will be relied on. The methodology will also be qualitative.

With regard to the contract element, an independent legal analysis will be performed on certain liner shipping agreements, as well as some framework international shipping laws, in order to ascertain how they contribute to the efficiency of the liner shipping system. Sample liner shipping agreements are obtained from liner shipping companies and/or their agents in order to carry out this analysis. Furthermore, expert opinions of liner shipping legal experts and shippers are also sought in order to collaborate or refute the independent analysis done.

With regard to the operational question, publicly available data from secondary sources as well as expert opinions of liner shipping experts are sought to explore whether the liner shipping system is efficient.

In seeking the expert opinions in both questions, questionnaires are drawn up and shared with each of these panellists for their thoughts and responses during expert interviewees. Thereafter, the responses received are analysed and used to expound on independent analysis carried out.

1.5 Thesis Structure

This thesis is divided into 7 chapters.

Chapter 1; Introduction (above) gives a background of the topic, the motivation for the topic, the problem to be assessed and introduces the methodology to address the problem.

Chapter 2 commences the literature review. In this chapter, liner shipping as a system is addressed. The chapter will explore the definition of systems, and how liner shipping fits within this definition. It will also show that systems are often analysed as networks and thus the network of liner shipping liner shipping will be defined and elements of the network will be assessed. The GCSN will also be explored and the important role of ports in this network will be analysed.

Chapter 3 is a continuation of the literature review where the network of contracts in liner shipping will be reviewed.

Chapter 4 introduces the three metrics by which efficiency is addressed; service reliability, vessel capacity availability and cost (freight), through which liner shipping efficiency will be investigated and analysed.

Chapter 5 presents the methodology. A triangulation methodology is used, combining expert interviews, independent analysis, and secondary sources in analysing the efficiency of the liner shipping network. Chapter 6 presents the results of the expert interviews conducted, collaborating same with independent analysis and secondary sources.

Chapter 7 concludes the thesis by answering, in summary, the sub-research questions and the research question. Recommendations, limitations to the research and suggestions on further areas of research are also shared in this chapter.

CHAPTER 2: LINER SHIPPING AS A SYSTEM

2.1 Introduction to Systems

The Oxford dictionary defines a system as a ‘a set of things working together as parts of a mechanism or an interconnecting network’. Johnson et al (2017) give a more expansive definition of systems as ‘(1) an assembly of components, connected together in an organised way; (2) the components are affected by being in the system and the behaviour of the systems is changed if they leave it; (3) the organised assembly of components does something; and (4) the assembly has been identified as being of particular interest.’ The most important element of a system is that the collection of parts is highly integrated to accomplish an overall goal (McNamara, 2006). Systems have various inputs, which go through certain processes to produce certain outputs, which together, accomplish the overall desired goal for the system (McNamara, 2006). Systems are made up of many smaller systems or subsystems, and where one part of the system is changed, the overall system makes necessary realignment to effectively achieve its goods (McNamara, 2006). Systems range from simple or complex, and systems have applications in various parts of human society, including art, biology, ecology and social. Transportation systems are generally analysed as complex systems, i.e. systems made up of several subsystems with non-linear interactions and several feedback cycles (Cascetta, 2001).

Most literature agree that the three major components of systems are input, process, and output (McNamara, 2006; Pham, 2016; Cascetta, 2001). Some literature also includes control and feedback as components of a system (Johnson et al, 2017; McNamara, 2006). Input refers any processes in the system to achieve the overall goal of the system, while processes, are series of activities conducted by the organization, product or service that manipulate the various inputs to achieve the overall desired goal of the system (McNamara, 2001) Outputs are the tangible results produced by the organization, product, or service after combining input with processes (Pham, 2016, McNamara, 2001). Feedback, from various stakeholders, is continuously exchanged among the various parts of the system in order to self-correct (Johnson et al, 2017; McNamara, 2001). These components of systems are operative in all types of systems, including transportation systems.

Cascetta (2001) defines transportation systems as the combination of elements and their interactions, which produce the demand for travel within a given area and the supply of

transportation services to satisfy this demand (Cascetta, 2001). The major components of transportation systems; nodes, networks, flows, infrastructure, and demand (Rodrigue, 2020, Atienza, 2016). These also when analysed point to the components of systems as explained above.

Nodes represent points of origin, ending, and transit, entry or exit points in a transport system (Rodrigue, 2020). Nodes are part of the network. Networks are a composed of a set of linkages which connect places and provide the capacity to handle passenger or cargo volumes. The amount of traffic which flows over a network is referred to as flows. Flows are a function of the demand and the capacity of the linkages to support them. Demand in transportation is derived. Derived demand is an economic term, which refers to demand for one good or service in one sector occurring as a result of demand from another (Charles, 2010). Thus, in transportation, demand occurs due to demand for the mobility of people, freight, and information (Rodrigue, 2020). Finally, infrastructure are conveyances which express the physical reality of a network and are designed to handle demand with specific volume and frequency characteristics (Rodrigue, 2020). Examples of infrastructure include ships, terminals, the sea, etc.

Nodes as shown above can form parts of the input processes, nodes mainly consist of terminals, ports, stations etc, without which there can be no transport. Processes include networks and network decisions made by the transport companies while output represents the service offered to the customers, in the case of liner shipping; a scheduled shipping service, as will be shown below. Feedback, as discussed above, is continuously happening amongst various stakeholders, e.g. in liner shipping a system where the shipping line notifies the port of an updated schedule or a cancelled sailing is a feedback process that modifies and updates the system, in order to achieve the intended goal of harmonious operations amongst different systems.

Having explored that transportation can be viewed as a system, the following chapter explores a form of transportation, liner shipping as a network. Systems are often represented as networks (Johnson et al, 2017; Turnbull et al, 2018). Thus, in discussing the liner shipping network, we are looking at the system of liner shipping.

2.2 Introduction to Liner Shipping

The shipping industry is usually described as operating in three different modes: industrial, tramp and liner (Lawrence 1972, Christiansen et al. (2004)). In industrial shipping, the cargo owner or shipper also controls the vessel – thus industrial operators aim to ship all their cargo at minimal cost (Fagerholt, 2004). The tramp operator owns or charters a fleet and serves available cargo with a basic contracted sum and tries to maximize profits by working on the spot market (Christiansen et al, 2004). Liner operators work according to a published regular schedule, independent of the utilization of the vessels (Christiansen et al. (2004), Schieck (2008)).

Tramp shipping is often equated to a taxi service while liner shipping to a public bus service (Hoffman, 2012). A taxi picks up services as they are requested/available i.e., spot market, the public bus service has a predetermined route and a predetermined time schedule which the public must follow to move from point A to B.

Stopford more extensively defines liner shipping as
'a fleet of ships, with a common ownership or management, which provide a fixed service, at regular intervals, between named ports, and offer transport to any goods in the catchment area served by those ports and ready for transit by their sailing dates. A fixed itinerary, inclusion in a regular service, and the obligation to accept cargo from all comers and to sail, whether filled or not, on the date fixed by a published schedule are what distinguish the liner from the tramp.'
(Stopford, 2009, p. 512)

Stopford's definition highlights certain characteristics of liner shipping, i.e., a liner service consists of a served port sequence (port rotation) that performs a round trip, a (single) deployed vessel type and a number of vessels (Guericke, 2014). Furthermore, to offer a liner service on a certain trade route weekly, a minimum number of vessels is required, subject to the vessel type's minimum and maximum speed (Guericke, 2014; Mulder and Dekker, 2016, Baatz et al; 2020). The connection between two ports is called a leg (Stergiopoulos et al, 2018) and an ordered set of ports at which a container vessel calls is called a string (Gelareh et al, 2013).

The benefits of this operation method of liner shipping networks are regular transportation opportunities, reliable sailing schedules and predictable transit times (Brooks, 2000). The

certainty brought by the fixed itineraries of liner shipping also enable carriers and their customers negotiate contracts for a longer duration of time (usually a year or more).

2.3 Liner Shipping Today

According to Blue Water Reporting (n.d.), there are currently at least 248 trade routes, 298 ocean carriers, 2607 ocean carrier liner services, 13372 vessels and 11537 ports. Of these 298 shipping carriers, there are 3 major carriers which dominate the industry (AP Moller Maersk (Maersk), Mediterranean Shipping Company (MSC), and CMA CGM) (Alphaliner.com, 2021). It is generally considered that there are three main trade lanes which make up a significant share of the traffic carried (Brooks, 2000). The Trans - Pacific is considered the largest, followed by the Europe/Asia trade and, finally, the Trans- Atlantic. The rest of the traffic is widely disbursed around the other trade routes, thus accounting for the existence of hundreds of carriers in the market (Brooks).

The liner shipping industry is characterised by 5 major factors: high fixed costs, low variable costs, perishable services, freight instability and strong competition amongst carriers (Stopford, 2009; Satta et al., 2013, Caschili et al., 2014; EC Commission BER Document, 2019). Liner shipping is asset- heavy and capital-intensive, with very high fixed costs for operations i.e., running, maintenance, insurance, crewing of the vessels (EC Commission Block Exemption Regulation (BER) Document, 2019). There is also low variable cost, i.e., each additional container transported represents a very low additional cost for the operation of a vessel. Thirdly, liner services are perishable, liner ships sail regardless of whether capacity is empty or full, and unused capacity cannot be used or sold on another voyage (EC Commission BER Document, 2019). Fourthly, freights in the liner industry are largely unstable, the industry is so closely linked to international trade such that change in global consumer behaviour (often caused by global crises such as financial crises, pandemics etc) invariably affect freight (Notteboom, 2021). Finally, factors such as excess capacity (supply of vessels) in a very competitive market means freight rates were often volatile.

In order to deal with some of these characteristics of liner shipping, there were, initially, several mergers and acquisitions resulting in a highly concentrated market with a few carriers dominating trade (Stopford, 2009). Between 2004 and 2018, the number of companies providing services per country declined by 38 per cent on average (UNCTAD, 2018a).

Examples of such mergers include merger of Sea Land (number 1 carrier as at 1980), Maersk Line (number 4 in 1980) and Safmarine (number 19 as of 1980) by 2001. The surviving Maersk company has gone ahead to acquire Hamburg Sud (number 20 as of 2001). The other company which grew rapidly was CMA-CGM, which again built up capacity to around 5% by acquiring Delmas by 2005.

Table 2.1 below shows the Top 20 operators as presented by Stopford as of 1980, 2001 and 2005 respectively. The table not only shows the consolidations noted above, but they also show the growing dominance of certain companies.

1980 Container Fleet				**2001 Container Fleet**				**2005 Container Fleet**			
Company	No	'000 TEU	%	Company	No	'000 TEU	%	Company	No	'000 TEU	%
Sea-Land	63	70	9.6	Maersk-SL + Safmarine	297	694	9.4	Maersk	586	1,665	16.4
Hapag Lloyd	28	41	5.6	P &O NedLloyd	138	344	4.6	MSC	276	784	7.7
CCL	16	31	4.3	Evergreen Group	129	325	4.4	CMA-CGM	242	508	5
Maersk Line	20	26	3.5	Hanjin/Senator	82	258	3.5	Evergreen	155	478	4.7
M Line	17	24	3.3	Mediterranean Shng Co	138	247	3.3	Hapag-Lloyd	131	412	4.4
Evergreen	22	24	3.2	APL	81	224	3	China Shipping	123	346	3.4
OOCL	17	23	3.1	COSCO	113	206	2.8	NOL/APL	104	331	3.3
Zim Container Line		21	2.9	CP Ships Group	80	148	2	Hanjin	84	329	3.2
US Line	20	21	2.9	CP Ships Group	80	148	2.0	COSCO	126	322	3.2
American President	15	20	2.8	CMA-CGM Group	81	142	1.9	NYX	118	302	3
Mitsui OSK	16	20	2.7	Mitsui-OSK Lines	65	139	1.9	Mitsui OSK	80	241	2.4
Farrel Lines	13	16	2.3	K Line	62	136	1.8	OOCL	65	234	2.3
Neptune Orient Lines	11	15	2	Zim	75	132	1.8	Sudamericana	86	234	2.3
Trans Freight Line	17	14	1.9	OOCL	48	129	1.7	K Line	75	228	2.2
CGM	9	13	1.7	Hapag Lloyd Group	32	116	1.6	Zim	85	201	2
Yang Ming	9	13	1.7	Yang Ming Line	45	113	1.5	Yang Ming	69	188	1.9
Nedlloyd	5	12	1.6	China Shipping	92	110	1.5	Hamburg-Sud	87	184	1.8
Columbas Line	13	11	1.5	Hyundai	32	106	1.4	HMM	39	148	1.5
Safflarine	5	11	1.5	CSAV Group	54	97	1.3	PIL	101	134	1.3
Ben Line	5	10	1.4	Hmaburg- Sud Group	45	80	1	Wan Hai	68	114	1.1
Top 20	**348**	**437**	**60%**	**Top 20**	**1775**	**3917**	**53%**	**Top 20**	**2700**	**7387**	**73%**
All Other Operators	**497**	**290**	**40%**	**All Other Operators**	**1135**	**3415**	**47%**	**All Other Operators**	**938**	**2777**	**27%**
World Fleet	**845**	**726**	**100%**	**World Fleet**	**2910**	**7392**	**100%**	**World Fleet**	**3638**	**10164**	**100**

Table 2.1: Twenty largest container fleet operators 1980, 2001, 2005 (year end)
Source: Martin Stopford (2009)

This dominance continued such that as of 2014, the top 15 liner companies control about 79.3% of the worldwide capacity in TEU. In 2016, the shipping line CMA CGM acquired American

President Lines, China Shipping Container Lines merged with China Ocean Shipping Company and Hanjin filed for bankruptcy (UNCTAD, 2018a). In 2017, acquisitions concluded include Hapag Lloyd and United Arab Shipping Company merger, the Maersk–Hamburg Süd sale and purchase agreement, as well as Nippon Yusen Kabushiki Kaisha, Mitsui Osaka Shosen Kaisha Lines and Kawasaki Kisen Kaisha the joint venture (UNCTAD, 2018a).

As at July 2021, the top 15 liner companies control 85% of the worldwide capacity in TEU (Statistica, 2021). The top seven, including Hapag-Lloyd, ONE and Evergreen, control 78% (Miller, 2021). Four groups — Maersk, MSC, CMA CGM and COSCO — control more than half of capacity (58%) (ibid). Table 2.2 below shows the list of the top liner companies, their total capacity in TEU and the market share which they hold.

Liner Company	**Total Capacity in TEU**	**% of Total**
Maersk	4.133.943	17
MSC	4.017.640	16,5
CMA CGM	3.012.168	12,4
Cosco	3.010.462	12,3
Hapag Lloyd	1.783.928	7,3
ONE	1.577.348	6,5
Evergreen	1.353.167	5,5
HMM	812.362	3,3
Yang Ming	628.477	2,6
Zim	409.023	1,7
Others	3.625.608	14,9
	24.364.126	**100**

Table 2.2: Top Liner Shipping Companies
Source: Freightwaves (July 2021)

Beyond the M&As, depressed market conditions and poor financial returns that persisted since the 2008 financial crisis also led to further market consolidation through the alliances (UNCTAD, 2018a). Prior to the pandemic, the industry struggled with a chronic supply and demand imbalance that undermined profitability, reduced freight rates and compressed earnings (UNCTAD, 2018a). Furthermore, weaker global trade and decreased demand for ships coincided with an overcapacity in ship supply, caused by the arrival of very large container ships that had been ordered years earlier (UNCTAD, 2018a). Accordingly, strategic alliances were formed to allow carriers realize economies of scale, extend their customer base and increase asset utilization while providing customers with more frequent sailings and faster transit times (Song and Panayides, 2002). It is important to note that cooperation amongst liner carriers is not novel (Agarwal and Ergun, 2008). As early as 1875, carriers used conferences,

as a means for curbing competition and controlling tariff rates in the market (Agarwal and Ergun, 2008).

These alliances are not static, they are constantly changing and morphing depending on activities within the industry. For example, the 2016 bankruptcy of the container line Hanjin (Republic of Korea) contributed to the trend towards consolidation (UNCTAD, 2018a). By the end of 2017, new global alliances were formed amongst the leading liner companies. Currently, there were three global alliances, down from four at the beginning of 2017. The table below presents these three global alliances and their capacity.

Alliance	Members	Capacity
2M	Maersk MSC	2.1 million TEU 185 Vessels 44 Routes served
Ocean Alliance	COSCO Shipping OOCL EverGreen CMA CGM	3.8 million TEU 330 vessels 38 routes served
The Alliance	Hapag Lloyd Yang Ming ONE	3.5 million TEU 249 vessels 31 routes served

Table 2.3: Liner Shipping Alliances
Source: Container-Xchange

These alliances participate in various forms of cooperation agreements, such as slot charter agreements, consortia (also called Vessel Sharing Agreements, or alliances). Slot charter agreement (SCA) is an arrangement where a shipping company books a certain number of container slots on a vessel of another shipping company in exchange for cash (normal slot charter) or slots on its own vessels (slot exchange) (Panayides and Wiedmer 2011, EUR Commission 2019). Vessel sharing agreements (VSA) usually several SCAs between the parties to the agreement (EUR Commission 2019). Consortia are similar to VSAs, except that they cover multiple trades rather than one trade, i.e., they are a matrix of vessel sharing agreements operating on the east-west trades (Asia-Europe; trans-Atlantic and trans-pacific) (EUR Commission 2019). As noted by Bergantino and Veenstra (2002), the different forms of co-operation allow operators, to varying degrees, to rationalise their services, while enlarging the scope of their activities, and to achieve cost savings.

Currently, liner carriers are facing a different kind of challenge from the previous years. The COVID-19 pandemic and the Suez Canal blockage have stretched thin the global supply chain- including liner companies, ports and warehouses. Record high demand, due to 'pent-up' demand, after the initial disruptions caused by the pandemic, place some pressure on present global capacity (supply) of liner shipping companies (Clarkson Container Trade and Capacity, 2021). Without lockdowns and governmental restrictions, the ability for consumers to spend on services, such as travel, live entertainment, etc, were limited. Income formerly spent on services were diverted to goods – such as home improvement goods, gaming equipment, home gyms, etc. Such goods are usually transported by container ships- specifically liner shipping companies, thus fuelling the demand for container shipping. This position was further fuelled by economic stimulus in countries like the United States, and supply side restrictions such as blank sailings and slow steaming. By the end of 2020, after the first wave of the pandemic, trade volume outweighed the supply (Clarkson Shipping Intelligence Network, 2021). This position of demand outweighing supply remains the case till today (Clarkson Shipping Intelligence Network, 2021).

Demand surge is exacerbated by port congestions, caused by the increased port calls amidst port efforts to avoid or deal with COVID-19 outbreaks. As at May, 2021, the time containerships spent waiting on anchor for berths more than doubled since 2019, with 116 ports around the world reporting disruptions (Chambers, 2021). Waiting times stretch to about three weeks in some ports (ports at Los Angeles and Long Beach) (Lewis, 2021). In Asia, port congestions are exacerbated by the closure of key terminals in Yantian Port and Ningbo – Zhoushan to deal with COVID infection of workers (Lewis, 2021, DSV, 2021). As at 13 August, about 85 box ships with a total capacity of 357,072 TEU were waiting at Zhoushan port while Ningbo had 55 vessels of 259,350 TEU (Lewis, 2021). Waiting times for vessels increased with some ships waiting for nearly 10 days (Lewis, 2021). Liner operators have diverted their vessels to other Chinese ports including Shanghai, where there are 61 ships waiting of 207,435 TEU (Lewis, 2021). As witnessed since the duration of the pandemic, each delay/closure causes a ripple effect on global trade lanes further exacerbating port congestion (DSV, 2021).

Misalignment in container placements is also a feature of the present challenges faced by liner shipping companies. It is estimated that only for every 10 containers shipped to North America from Asia, only four return (Cogoport, 2021). There are about 180 million containers

worldwide (Tan, 2021), however they are idling at ports in Africa, Europe, South America, Australia and New Zealand, while they are needed for loading and export in Asia (Cogoport, 2021). New container build orders (about 4.7m TEU expected in 2021) are estimated to be unable to put a dent in this problem given the continued port congestions being experienced (van Marle, 2021).

Due to these challenges, the freight prices are at record high levels. In fact, liner companies are experiencing some of the most profitable years since the 2008 financial crises. Container freight rates rose sharply in late 2020 and continued to post further spectacular gains throughout 1H 2021, against a backdrop of a 'perfect storm' of strongly rebounding trade volumes, severe logistical disruption and port congestion, alongside 'manageable' supply growth (Clarkson Research Container Intelligence Monthly, 2021). Using data from Clarkson Shipping Intelligence Network, the freight rate as of 13 August 2021 was compared with highest freight rates for similar periods in 2017 -2020 to show the surges in rates. This is presented in Table 2.4 below:

Routes	2021 Freight Rate $/FEU	2020 Freight Rate $/FEU	2019 Freight Rate $/FEU	2018 Freight Rate $/FEU	2017 Freight Rate $/FEU
Shanghai - East Cost America	$10,452	$4,207	$2,801	$3,485	$2,661
% change from 2021		↑148%	↑273%	↑199%	↑292%
Shanghai - West Cost America	$5,744	$3,639	$1,615	$2,298	$1,659
% change from 2021		↑57%	↑255%	↑150%	↑246%
Shanghai - Europe	$7,407	$1,029	$810	$959	$925
% change from 2021		↑619%	↑814%	↑672%	↑700%
Shanghai - Australia/ NewZealand	$3,717	$1098	$770	$756	$514
% change from 2021		↑238%	↑382%	↑391%	↑623%
Shanghai – South America	$9,820	$1,878`	$2,104	$1,830	$3,100
% change from 2021		↑422%	↑366%	↑436%	↑216%

Table 2.4: Freight Rates Comparison
Source: Clarksons Shipping Intelligence Network

Average freight rates for 2019 – 2021, showing year on year increase also provide evidence of these freight rate surges, although less dramatically than presented in Table 2.5 above.

Routes	2021 Average Freight Rate $/FEU	2020 Average Freight Rate $/FEU	2019 Average Freight Rate $/FEU
Shanghai – US East Coast *% change y- o-y*	$5,982 -6%	$3610 37%	$2634 113%
Shanghai – US West Coast *% change y- o-y*	$2745 80%	$1625 148%	$1525 -12%
Shanghai –(North) Europe *% change y- o-y*	$4669 -8%	$1204 58%	$760 450%
Shanghai – Australia/New Zealand *% change y- o-y*	$2163 -28%	$1339 125%	$596 135%
Shanghai – South America *% change y- o-y*	$8,060 -2%	$2426 45%	$1673 503%

Table 2.5: Average Freight Rates Comparison
Source: Clarksons Shipping Intelligence Network

The challenges which the liner shipping industry faces currently is very different from its position a few years ago. These challenges do raise questions about the mechanism of the network and its efficiency. Furthermore, if we understand that a network is a representation of a system, then it calls into question the self-adjusting and self-repairing capabilities, i.e., the feedback function of the system as explained in 2.1 above. In order to access the efficiency of the liner shipping industry, the following sub-chapters define the liner shipping network.

2.4 Liner Shipping Network

2.4.1 Planning Levels

All modes of transportation - rail, air, road, and sea are often analysed as networks. Network design is a topic which captures some of the most salient features of transportation planning (Magnanti and Wong, 1984). Networks are a type of mathematical model which are very frequently used in the study of transportation planning (Boyles et al, 2019). The objective of network planning is to optimise efficiency – i.e., optimize specific objectives (e.g., total travel time) through choosing among a given set of projects while keeping consumption of resources (e.g. budget) within their limits (Langerudi, 2014). Magnanti and Wong note that network

design is pervasive in the full hierarchy of decision-making situations that arise in transportation i.e., strategic, tactical, and operational levels of decision making.

At the highest, most aggregate level of decision making, network design choices greatly influence the effectiveness of strategic, long term transportation planning such as acquisitions and investments (Magnanti and Wong). Tactical intermediate network decisions are essential as well for the planning of effective use of acquired resources (Magnanti and Wong). Finally, network design decisions arise in certain operational short term planning problems (Magnanti and Wong).

Liner shipping networks follow the same principles as laid out above. The objective of liner shipping is also about effectiveness and efficiency (Guericke, 2014). Furthermore, the profitability of a service route and invariably the liner company is intrinsically tied to network decisions made (Agarwal and Egun, 2008). Schmidt and Wilhelm (2000) distinguish between the strategic, tactical, and operational planning horizon. Strategic decisions are made for a relatively long period, usually about two to five years. An example of strategic decisions as shown in Figure 2.1 below is the determination of the optimal number and mix of ships in a fleet. Given that the average lifespan of a vessel is about 10.7 years (UNCTAD, 2011), the huge capital investment of owning a ship (usually in millions of US dollars) and the cost of idling a 2,000TEU ship is $20,000-$25,000 per day (Agarwal and Ergun, 2008).

The tactical planning problems are determined by the strategic planning and have a shorter time horizon of 6 to 24 months (Schmidt and Wilhelm, 2000; Pasha et al, 2020). In the tactical planning stage, service networks are determined by creation of shipping routes, i.e., the sequence of port visits by a given fleet and the assignment of ships to these routes (Agarwal and Ergun, 2008). In these service networks, ships move in cycles from one port to another following the same port rotation for the entire planning horizon. This is important to maintain a customer base and provide these customers with a regular schedule (Agarwal and Ergun). Most carriers maintain at least one departure each week from each port visited on a service route (i.e., a cycle). This requires that the number of ships that operate on a cycle be at least equal to the number of weeks that it takes to complete the cycle. The problem of designing the service network of a carrier is referred to as the ship scheduling problem.

Operational planning problems are typically solved on a daily or weekly basis (Guericke, 2014). In the operational planning stage, carriers make decisions regarding which cargo to accept or reject and paths through which to ship the selected cargo (Agarwal and Ergun, 2008). This is referred to as the cargo routing problem. Agarwal and Ergun (2008) explore the intricacies of this decision. They note that a carrier may elect not to transport some cargo, either because it is unprofitable or alternative cargo, maybe at other ports, that is relatively more profitable. Decisions also must be made in cases of overbooking or a no-show of accepted cargo, on which containers to load, which cargo to book on later ships, where capacity is exceeded (Windec, 2013). Accepted cargo starts its trip from an inland location and arrives at its origin port (Agarwal and Ergun, 2008). Cargo then moves from its origin port to its destination port, possibly after visiting some intermediate ports (Agarwal and Ergun, 2008, Windec, 2013). From there it is taken to its final in-land destination using another feeder network (Agarwal and Ergun, 2008, Windec, 2013). Some of the intermediate ports that a cargo visits during its journey from the origin port to the destination port may act as transhipment ports where cargo is transferred from one ship to another (Agarwal and Ergun, 2008, Windec, 2013).

Another operational planning task is to prevent a ship from stability problems, by planning the container stowage accordingly (Windec, 2013). Examples of container stowage planning analysis can be found in Wilson and Roach (2000) and Kang and Kim (2002). The decisions made at each planning level affects the other planning level (Agarwal and Ergun, 2008), accordingly it is important that there is a coherence in these planning levels. Decisions made at the strategic level set the general policies and guidelines for the decision making at the tactical and operational levels (Agarwal and Ergun, 2008, Guericke, 2014). Similarly, the decisions at the tactical level set the capacity limitations and network structure for the operational planning level (Agarwal and Ergun, 2008). In the reverse direction, the information on cost and revenue that are generated by the system given the set parameters provides the much-needed feedback for decision making at a higher level (Agarwal and Ergun, 2008).

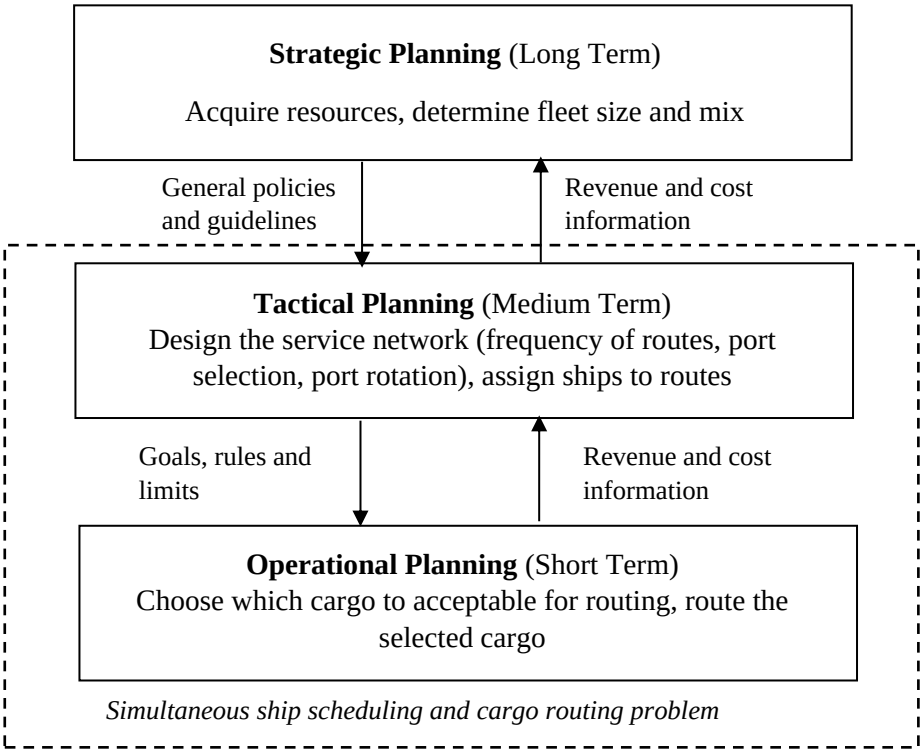


Figure 2.1: Planning Levels for Liner Shipping
Source: Agarwal and Ergun

2.4.2 Types of Routes and Network Structure

Routing is an important example of network design in the tactical decision planning level as noted above. In this level, decisions on ports at which to call and routes to get to those ports are decided. Liner services are generally classified as deep-sea, short-sea (also feeder) services and inland shipping (Stopford, 2009; Vigfúsdóttir, 2016). Deep sea shipping is the long haulage between continents, connecting major industrial areas such as Asia and Europe (Vigfúsdóttir, 2016). Deep-sea services serve Transatlantic, Transpacific and Asian trades. On the other hand, short sea shipping (feeder) services are usually connected to one or more hubs and pick up or deliver cargo within a smaller geographical region (Stopford, 2009; Vigfúsdóttir, 2016). Inland shipping is mainly covered by barges working on waterways, either intra-port between terminals or between inland ports (Vigfúsdóttir, 2016).

At the basic level, there are different types of port rotation; as shown in Figure 2.2 below. Sometimes networks could be a combination of two or more of these networks, depending on the strategic and tactical objectives to be achieved.

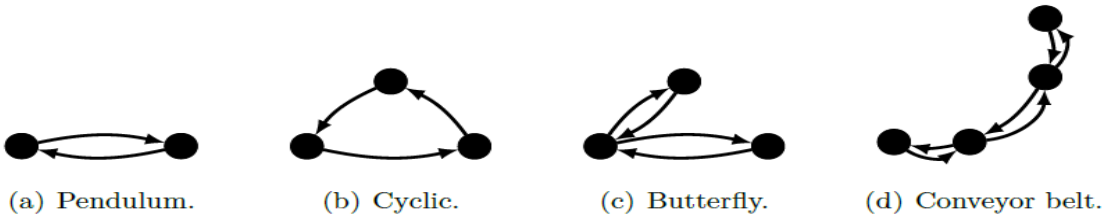


Figure 2.2.: Liner services with different route types.
Source: Guericke, 2014

These route types are explained by Plum et al (2013) and Guericke (2014) extensively. According to the authors, pendulum routes alternate between two ports, while the cyclic routes call more than two ports, without calling a port twice per round trip. The pendulum and cyclic routes are referred to as the simple routes, while the butterfly and conveyor routes are referred to as the non- simple routes (Guericke, 2014). Butterfly routes are cyclic routes that call one port twice (Kingsley, 2019), and conveyor belt routes call more than two ports and visit more than one port twice per round trip (Suhl and Guericke, n.d). The advantages of non-simple routes lie in their increased capacity on single legs, decreased vessel draft due to increased port calls and potentially improved transit times (Plum et al., 2013). In practice, pendulum routes are more often characterized as routes that transport cargo without transhipment and usually call more than two ports.

2.4.3 Global Network of Liner Shipping

As noted in the introduction above, a lot of research has been carried out on networks created in each level of decision making. This thesis does not carry out an in-depth analysis into each of these network designs. However, there is a lot of literature covering different aspects of this network planning. With regard to strategic level decision making, networks dealing with infrastructure and fleet mix (Msakni et al, 2020, Pantuso et al, 2014, Karsten, 2015, Mulder, 2016). With regard to tactical level networks, literature on route designs are ubiquitous (see Fagerholt, 2004, Fraser and Notteboom, 2014, Tran and Hassis, 2014, etc).With regard to operational level network decisions, literature such as network designs with relation to revenue management (Zurheide and Fischer, 2012), environmental routing (Windeck, 2013), vessel schedule recovery (Brouer et al., 2012), Meng et al., 2013) and stowage planning (Avriel et al., 1998, Imai et al., 2006, Delgado et al., 2012 and Pacino, 2013).

Other than these sub-networks as noted above, there is a much broader scheme in which the container shipping is also a network- this is called the Global Cargo Shipping Network (GCSN). The term 'global' here refers to a geographical analysis, i.e., the application of network analysis to worldwide movement of cargo. This aspect of network analysis, which discusses the relationship between single firms' operations and how they create and impact the whole shipping network, is often less evident and therefore often less discussed. Bergantino and Veenstra (2002) posit that in order to understand the workings of the global network system, it is important to identify the role played by the individual companies. In their paper on the worldwide network of container shipping, Ducruet and Notteboom (2012) explore this by using data of vessels between the ports through a 365-day sequence of port calls in the years 1996 and 2006. In this way, the activities of all liner companies are considered – thus confirming Bergantino and Veenstra's position that the activities of each individual liner company are factored into the global network. Thus, a shipping company is identified with the subnetwork it represents and the set of shipping companies operating their ships can be considered as the various components of the global liner shipping network (Bergantino and Veenstra, 2002). The presence of this interaction of companies thus transforms the network from virtual (Figure 2.3A) to real (Figure 2.3B) as shown below.

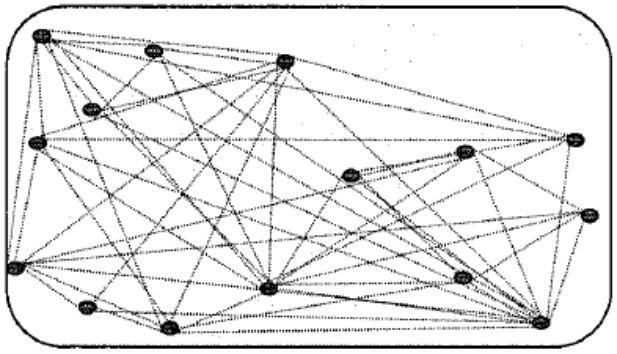


Figure 2.3 A: Virtual Global Network of Cargo Shipping

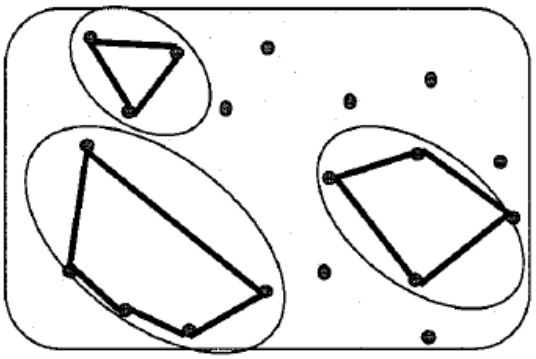


Figure 2.3 B: Real Global Network of Cargo Shipping

Source: Bergantino and Veenstra (2002)

Furthermore, the increasing cooperation between liner companies also led to a connection between the sub-networks of shipping companies to one another, forming a larger and integrated network, which in turn forms parts of the global liner shipping network (Bergantino and Veenstra, 2002, Parola et al, 2013). An example of this changing network is shown in Figure 2.4 below. The aim is that both shippers and carriers can both benefit from this further integration; liner companies can take advantage of the increased connections available in order

to lower costs and increase revenue potentially while shippers have the added advantage of accessibility and geographical coverage, presumably a higher quality of service (Bergantino and Veenstra, 2002). In analysing efficiency in the coming chapters, the extent to which actors in the liner shipping industry consider their place in this global network in taking decisions will be explored and analysed.

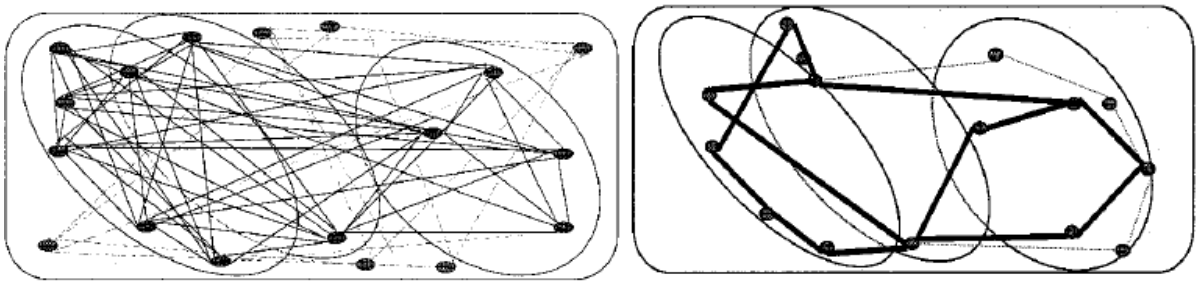


Figure 2.4: Interaction of Sub-networks in Global Cargo Network of Shipping
Source: Bergantino and Veenstra (2002)

2.4.4 Importance of Ports in Global Network Structure

The liner shipping industry is formed by a system of nodes and links, which can be identified with ports and sea-lanes, respectively (Bergantino and Veenstra, 2002). The circular points in Figure 2.2 above are referred to as nodes and they represent ports which the carriers plan their networks around. The importance of ports in the liner network cannot be overemphasized. Traffic flows through ports are a physical outcome of route and port selection by the relevant actors in the chain (Ducruet and Notteboom, 2012). Port choice is important not just to carriers in designing their networks, but also to shippers and forwarders. Thus, liner service network design is a function of carrier-specific operational factors (i.e. lower costs) as well as shippers' needs (e.g. transit time) and willingness to pay for a better service (Durcruet and Notteboom, 2012). In fact, in designing their networks, shipping lines implicitly have to make a trade-off between the requirements of the customers and operational cost considerations (Durcruet and Notteboom, 2012).

Several authors have written on the relevant service-related and cost factors which explain this choice which these actors must make (see Murphy et al., 1992, Murphy and Daley 1994, Malchow and Kanafani, 2001, Tiwari et al., 2003, Nir et al., 2003, Chou et al., 2003, Song and Yeo, 2004, Barros and Athanassiou, 2004, Guy and Urli, 2006 and Wiegmans et al., 2008.). Port choice thus becomes a function of the overall network cost and performance (Ducruet and Notteboom, 2012). A list of typical port choice criteria include:

(a) Physical and technical port infrastructure, including nautical accessibility (e.g. draft);
(b) Terminal infrastructure and equipment, hinterland accessibility, and intermodal offer;
(c) Geographical location vis-à-vis the main shipping lanes and the hinterland;
(d) Port efficiency expressed as port turnaround time, terminal productivity, and cost efficiency;
(e) Interconnectivity of the port (sailing frequency of deep-sea and feeder shipping services);
(f) Reliability, capacity, frequency, and cost of inland transport services;
(g) Quality and cost of auxiliary services such as pilotage, towage, and customs;
(h) Efficiency and cost of port management and administration (e.g. port dues);
(i) Availability, quality, and cost of logistic value-added activities (e.g. warehousing) and port community systems;
(j) Port security/safety and environmental profile; and
(k) Port reputation. (Ducruet and Notteboom, 2012)

As noted in Chapter 2 above, there are at least 11537 ports in the world. Each port operates in their own local context; i.e. with different legal and regulatory contexts, different levels of development and practices. Port infrastructure indicator as published by the World Economic Forum (WEF) is an indicator of the deep diversity in development levels between ports in the world. Ranking on a scale of 1-7, Singapore was ranked as the country with the most developed port infrastructure with a score of 6,5 while port infrastructure in Tajikistan was ranked last with 1 point (Globaleconomy.com, 2019). Ports in Europe constitute 50% of the top 10 most developed ports in the world (Finland (6.4), Netherlands (6.4), Denmark (5.8), Belgium (5.6) and Estonia (5.6)) (Globaleconomy.com, 2019). 30% of the top 10 are Asian ports (Singapore (6.5), Hong Kong(6.3) and Japan (5.8) and 20% of the top 10 are North American ports (Panama(5.7) and USA (5.6) (Globaleconomy.com, 2019). The first Ocean port on the ranking is New Zealand, ranking 35th with a score of 4.9, while the first African port is Morocco ranking 26th with a score of 5.10 (Globaleconomy.com, 2019).

Different levels of development are also closely linked, in many countries to port governance and port models. Port management models include service ports, tool port, landlord port and private service port (Dooms, 2021). Service ports are mainly controlled by ports authorities and is the primary model found in developing countries (Dooms, 2021). On the other hand, landlord ports, mainly found in Europe and United States, are ports where the port authority is the main a regulatory body and landlord, and port operations are executed by private companies

(Dooms, 2021). The operations of these ports also differ with these models and thus impacts the network planning of liner shipping companies.

Furthermore, the volume of international maritime trade, and thus port traffic, varies across regions. This difference in volume is shown in the diagram below:

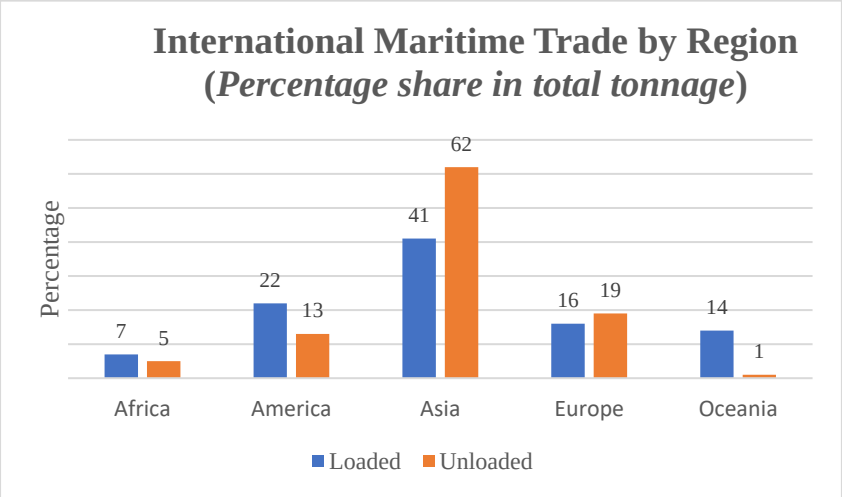


Figure 2.5: International Maritime Trade by Region
Source: UNCTAD 2020

The difference in trade does mean that port traffic to and from these regions will vary and differ. Accordingly, the liner shipping industry network is designed to operate in a way such that these divergence in development and traffic are considered. Thus, network planning on size of fleet and fleet mix, route and schedule planning etc must take these differing realities and factors of policies, development and traffic in order to ensure efficiency of their networks.

2.5 Summary Thoughts on Chapter 2

The analysis of Liner shipping as a network has been presented above, firstly with regard to subnetworks related to strategic, tactical and operational processes. A more macroscopic perspective of the global network was also presented. This chapter thus answers the first sub-question with regard to the understanding of liner shipping as a network. The subsequent Chapter 3 will go on to analyse the network of contracts which are present in liner shipping. This has been set out in a different chapter noting that it is an element of liner shipping network which has not previously been considered and thus could benefit from thorough analysis of the links and connections. Furthermore, an understanding of the network system set out in this chapter is important for the understanding of the subsequent chapter.

CHAPTER 3: LINER SHIPPING AS A NETWORK OF CONTRACTS

3.1 Introduction

Chapter 2 above explores liner shipping network – both as sub-systems and as a global network. As stated in the introductory chapter, this is the most notorious understanding of the liner shipping networks. To the best of my research on this topic, there has not yet been any research or work on liner shipping network from a contractual perspective. Yet, it does exit. Operations of liner shipping companies do not exist in vacuums – they are always undertaken within the bounds of legal agreements. As noted by Swaab (2014), contracts are written documents which outline the full understanding of the business relationships and scope of the work so that no one can claim any misunderstandings later down the road. Accordingly, these legal agreements set the context or foundation for the operations of liner shipping. Thus, the foundations of liner shipping operations- i.e., the contractual agreements must be assessed.

The aim of this chapter is to assess some of these contractual agreements which shape the liner shipping network as described in Chapter 2. It is important to note that the network of contracts presented below is only from the perspective of the liner shipping company- i.e., it is only contracts to which liner shipping companies are parties which will be assessed.

3.2 Contract of Carriage

International trade is heavily reliant on international transport as it provides the means for transfer of goods across international boundaries (Trade Finance Global, 2021). International transport also is the important link between buyers and sellers of the goods in international trade (Trade Finance Global, 2021). Where a sales contract is completed between a buyer and seller in international trade, either of the parties may be responsible to arrange for transportation of the good and service. The decision on who handles the transportation, as well as other important commercial decisions including when risk passes, who pays for the insurance etc, are dependent on the international commercial terms (Incoterms) under which the contract is concluded.

The contract of carriage is the legal international transport document which guides the relationship between the party contracting for the transport and the transport company A contract of carriage is defined as an agreement that is concluded between a carrier and a shipper

for the carriage of goods by sea, in which a carrier, against the payment of freight, undertakes to deliver goods from one port to another (Oner, 2019).

It is not always the case that a contract of carriage is concluded, or where concluded it is sometimes not in writing (Pejović, 2020). Usually, shippers who ship smaller quantities, infrequently or outsource their logistics functions do not negotiate directly with liner companies. They often outsource such activities to logistics companies or freight forwarders (Gorton, 2010). However, a cargo owner who wishes to ship cargo by sea may negotiate with shipping companies on a time frame or on a volume basis (Gorton, 2010). In time frame contracts, the parties would negotiate transport of goods over a long period of time e.g., a year. the course of a year. Volume contracts refer to where the parties agree to transport a certain volume of goods over a certain period of time (Gorton, 2010, Rotterdam Rules, 2009). Where these negotiations are put into writing, this is the contract of carriage. The contract of carriage will always exist before the bill of lading (Anderson, 2018).

Although sometimes used erroneously interchangeably, the contract of carriage is not the same as a bill of lading. The contract of carriage is very closely related to the bill of lading, a document which is issued unilaterally at a later stage by the carrier (Oner, 2019). In some circumstances, the contract of carriage provides a clause that the shipment is subject to the terms and conditions of the bill of lading, and on the other hand, the bill of lading might refer to the contract of carriage (Oner, 2019). This relationship is further discussed in Chapter 3.3 below.

3.3 Bills of Lading

The essence of the designation of networks as shown above is for liner companies to designate the routes through which to ship accepted cargo to designated destinations. Customers of liner companies i.e. shippers who wish to a relevant destination will contract with the liner company to undertake the movement of their goods. Usually, the document which evidences the contract of carriage between the shipper and the liner company (the carrier) is a bill of lading. A bill of lading is a transport document issued by or on behalf of a carrier to the person with whom he has entered into the contract of carriage of the goods, usually known as the shipper (Pejović, 2020). It is important to note that the bill of lading is not itself the contract of carriage. The terms and conditions printed on the reverse side of the bill of lading serve as evidence of the terms and conditions of that contract of carriage (Wilson 2010, Pejović, 2020). A bill of lading evidences an already existent contract of carriage between the shipper and the carrier, and

sometimes a third party (the consignee) (Pejović, 2020). The original contract is between the carrier and the shipper, however upon transfer of the bill of lading to the consignee, then the relationship between the carrier and the consignee will be governed by the bill of lading as well (Pejović, 2020). This function as evidence of a contract is a major function of the bill of lading.

The bill of lading has 2 other important functions: as a receipt and a document of title. As a receipt, it serves as written acknowledgment by a carrier that goods as contained in the bill of lading were received for shipment (Pejović, 2020, Wilson, 2010). The third function of the bill is as a document of title. With the development of international trade and documentary credits, bills of lading became negotiable documents of title allowing the shipper to transfer the ownership of cargo while it is in transit (Wilson, 2010, Pejović, 2020). This transfer of constructive possession takes place where the bill is endorsed or consigned to a third party – making the document negotiable/transferable (Djadjev, 2017). This enables the transferee claim delivery of shipped goods on arrival at the port of discharge ((Wilson, 2010).

A typical bill of lading will contain information on the description, condition and quantity of goods shipped, loading and discharge port, date of shipment, the name of the ship, whether freight has been paid, the terms of carriage under which the cargo is being carried and delivery instructions (e.g. notify party or consignee) (Mills, 1998). The bill of lading is symbolic of the goods (as a document of title and receipt) and as such statements on the bill of lading about the goods are of evidentiary value. This means that it plays a vital role where there is a rejection of the goods at the port of discharge for any alleged damage or loss of cargo (Djadjey, 2017).

It is also important to note that the sea waybill is another form of contract of carriage – however it lacks the document of title function which the bill of lading holds. It remains a receipt and an evidence of the contract of affreightment (Pejović, 2020). Most companies engaged in the liner trade will produce their own proprietary brand of bill, while smaller operators often adopt the standard forms drafted by the international shipping organisations (Wilson, 2010, Djadjev, 2017). A sample sea waybill for the carrier Blue Anchor Line was obtained from its website (blueanchorline.com, n.d). An analysis notes that some of clauses closely model the sample Hapag Lloyd bill of lading obtained from the internet too (hapag-lloyd.com, n.d).

The bill of lading and sea waybill are very important in delineating the obligations of the rights and obligations of parties to the contracts (i.e. the carrier, shipper and/or the consignee). These rights and obligations are delineated at the back of the bill of lading as stated above. In liner

shipping, the shippers are often smaller companies or individuals, accordingly in the conclusion of a contract of carriage, there is usually an evident inequality in bargaining power. This inherent inequality between the parties to a bill of lading necessitated restrictions being imposed on the traditional principle of freedom of contract (Wilson). As such, international conventions have defined the basic obligations of the carrier towards the cargo from which the carrier cannot contract out itself out (Wilson, 2010). These international conventions are discussed in Chapter 3.6 below.

However, at the moment, it suffices to say that the bill of lading is one of the major links in the network of contracts. As it evidences the contract of carriage, it is the primary connection between the shipper and a liner company. This link is complicated by the fact that contracts for affreightment are not always contracted directly by the shippers, contracts are often contracted by freight forwarders. Freight forwarders are individuals or companies which act as intermediaries between the liner company and the shippers (Djadjev, 2017). They usually receive small shipments—referred to as less-than container load (LCL) or less-than-truckload (LTL)—from shippers (Djadjev, 2017). A number of these LCLs are consolidated and a contract with a sea carrier for the transportation of the goods is completed. A freight forwarder could act as an agent of the shipper, as an agent of the carrier, and may contract for a carriage of goods as a principal (Djadjev, 2017). This means that in drawing the link between the shipper and the carrier, the freight forwarder acting as an intermediary or acting as a principal should be considered.

3.4 Liner Shipping Cooperative Agreements

Cooperative agreements between liner shipping companies have been briefly presented in Chapter 2.2 above, while discussing the current state of liner shipping today. It was stated that factors such as freight rate instability, high fixed costs, low variable costs, perishable services led to a need for cooperation in a normally highly competitive industry. This cooperation is aimed at maximising economies of scale, increasing scope (joint utilization of equipment and know-how) and entering new markets, while guaranteeing regular time schedule ocean shipping services in international trade. (Goerzen and Beamish 2005; Hoetker and Mellewigt 2009, UNCTAD, 2016).

As noted in a 2016 UNCTAD report, these cooperative agreements range from conferences to consortia, vessel sharing agreements, strategic/global alliances, capacity stabilization

agreements and discussion/talking agreements. Liner conferences were established as far back as 1875 – they are "formal or informal private arrangements between carriers or between shipping lines which enable them to utilize common freight rates and to engage in other cooperative activities on a particular route or routes" (OECD, 2002). The role of these conferences has been grossly limited by narrowing of antitrust and competition immunities, especially in Europe and the United States. Consortia have become more common place in the industry instead.

Consortia are "agreements/arrangements between liner shipping companies aimed primarily at supplying jointly organized services by means of various technical, operational or commercial arrangements (e.g. joint use of vessels, port installations, marketing organizations, etc.)" (OECD, 2002). Unlike conferences, consortia do not set common freight rates, through technical, operational and commercial arrangements, they aim at improving the efficiency of the operations of their members (UNCTAD, 2016). This efficiency is in the form of stemming from fluctuations in demand for shipping services, providing lower-cost services, enhancing frequencies and a wide variety of destinations (UNCTAD, 2016). Consortia take the form of vessel sharing agreements, slot sharing agreements as well as strategic alliances which have been discussed in Chapter 2.2 above.

These agreements also form part of the network of contracts which underly the operations of the liner shipping network. As shown in Chapter 2.3.3 above when discussing the global shipping network, these agreements are responsible for bundling of sub-networks within the network. Furthermore, through agreements such as vessel sharing and slot sharing agreements, situations where bills of lading might be issued by a different liner company, than with which the contract of carriage was concluded might exist. For example, a major manufacturer/distributor of drinks might enter into a contract of carriage with Liner Shipping Company A for a duration of a year. During that time, Liner shipping Company may buy some slots on Liner Company B and a bill of lading issued to the manufacturer/distributor by the master of Liner Company B. In entering the initial contract with Liner Company A, it might have been specific reasons for which that company was selected over the other e.g. reliability of service or schedule. However, the manufacturer/distributor might find itself in a legal relationship with another shipping company by virtue of this slot sharing/vessel sharing agreement.

It should also be noted that these cooperative agreements on their own form a small network – described by Caschili et al (2014), as small world networks. Small world networks are characterized by a high local connectivity (i.e. clustering coefficient C) and by a small topological distance (i.e. shortest path l) between each pair of nodes in the network (Watts and Strogatz, 1998). Inter-firm cooperation is identified as a small world network because small world networks often encapsulate the many characteristics of industrial cooperation (Caschili et al, 2014). Small world networks are sparsely connected networks with high local connectivity, and therefore firms identified as small world networks are more likely to disseminate information and implement best practice among them (Watts and Strogatz, 1998). Testing with data of 65 carriers that provide 603 container services, their results indicate that the cooperative agreements of liner companies belong to the family of small world networks, which the authors have labelled the 'Cooperative Container Network (CCN)' Caschili et al (2014). By applying network analysis, the authors demonstrated that CCN belongs to the class of small world networks with high levels of local interconnectivity, such that random patterns do not emerge from cooperation among container carriers, thereby implying that they abide by rules in their cooperative relationships (Caschili et al (2014).

3.5 Terminal Agreements

Liner shipping operations are closely related to terminal operations and decisions about ships cannot be taken while disregarding their effects on terminals (Mudler and Dekker, 2016). Terminals are the largest bottleneck for shipping (Mudler and Dekker, 2016). Notteboom (2004) conveys a similar sentiment noting that in a world of aggressive competition amongst liner companies and bigger vessels, ports (terminals) which generally do not develop as quickly find themselves playing catch up in an increasingly unstable manner. Notteboom (2020) has also noted that this position of ports, against developments of shipping lines, is unsustainable.

For a container ship calling at a terminal, two things are most important; berth scheduling and crane allocation (Mudler and Dekker, 2016). Berth scheduling is the determination and allocation of berthing times and positions to containerships in port container terminals (Kim and Moon, 2003). Crane allocation deals with the number of quay cranes which are to be allocated per containership to move containers from the waterside to the yard for storage and vice versa. These two factors guarantee the turnaround time of a vessel. It is in the interest of the port as well as the ship to reduce the turnaround time as much as possible. A low turnaround

time means that the berth is freed up for use for another vessel, thus increasing the ship's throughput. (Kokila and Abijath, 2017). A shorter turnaround time is generally indicative of high port efficiency and trade competitiveness (Kokila and Abijath, 2017; UNCTAD, 2019).

On the other hand, it is a major objective for a liner ship to reduce its turnaround time as much as possible to meet its schedule i.e., call at all intended ports as at when due. The famous saying 'a ship is not made for the port but for the sea' is accurate because a ship; especially a liner shipping wishes as much as possible to be on the move, meeting schedules and beginning where possible, new shipping schedules. The ability of a liner ship to complete a scheduled trip as quickly as possible is directly related to the profitability of a liner shipping company. Similarly, when we take supply chain into consideration, high turnaround time simply means that the process from raw material to the final product takes a lot of time (Kokila and Abijath, 2017).
In order to secure these services at ports/terminals, liner companies sign 'Terminal Services Agreements' (TSA) with terminals. A sample APMT terminal agreement obtained on the internet shows the obligations of APMT to include provision of berthing, stevedoring and vessel stowage planning (APMT TSA, n.d). Per the TSA, APMT does not guarantee any speed or starting or completion times for the performance of its obligations other than due care and diligence (APMT TSA, n.d). On the other hand, the customer's obligations include submission to the terminal 'documents, information and notifications not later than twenty-four (24) hours before the vessel arrives as APMT may reasonably and specifically request in the discharge of APMT's obligations necessary for the orderly and efficient discharge/loading of that vessel' (APMT TSA, n.d). Where the required information is not received within the indicated timeframe, then APMT may have to direct the customer container ship to wait in turn (APMT TSA, n.d).

TSA agreements which enable liner shipping companies to obtain services which are intrinsic to the operations of its networks. As noted above, the efficiency of a port also impacts the efficiency of a liner shipping network. The higher the turnaround time at a port i.e., the more efficient the port is, the more efficient a liner shipping network can be. Thus, TSA agreements are an important part of the network of contracts given that indispensability of the nodes in the liner network – the liner network cannot exist without the nodes.

3.6 Network of Contracts

Figure 3.1 below shows the network of contracts which fuel the liner shipping network from the perspective of Liner Company A. This puts into a visual perspective the interrelationship between each of the relevant parties in a liner shipping network. Liner Company B will also have a similar network with each party in the network as shown in Figure 3.2.

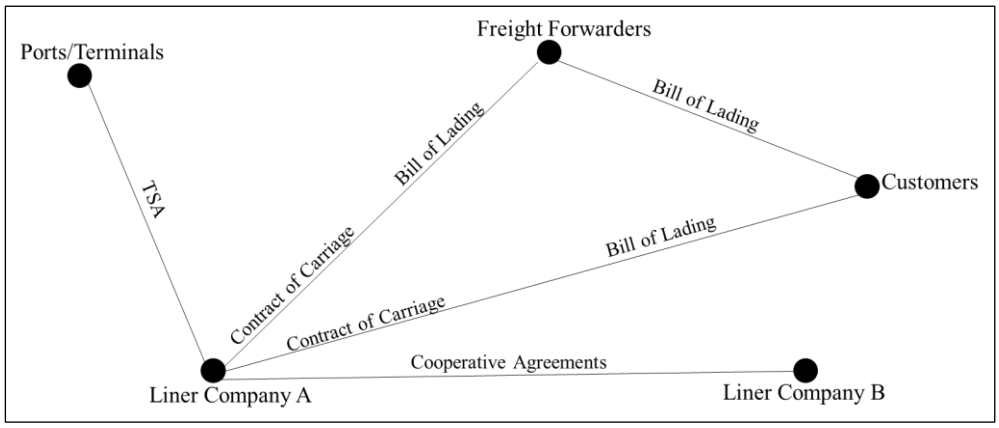


Figure 3.1: Network of Contracts (Liner Company A)
Source: Self designed

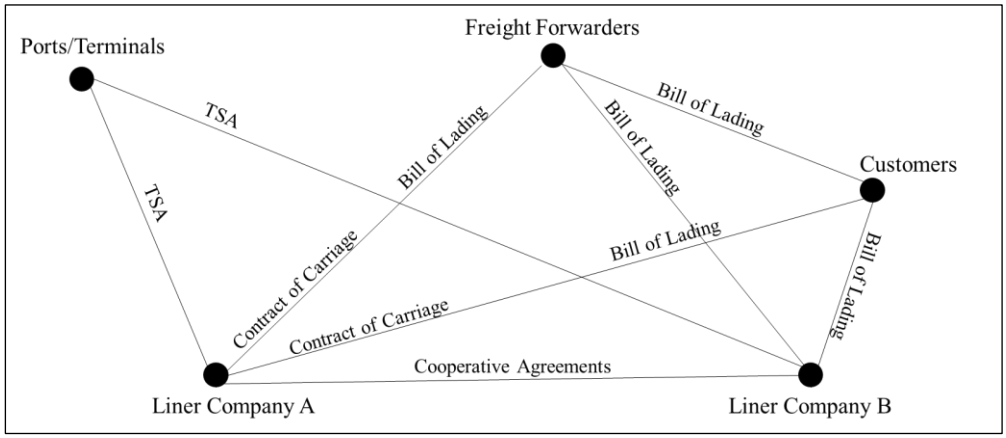


Figure 3.2: Network of Contracts (Liner Company A and B)
Source: Self designed

The primary document which regulates the relationship between customers(shippers) and carriers (liner networks) is the bill of lading as explained above. This will be the primary contractual document analysed in accessing the liner network efficiency. It should be noted that the other contracts as explored above possibly play a major role in efficiency, but that analysis is outside the scope of this paper. Primary focus is given on the interaction between the carriers and the shippers and how the operations and underlying contracts serve those parties. Also, it is not the aim of this paper to explore all the rights and obligations in a bill of

lading, this is beyond the scope of this paper. The aim of the paper will be to analyse elements of the contract of carriage which impact the efficiency of the liner network. This will be discussed in Chapter 6 below.

It is acknowledged that in modern shipping, there are several other transport documents used in the carriage of goods by sea, including sea waybills, ship's delivery orders, multimodal transport documents and electronic bills of lading. However, the focus on this paper is on bills of lading as it remains traditionally the most important transport document in international carriage of goods by sea (Proctor, 1996). Furthermore, a sample sea waybill for the carrier Blue Anchor Line was obtained from its website (blueanchorline.com, n.d). An analysis notes that some of clauses closely model the sample Hapag Lloyd bill of lading obtained from the internet too (hapag-lloyd.com, n.d).

Furthermore, some clauses in the sea waybill can also be seen to be direct excerpts from the Hague/Hague Visby rules. The Hague-Visby Rules is the most widespread legal regime currently in force in most shipping nations of the world, regulating the operation of bills of ladings (Djadjev, 2017; Bundock, 2011). Traditionally, contracts of affreightment are negotiated against a background of custom and commercial usage from which a series of obligations are implied and are automatically incorporated into the contract in the absence of agreement to the contrary (Wilson, 2010). Where there is an agreement to the contrary, this is usually set out on the second page (terms and conditions page) in the Bill of Lading.

However, given that the bargaining power between the parties to a bill of lading is unequal, this freedom of contract is statutorily restricted, and this is achieved on a worldwide level through international conventions (Djadjev, 2017). Thus, the Hague Rules of 1924, and thereafter the Hague Visby Rules of 1964 were introduced. Subsequent rules (Rotterdam Rules and Hamburg Rules) have not gained the same recognition as the Hague Visby Rules. As a consequence, it remains the international convention incorporated into most bills of lading (Djadjev, 2017; Bundock, 2011).

These rules are either automatically applicable into the rules of ratifying countries (monist systems of law) or implemented through domestic legislation (dualist systems of law). The international law governing carriage of goods has developed from the common law concept of freedom of contracts, as noted above. The first international convention governing carriage of goods, the Hague Rules of 1924 and its amending protocols (Hague-Visby Rules) maintained this markedly Anglo common law outcome (Jiménez-Valderrama, 2015). This is attributed to

influence of the United Kingdom in international trade during the 19th and early 20th centuries, resulting in a heavy influence of English legal institutions in governing the admiralty and shipping matters globally (Jiménez-Valderrama, 2015).

Today, English law is still considered one of the most widely used "foreign" law selected in international commercial and particularly maritime contracts (maritimelondon.com, 2016). Furthermore, court judgments in countries around the world still often rely on English case law for interpretation of maritime conventions. Accordingly, it is important to understand how these international conventions are implemented into UK law. The Hague-Visby Rules were incorporated into English law by the Carriage of Goods by Sea Act 1971 (Cooper and Jackson, 2019; Chamberlain and Calaço, 2021). As of today, the United Kingdom is yet to become a signatory to the Hamburg Rules of 1978 or the Rotterdam Rules of 2009 (Chamberlain and Calaço, 2021; United Nations Treaty Depository, 2021).

The following chapter explores the efficiency metrics by which the liner shipping network can be analysed. The aim will be to present benchmarks, against which the methodology, including the expert interviews and exploration of data on the liner shipping industry will be measured and analysed.

CHAPTER 4: EFFICIENCY METRICS OF LINER SHIPPING NETWORKS

4.1 Introduction

The aim of liner networks planning is to achieve efficiency from the perspective of the customer i.e., the shipper/consignee. Chrstiansen et al (2020) summarized the liner network design problem as follows 'the task is to design a set of weekly services, assign vessels to the services, and flow the demand through the resulting network such that it arrives within the stated time constraints. From the shippers' perspective, efficiency consists of faster, cheaper, and reliable services. Based on these, the three metrics of efficiency; service reliability, capacity availability and cost are surmised.

Firstly, one should be able to assess efficiency by looking at the extent to which the task, i.e. design of weekly services, is achieved. In other words, to what extent are customers of liner shipping services promised frequent and reliable services - to what extent are these services negotiated and contracted and to what extent are these promises met. This will be explored below as the service reliability metric. Secondly, to what extent is the assignment of vessels successful such that customers can have the required capacity when and where needed. This is expressed as the capacity availability metric. Thirdly, the cost of shipping is assessed. Liner shipping is expected to be inexpensive. This is one of the major arguments in favour of liner shipping consortia. Carriers argue that consortia allow carriers to achieve economies of scale, which benefits can be passed on to consumers (EU BER Document, 2019). Therefore, the third efficiency metric is Cost Effectiveness; the extent to which liner shipping costs are truly cheap will be assessed as well.

4.2 Service Reliability

Liner shipping companies are expected to provide faster and more reliable services. These faster and reliable services are what have been termed 'service reliability'. Faster and more reliable services (service quality) were critical reasons by carriers to maintain the EU Block Exemption Regulations (BER) during review in 2019. In the 2019 document prepared by the EU Commission, the carriers, vessel owners and their associations explained that the consortia allow carriers to improve their services.

Notteboom (2006) in discussing what he terms 'time factor in line shipping' notes that there is a difference between transit time reliability and schedule reliability. A schedule is a published timing of a round-voyage of a specific ship while the transit time can be defined as the number

of sailing days on a port-to-port basis (Notteboom, 2006). He notes that these two are not the same - a shipping line may succeed in the delivery of a container in the indicated port in time, while schedule reliability of the vessel is poor. An example is the unplanned shifting of cargo from one vessel to another vessel in view of getting the container in time at the port of destination (Notteboom, 2006). Although this is acknowledged, it should be noted that for the purposes of this paper, service reliability is used loosely to indicate the ability for the shipping line to meet scheduled delivery time. From a logistical perspective, what is important to a customer is the ability to have its goods as and when due. Therefore, in assessing efficiency in this paper, this wider meaning is used.

Service reliability is possibly the most important factor in liner shipping because of its impact on all players and actors within the liner shipping network, including shippers/consignees, carriers, ports and terminals and other logistics providers. The importance of service reliability to the shipper is assessed below.

4.2.1 Shippers/Consignees

When choosing a carrier for sending of goods, shippers will usually consider a variety of factors. One of the factors which might be considered is service reliability (Chung and Chiang, 2011). With regard to shippers specifically, service reliability is important to them because, depending on the agreed upon incoterms agreed, the shipper might still bear the risk of loss of cargo during the transit. Therefore, it helps the operations, and perhaps the mental/psychological health of a shipper, to know that shipped cargo arrives promptly and safely. Where the consignee is responsible for bearing the risk, the burden is reversed.

More importantly, service reliability is important element in production and operational effectiveness of consignees. In planning its supply chains, realistic expectations on delivery time of raw materials/inventory, safety stock and lead time determination, service reliability becomes even more important (Notteboom, 2006; Vernimmen et al, 2007; Chung and Chiang, 2011). Unreliable schedules have major cost implications for consignees, especially those who practice ‘just in time’ production.

Consignees run the risk of 3 major types of logistics costs in the face of schedule unreliability. Firstly, costs arising from downtime/disruptions in manufacturing activities due to failure to secure inventory/raw materials at the right time (Notteboom,2006; Chung and Chiang, 2011). As noted by an Aberdeen Strategy and Research Report (2016), the average cost of downtime per hour across all business is $260,000. Of course, this varies greatly with the type of business

and the size of the business. For example, according to a Thomas Report (2006), the average cost of downtime per minute in the automotive industry is $22,000. In order to counter this type of cost, a second type of cost is incurred. This is the cost of investing in higher inventory levels in order to avoid disruptions to their production processes and meet service level agreements (Gross and Soriano, 1969; Vernimmen et al, 2007). Finally, the third type of costs is the 'congestion surcharges' imposed by deep sea shipping lines or inland transport operators aiming to recover the costs associated with rising congestion levels (Dynamar, 2006; Vernimmen et al, 2007).

Apart from logistics costs, service reliability is important to support the business and the image of a business. As noted by Chung and Chiang (2011), service reliability can help companies maintain supply chain integrity by improving product supply flows. This is especially important as competition between companies becomes less focussed on individual companies, but on supply chains. As noted by Lam and Van de Voorde (2011), today, the long-term competitiveness and ultimate success of a firm depends on its managerial ability to integrate and coordinate the intricate network of business relationships among supply chain members.

4.3 Vessel Capacity Availability

Vessel capacity availability refers to the access which a shipper has to liner services. As noted in Chapter 2.3 and 4.2.2 above, fleet size, vessel size and fleet mix are strategic network planning problems which a liner shipping company must handle in order to ensure that there is the right amount of capacity available to meet demand for its services.

The essence of this metric is to explore how, from a logistical point of view, decisions are made on how many ships to deploy in order to make adequate capacity available to the shippers. From the shippers' perspective, the question that will be explored is to what extent there are challenges with getting the required capacity to transport goods to and from where needed. This is important especially in light of the high demand surges and supply limitations noted in noted in Chapter 2.2 above. Where shippers are unable to secure required capacity to facilitate trade, then the liner shipping network would be considered inefficient in so far as the raison d'etre of the network is to provide such services to its customers.

4.4 Cost Effectiveness

Cost effectiveness is important to both the shippers and the carriers. For obvious reasons, shippers are interested in getting optimal service at minimum possible cost, i.e., freight costs. On the other hand, carriers are also interested in cost effectiveness. In 2019, the EU Commission, the carriers, vessel owners and their associations explained that the consortia allow carriers to enjoy economies of scale which are passed on to their consumers (EC BER Document, 2019). Thus, cheaper liner services are also a critical reason given by carriers to maintain the EU Block Exemption Regulations (BER) during its review in 2019.

Despite having just 8 players controlling over 80% of the market (see Table 2.2 above), the shipping industry remains very competitive because services are largely homogenous (UNCTAD, 1998). This means that under a given route and frequency, customers often focus more on price differences than on the "quality" of cargo handling, as there is not much differentiation in terms of the actual service provided – barring differences noted above (UNCTAD, 1998). Thus, the biggest shipping companies still compete to capture the market of major shippers on major trade routes. This can be achieved in many ways, one of which is promises of good freight costs. CMA CGM, the third biggest shipping company (see Table 2.2 above) captures this on its website with the phrase 'our offers are regularly ranked among the best in the market'(cma-cgm.com, n.d).

Freight rates are usually a combination of many types of costs, including, port construction fee, surrender fee, VGM fee, seal fee etc. Each element is listed and a cost is attached to it; the total of each of these costs is termed the freight rate. These freight costs are ideally the costs which might guide the decision of shippers. Therefore, it is important to assess the freight costs over the past few years. It can be expected that where the freight costs are low and indeed competitive, then the liner shipping network could be seen to be efficient, and vice versa.

The chapter below sets out the research methodology employed to test the efficiency of the liner shipping network.

CHAPTER 5: RESEARCH METHODOLOGY

5.1 Introduction

Numerous research has been conducted on liner networks and their planning. Most of this research has been based on solving, through quantitative analysis, various network planning problems. However, there is little qualitative research in this regard. There is limited research exploring how, in reality, operational planning takes place and whether agents within this industry operate as though in a network. This is the aim of this paper. To achieve this, a methodological triangulation approach has been used by combining expert interviews, independent analysis as well as information from secondary data sources. The purpose of the use of the triangulation technique is to analyze the efficiency of the liner shipping network from different data sources. This is to achieve three main purposes: to enhance validity, to create a more in-depth picture of a research problem, and to interrogate different ways of understanding a research problem. This technique helps validate research findings by checking that different methods produce the same results (Nightingale, 2020). In using the triangulation technique of expert interviews, independent analysis and secondary data sources, the paper will explore areas of convergence, complementarity, and divergence between the sources in order to deliver a more robust outcome (Nightingale, 2020).

5.2 Expert Interview

The aim of the expert interviews is to gain practical perspective on the operations of the maritime industry; both from a planning perspective and from the perspective of the customers of the shipping industry. To this end, expert interviews were conducted with both shippers and shipping line professionals. In total, there were 9 experts: 5 shippers and 4 liner shipping experts.

The liner shipping experts were all from a liner shipping company headquartered within Europe. On the other hand, 3 of the shippers are from companies headquartered in the Netherlands, while one of the shippers is headquartered in Mexico. The liner shipping experts composed primarily of two job portfolios; the first being the operations department, therefore closely related to liner network planners, while the second kind were personnel with information on contracts and bills of lading. With most of the shipping experts, an oral interview was conducted, although one of the experts preferred a questionnaire format. A format of questions was drawn up and these were used in conducting the interviews. The same questions were shared with the personnel who preferred a questionnaire.

Three sets of questions were drawn up. The first set of questions were operational questions i.e., shared with the operational liner shipping personnel. The second set of questions were shared with the legal personnel within liner shipping. The third set of questions were shared with the shippers. Two rounds of interviews were conducted with most of the experts, to foster a robust discussion of the topics involved. Furthermore, follow up questions raised by conversation with one personnel were also shared with other personnel in order to get the interviewee's perspective and feedback. The questions are presented below:

Questions for Operational Personnel

1. The network planning objectives of the company?
2. How are network planning decisions made and what are the measures of efficiency from the perspective of the company?
3. How are decisions on asset use, distribution, allocation across routes, customers, etc., made so as to optimise/maximize revenue/profit generation with the resources at the disposal of the company?
4. How does the company guarantee that its partners e.g. terminals, consortia partners, are efficient so that the company can meet its objectives?

Questions for Legal Personnel

1. The bill of lading is usually evidence of a contract of carriage, how often is there an outstanding or independent contract of carriage between the carrier and shipper? How is this negotiated and what kind of clauses are in there?

    a. In situations where there are price surges in the spot market which far outweighs the contracted value, what is the policy or renegotiation of contracts (such as right now due to COVID disruptions)?

    b. Where contracted capacity is not provided, are there legal redresses for the shipper in the contract of carriage? How is this negotiated?
2. The liner network is designed to provide reliable scheduled services to the customers, does the present legal/contractual framework of bills of lading and contracts of carriage sufficiently mirror the objective of the liner network? Examples include:

a. Delays, blank sailings which regularly occur in liner shipping – there are no protections afforded by the bills of lading/HVR on this. Are there provisions in contracts of carriage covering this? Commercially, how is this remedied?
b. Detention fees for containers covered by the schedule of fees. However, there are cases where shippers are unable to return empties due to being turned back by terminals/ports. What legal provisions are available to ensure that the shippers who are willing and able to return the empties but are not able to are not penalised anyway by these fees?

3. The HVR and bills of lading are instruments which were developed long before liner shipping. Would you agree that the legal instruments do not accord with the realities of the liner shipping operations?

Questions for Shippers

1. What are your thoughts on the general liner shipping network, do you believe it is efficient or inefficient?
    a. For my thesis, I am working with three metrics: schedule reliability, vessel capacity availability and cost of shipping. Based on these three metrics, would you agree that the liner shipping networks are (in)efficient?
2. Please can you confirm how you go about obtaining capacity on a vessel to ship your goods? Do you simply book on the spot market, or do you engage in negotiations with a shipping company or a freight forwarder?
    a. Where negotiations are done, do you seek, or request assurances guarantees with regard to time of delivery of goods shipped?
    b. Do you make decisions, on which liner company to ship your goods with, based on schedule reliability? Do you communicate same expectations to the sales and marketing personnel of the shipping line/or the freight forwarder with whom you contract?
    c. How satisfied are you with schedule reliability of vessels today?
    d. Prior to COVID and its disruptions, are your sentiments in c. above the same?
3. Do you have any legal or commercial remedies where shipping companies fail to deliver your goods within the agreed or expected time?

a. Have you witnessed any challenges with obtaining vessel capacity from liner companies i.e., getting capacity to ship your goods?
b. There is news in maritime websites that shipping companies are reneging on long term contracts in an effort to force shippers to the purchase capacity under the spot market. Have you found this to be relevant in your dealings in recent times?
c. Where answers to question 3 and a show that there are challenges with obtaining capacity, can you confirm that this has been the case in the COVID impacted years of 2020-2021 (such that prior to this time, such challenges did not exist?)

4. Do you find the cost structure of freight to be transparent and straightforward? I had a comment from a shipper that 'as many three letter combinations of the alphabets in the English language, that is how many surcharges the shipping lines can come up with to justify freight'. Another shipper notes that the freight does not reflect the actual cost of the service rendered.
    a. Do you also have similar concerns with the components of the tariff?
    b. Did such concerns exist pre-COVID disruptions, and are they simply now exacerbated by COVID-19?
    c. Where you agree that the cost structure is complex and not transparent, could you give examples of such concerning surcharges.
    d. If it is okay to ask, could you share a breakdown of a typical freight with me to reflect concerns in b and c above? (Please you do not need to give me an actual invoice - just a breakdown of the components and how much of each component makes up the total freight will suffice).
5. Where the answer to No 1 is that the liner network is inefficient, what measures legal and commercial do you think can address the challenges?

The aim of interviewing liner shipping operators is to gain insight into the efficiency metrics which liner shipping companies consider in network planning, how these metrics are measured. Furthermore, it is also important to understand the actual practical process by which network

planning is done and how the liner shipping companies ensure that the global network structure is taken into consideration in network planning. In this regard, the interview will also shed light into the extent to which liner shipping companies partner with other actors within the network in order to ensure efficiency of the global shipping network.

The aim of interviewing legal personnel in the company is to explore the contract system which is evident in the liner shipping network. As explained in Chapter 3 above, the network of contracts supports the operations of the liner network. They are the foundation between the relationship between liner shipping companies and their customers, as well as with their partners (terminals, other shipping companies). Therefore, aim of the discussion with these experts is to explore the system of contracts currently existent and to explore the extent to which these networks support efficiency of the liner network. Very important to explore is how the negotiations between the sales/commercial/marketing unit of the liner shipping companies and shippers are reflected in these contracts. Particularly explored are clauses on delay and reliability of schedule as well as the hidden costs as explained in Chapter 4 above.

Finally, with the interview of the shippers, aim is to explore again, their negotiations with the sales/commercial/marketing unit of the liner shipping companies and what their expectations are of these negotiations/ agreements with the liner shipping companies in terms of operations. Also, important to understand is, from the perspective of the shippers, whether there are legal redresses for shortfalls in expectation. This line of questioning will explore whether the contracts of carriage contracts, the bills of lading (and invariably the Hague Visby Rules) which negotiate carriage by sea are adequate to support the mandates of liner shipping which are faster, cheaper and more reliable services. Also important is an exploration of other means of redress, including commercial which may be open to the shippers to address their short falls in expectations.

5.3 Independent Analysis

Liner networks are guided by a network of contracts. In analysing efficiency, the metrics selected; Service Reliability, Cost and Vessel utilisation find their bearings in contracts. These are the contracts of carriage, the bills of lading, consortia agreements and the terminal service agreements. In assessing the bills of lading, the framework under which they are operative, the

Hague- Visby Rules will also be considered (the Hamburg or Rotterdam Rules are not considered, although it is noted that some countries are signatory to the rules).

Furthermore, it is not possible for reasons of confidentiality and commercial sensitivity to obtain consortia agreements. However, samples of contracts of carriage, bills of lading and terminal service agreement as obtained on the internet, especially on the websites of some of the major liner companies are analysed against these efficiency metrics. The aim is to show clauses contained or which are absent from these contracts, and whether the presence or absence of these contracts affect the efficiency of the current liner network framework.

5.4 Secondary Sources

Secondary sources have been relied on to provide information or data which cannot be independently assessed by the researcher of this paper. Independent sources relied on include Lloyds Weekly, Sea Intelligence, etc which give data on schedule reliability of vessels. This information will be necessary in considering the service quality of the liner shipping companies.

CHAPTER 6: ANALYSIS AND RESULTS

6.1 Introduction

The results of the methodology are presented in this chapter, according to each metric tested and assessed. Where the result has been obtained through independent analysis or access to external sources, this is clearly prefaced. Where the result is obtained through expert interviews, this is also clearly stated.

6.2 Service Reliability

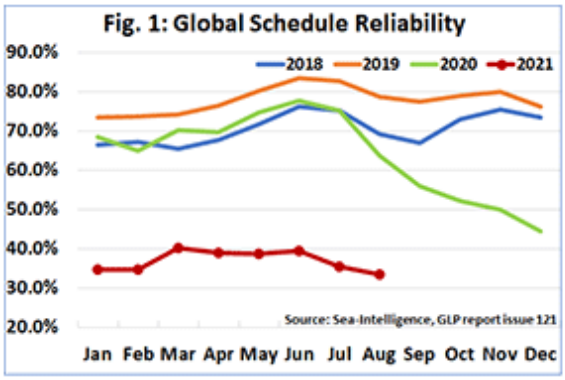
Service reliability speaks to the ability of the liner shipping companies to provide fast and reliable services. As noted in Chapter 5.2 above, this was one of the reasons given by liner companies for continued inclusion of liner shipping companies in the Block Exemption Regulations. A major aspect of service reliability which was explored was schedule reliability. A first question which was explored in the expert interviews is whether experts interviewed did consider schedule reliability a measure of efficiency. All 7 interviewees, both shippers and liner shipping experts, did consider this to be an important metric in assessment of efficiency.

From the perspective of the liner shipping companies, schedule reliability is a metric by which the efficiency of the liner networks is assessed. A liner shipping expert stated that scheduled reliability is the topmost performance indicator. According to the expert, at the execution of a network, considerations to be made in this regard include 'am I getting there on time? If I'm not getting on time, what is the reason? Do I have less vessels? Are there delays? Is the weather bad? Is the distance that the vessels are taking across the ocean? Is it more than what we had planned? Or in the wintertime is the vessel being affected by typhoons are bad weather? So, in the wintertime, do you want to have a separate performer?' He further notes that it is important to also check for reliability at every port, thus the following considerations are made; '[a]nd then if you go one step deeper than it is how efficient are we in ports? Can we do something can we store the vessel differently so that the terminal can provide better productivity?' Another liner shipping expert however suggested that given that schedule reliability is currently the least influenceable metric in shipping given the disruptions in the industry, perhaps, it should not be given as much priority. There was also a comment from another shipping expert to suggest that not all liner shipping companies consider schedule reliability to be important, in practice. According to the expert, the other shipping company with whom the company forges an alliance think they are 'crazy' to promise customers a certain arrival time. He notes

that within the alliance there are ‘different drivers, different mentality, different culture, different cost model, which of course also impacts service quality to customers.’

From the perspective of the shippers, schedule reliability is a *sine quo non* to their use of liner shipping. According to a shipper expert, it is impossible to plan effectively without schedules and their reliability. Another shipper mentioned that schedule reliability is in fact one of the bases on which a particular shipping company attempts to convince him to use their services. It was also confirmed from conversation with another shipper that some liner companies are more schedule reliability sensitive than others. As noted by Shipper 5: ‘where quality is preferred, I go with [Shipping Line 1] and where I am concerned about getting lower prices, I go with [Shipping Line 2].’ The shipper mentioned that quality assurances such as schedule reliability or storage of products seem to have little implication for this second shipping line. Therefore, it is considered an important metric on both sides of the liner network, for both shippers and shipping lines, although some shipping lines arguably prioritise this metric much less.

According to a Global Liner Performance (GLP) Report by Sea Intelligence in September 2021, schedule reliability has hit an all-time low of 33.6% in August 2021 since the 10 years in which it has tracked schedule reliability (Lloyds Loading List, 2021). This was a further drop from the 35% - 40% averages recorded in earlier months in the year (Lloyds Loading List, 2021). This 33.6% reported in August 2021 is -30.1% than August 2020 (Lloyds Loading List, 2021), -40.2% than August 2019 (World Maritime News, 2019). The diagrams below presented in the GLP Report show the sharp decrease in schedule reliability from July 2020, continuing well into 2021. Furthermore, global average delays for late vessel arrivals have also spiked since 2020 and much more dramatically in 2021.



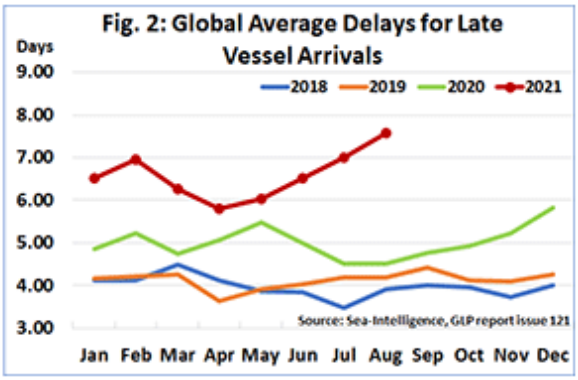


Figure 6.1: Vessel Schedule Reliability (GLP Report)
Source: Lloyds Loading List

These figures are collaborated by the sentiments of the expert witnesses interviewed. From the perspective of shippers, this is a deeply unsettling experience for their business operations. The cost and impact of delay on production is usually quite significant (Shipper 2). One shipper (Shipper 1) described the present schedule reliability as 'horrible', while a second (Shipper 2) described the present schedule reliability as 'ridiculous'. Shipper 1 and 3 noted that apart from prolonged lateness of vessels experienced, the most distressing part about schedule unreliability of the shipping companies are the preponderance of last-minute changes in shipping schedules, including blank sailings, in in the industry. According to Shipper 1, a remarkable schedule reliability of a vessel (with regard to delay of vessels) is of no consequence where he is unable to even get his goods on the ship due to constant rolling of his cargo, contrary to the previously scheduled arrangements. Shipper 2 observed that schedule unreliability coupled with soaring prices is 'an explosive combination' like no other, and a catalyst for certain companies such as IKEA to get their own networks in place. Indeed, this trend for major retailers, including Walmart, Target, Costco, Dollar Tree, has been on the rise with Reuters tagging it 'Containergeddon' (Baertlein, Saul and Cavale, 2021). One of the stated aims is to 'secure ship space'. This is closely tied to the Vessel Availability metric and will be explored further in Chapter 6.3 below.

Liner shipping experts admit that schedule reliability has in the past few years been at an all-time low as confirmed by the secondary sources above. According to liner network operators interviewed, liner network is planned in such a way that global liner network is taken into consideration. As noted by Liner Expert 1 and 2, a network is designed is with a number of factors in mind including; where the demand is generated, the costs, the intention to deliver boxes, environmental factors (reducing carbon emissions, pollution, etc in shipping), port/terminal attractiveness, availability, capability (tides, drafts, bridges etc), productivity, restrictions (e.g. safety requirements), as well as customer requirements. All of these are considered in developing of a network design. Also considered in network planning are buffers; buffers are slacks allowed in network planning to factor for delays e.g., congestions at port, unavailability of pilots upon arrival at a port etc. Buffers/slacks are built into network system so as to ensure that the network is workable, and operations are therefore efficient. Therefore, ideally, given the meticulousness in liner network planning, operations should run efficiently. Service offered should be as designed; schedule reliability should be described in less harsh words by shippers.

However, both liner experts agree that there are factors which are impossible to plan; these include weather conditions such as typhoons, heavy winds and storms which could ground the operations of liner ships for days. According to Liner Expert 2, such unplannable factors impact reliability either in vessels waiting for typhoons to pass or slidings (blank sailings) in order to continue on the voyage. In that sense, despite an impeccable planned network, the realities of network shipping mean that schedule reliability could never truly be perfect. On the other hand, Liner Expert 2 also notes that the commercial reality and objectives often differ strongly from the network planner's perspective. Liner Expert 2 notes that not even all the predictable eventualities could be effectively planned. He gives an example of port congestions, noting that on some routes and some ports, it will be necessary to include at least a week of buffer at each port in light of the present reality of the port congestions across some of the major ports in the world. However, the reality he notes is that these could never be sold by the sales and marketing units of the company. Liner shipping companies are in fierce competition with each other to differentiate themselves by offering the shortest transit times, noting the very homogenous nature of the service. Such a realistic buffer therefore automatically takes the company out of the competition and makes it impossible to even get business in the first place. He notes that the marketing units have the sentiment that 'customers do not want the truth' about realistic transit times, and thus reliabilities of the schedule, although he believes there should be a more transparent conversation had in this regard with shipping lines and their customers.

This leads to the question 'what is promised to shippers at the times of negotiations vs what is actually delivered?' Is it the case that the sales and commercial negotiate and sell transit times which are not attainable in the first place? This question calls into question the doctrine of legitimate expectation and whether contractually the shippers have a right to expect a certain type of service. It also raises questions as to the legal recourses which are available to shippers where they have an unsatisfied legitimate expectation. Shipper 4 seemed to hold the view that schedules promised are essentially a marketing strategy or gimmick; '…. if the schedule says it takes 23 days from point A to point B, they rarely make it happen, … and then in the end it takes 27 days every time; thus, it is probably a marketing strategy to choose X company instead of Y and a way of taking advantage of inexperienced and small shippers'. Liner Shipping experts also believe that the tussle between the commercial and operational reality is also dependent on the negotiations and contracts entered into between the parties. Liner expert 2 notes that some clients in negotiating contracts with shipping companies specifically ask for

guarantees in terms of schedule reliability. Where this is given, then the customer might pay a premium to secure such a service and there are repercussions in the place of penalties to be paid by the shipping company to the customer (Liner Expert 1).

Although not shared directly by the liner expert, it is insinuated that schedule reliability in places where there are guarantees are often much more reliable. As noted by this shipper, there have been cases where 'we had to advance a vessel by 1- 2 hours, kick a vessel out or do a cut and run on one vessel, leaving containers behind,' in order to meet promises which are made to customers or to show on the system that 'we are slightly better than our competitors'. From the perspective of the shippers with the guarantee, the liner network is efficient in the sense that their goods arrive as at when agreed. However, this raises questions of efficiency for shippers without such guarantees or who cannot pay such premiums, especially smaller shippers, who do not have the volume to negotiate volume contracts with shipping lines. Arguably, it supposes that where there are legal repercussions in place, in terms of a contract, the shipping lines do work hard to ensure that promises made are kept. Therefore, one solution to the problem of schedule reliability is to encourage shippers to negotiate such terms directly with shipping companies. However, three questions arise: what happens to (smaller) shippers who although not contractually agreed depend on schedules published by shipping companies, shippers who do not have the size or volumes to even enter into direct contracts with the shipping companies, and finally shippers who even when in negotiations do not have the ability to secure an agreeable premium due to unequal bargaining power? This issue of unequal bargaining powers between shippers and shipping companies was raised by interviewed shippers several times.

General contractual terms and international rules on which the liner shipping currently operates support the present status quo. With regard to blank sailings, Article 17 (d) of the sample Hapag Lloyd Bill of Lading provides that 'the carrier may at any time and without notice to the Merchant…*proceed by any route in his discretion (whether or not the nearest or most direct or customary or advertised route) or at any speed and proceed to or stay in any place or port whatsoever, once or more often and in any order'* [emphasis added]. The import of the bill of lading is that shippers have in essence acquiesced to the right of the carriers to engage in blank sailings i.e. deviate from the agreed or advertised route. It is arguable that in light of the premise on which liner shipping is built, as has been analysed severally above, this position does not remain tenable. Liner shipping is expected to provide 'reliable' and 'scheduled' services, yet

the primary document on which most shipping is done expressly excludes any liability for the shipper from deviations, and invariably blank sailings. The Hague and Hague Visby rules are mostly silent on deviation from agreed or advertised routes, except in situations of saving life. Shipping companies are allowed to contract on topics on which the Hague Visby rules are not prescriptive i.e. they may not enter into contracts which breaches the rules under the Hague Visby Rules, but they may enter into contract on which the rules are silent. Thus, this position is again maintained by the international law. The Rotterdam Rules are not as silent on deviation but also add no real value. Article 24 of the Rotterdam Rules provide that 'When pursuant to applicable law a deviation constitutes a breach of the carrier's obligations, such deviation of itself shall not deprive the carrier or a maritime performing party of any defence or limitation of this Convention,….'. Again, this provision only speaks to deviation, only when it is already agreed by the parties through a separate contract that deviation constitutes a breach. Again, this is not enough nearly good enough to address the liner shipping perspective. It leaves the determination of deviation up to the prior agreement of the parties. It is highly unlikely that a shipping line would contract against this favourable position.

With regard to delay of vessels, the general contractual terms and international rules on which the liner shipping currently operates do not take into account remedies for delay, therefore the need for such individual contracts of guarantees. Shipping companies expressly exclude themselves from consequences of delay in the Bill of Lading. The sample Hapag Lloyd Bill of Lading obtained (as explained in Chapter 3 above) in its Article 7 (Sundry Liability Provisions), sub paragraph 5 (delay) specifically states that 'unless expressly agreed, the Carrier does not undertake that the Goods shall arrive at the port of discharge or place of delivery at any particular time or to meet any particular market or use and the Carrier shall not be liable for any loss or damage caused by delay'. The Bill of Lading therefore factors specific agreements of guarantees mentioned above, however, it fails to address the questions raised above.

Noticeably absent from the Hague Visby Rules are any rules or prescriptions on delay of vessels, in sharp contrast with the Rotterdam Rules. Article 21 of the Rotterdam Rules defines delay in delivery as 'when the goods are not delivered at the place of destination provided for in the contract of carriage within the time agreed.' Chapter 5 of the Rotterdam Rules titled 'Liability of the carrier for loss, damage or delay' states the carrier is liable for delay in delivery, if the claimant proves that the delay took place during the period of the carrier's responsibility' (Article 17 (1). Article 17(3) of the Rotterdam Rules also provide a detailed list

of events or circumstances for which liability is relieved in part or in full. These include '(a) Act of God; (b) Perils, dangers, and accidents of the sea or other navigable waters; (c) War, hostilities, armed conflict, piracy, terrorism, riots, and civil commotions; etc. A full list of these exemptions is presented in Appendix (I) below. Arguably, this gives an opportunity for liner companies to escape liability where delays occur due to eventualities which are outside of their control. Further sub-paragraphs in Article 17 also provide rules for partial liability of the shipping company despite the occurrences of these eventualities where the shipper shows that the fault of the carrier caused or contributed to the instances of delay e.g. due to initial unseaworthiness of the vessel, improper crewing of vessels, failure to exercise due diligence, etc (Article 17(4) and (5)). A full list of these instances is also shown in Appendix I below.

Under Article 17(5(b)), the carrier remains responsible when it is unable to prove that (i) none of the events or circumstances referred to in subparagraph 5 (a) [unseaworthiness, improper crewing and equipping of the ship] caused the loss, damage, or delay; or (ii) it complied with its obligation to exercise due diligence pursuant to article 14. Therefore, the carriers cannot simply hide under the blanket of the exemptions. The impact of Article 17 (5(b) is essentially to put the burden of proof squarely on the carrier. Where a shipper is unable to prove unseaworthiness, improper crewing and equipping of the ship per Article 17(5(b)), it puts the burden on the carrier to prove that the delay was not caused by its own fault.

The Rotterdam Rules, unlike the Hague Visby Rules, therefore provide a robust protection for shippers, unlike the Hague Visby rules. The impact of this rule will be important for small shippers where courts interpreting the rules do not limit the impact of phrase 'within the time agreed' in Article 21 to include only contracts of guarantee as explored above. The clause should be interpreted generously to include instances where schedules are published and, on this basis, shippers make bookings with a shipping line. This strict interpretation is necessary in light of the fact that the decision to publish certain schedules and transit times are commercially strategic decisions done in order to gain competitive advantage over competitor shipping lines. Furthermore, it takes into account the unequal bargaining power which currently exists between shippers and shipping companies. A global company with operations in over 33 countries still commented on the presence of such unequal bargaining powers, depending on the routes sailed (Shipper 3). Moreover, a strict interpretation is supported because the ability to provide reliable services is a major justification for continued existence of Block Exemptions for shipping companies in Europe and many other trading regions. Therefore, without such

stringent interpretation, there will be little accountability to guarantee that this foundation is maintained. This is indeed the position in which shippers and shipping companies find themselves today.

Unfortunately, the Rotterdam Rules, as explained above, is still mainly ineffective as many shipping countries are yet to ratify to it. The Hague Visby Rules is still very much in force in most shipping companies and is most ubiquitous in Bill of Ladings of shipping companies. The Bill of Lading rules and Hague Visby Rules under which the liner shipping industry operates do not take into account the perspective of the shippers in its provisions. Bill of Ladings, in the form in which they exist today, existed as far as the 19th century (Taylor, 2015) while the Hague Visby Rules originated in 1968. Container shipping has in just in past 50 years assumed its place as a major driver of the global economy (The Economist, 2013), therefore these rules were not made with liner shipping in its consideration. Due to the very pertinent role which container shipping plays in the world trade, as well as increased consolidation amongst liner shipping companies as shown in Chapter 2.2, Table 2.2 and 2.3, it is important that there are measures to support the shippers and also hold shipping companies to their promises. These will be important in driving efficiency in liner shipping. As shown with the guarantee contracts, liner shipping companies are inclined to operate efficiently where there are legal repercussions at stake. Where there is a global repercussion such as the rules in the Rotterdam Rules, it is arguable that the tussle between the commercial vs operational to produce unrealistic schedules and transit times will be greatly reduced. This is not taken care of by contracting guarantees on individual basis by the shippers.

In the absence of a legal remedy, shippers who are caught in unfavourable positions with shipping companies are forced to vote with their feet (Shipper 3) i.e., to exclude the carrier/liner company from future tenders or bids (Shipper 5). In a liner network which is so greatly consolidated, this option is unsustainable and perhaps hurts the shipper more than the shipping company. Liner Shipping Expert 3 suggests an alternative solution. He notes that shippers have shown complacency in supply chain management, especially in the shipping leg. This is seen in failure to negotiate shipping agreements because shipping has in the past been so cheap, therefore, it showed such restraint and there were no real consequences for failure to do so. In another interview, Liner Expert 3 noted that shippers have treated shipping as a mere commodity and not as a strategic piece in its supply chain. He therefore posited another solution which is a more robust supply chain mechanism in which shipping is recognised as the most

volatile element of the chain and planning measures are undertaken in such a way as to take this to account, so that where there are delays, productions are not stalled or halted. 2 shippers interviewed agree with this liner shipping expert that shippers have in the past perhaps shown complacency in supply chain management.

However, Shipper 1 notes that the impact of this position i.e., considering shipping as volatile, is to put the shippers in a fire fighting position. According to the shipper, supply chain management has become about putting out fires- which is 'tiring and exhausting'. An example is the export department of his company since COVID-19. He notes that only 15% of the work done has been on actual planning, while 85% of the work currently done has been focused on dealing with schedule volatility. He also mentioned that the unit ordinarily consists of 7 staff members, but since the pandemic, there is now a staff strength of 8, with one staff member's role dedicated to what he has termed 'firefighting'. Shipper 2 echoes the same sentiment when he notes that two years ago, the company spent at most an hour a day, sometimes an hour a week organising logistics. Today, he notes that it is a daily business.

It is admitted that better supply chain management on the path of the shippers is advantageous and indeed potentially inevitable given the realities which COVI-19 has presented. Shipping companies such as CMA CGM and Maersk are increasingly offering such end-to-end supply chain services to shippers such as to account for the volatility of shipping – such that delays in shipping can be made up for in other legs of the supply chain. However, this service again is exclusionary such that not all shippers, whether for reasons of risk management or size, will be unable to participate. Such shippers should not be forced to outsource their entire supply chain management to shipping companies. Shipper 1 also notes that supply chain management services of non -vessel owning logistics companies such as Kuehne and Nagel, have traditionally not offered much service reliability. Such that in reality, only shipping companies who can control the shipping leg can truly offer such services. In light of the great consolidation already in the industry, this might not represent a desirable scenario. The foundation or the basis for which liner shipping exists or enjoys anti-trust exemptions around the world is to provide 'faster, cheaper, reliable services'. On this foundation, solutions to schedule reliability cannot only be commercial, but also legal. There should be legal obligations which prescribe a certain level liability for delays and failures to provide services promised, either as guarantees or through published schedules.

6.3 Vessel Capacity Availability

Capacity availability as explained above speaks to the ability of liner shippers to obtain space on vessels to ship their goods. Shipper 4 mentioned that prior to COVID-19 pandemic, capacity availability was not a real concern. Capacity was readily available where needed. This is confirmed by Liner expert 3 who noted that as shown in Table 2.4 that prior to COVID-19, freight rates were so low, which coupled with aggressive competition between shipping lines and overcapacity within the market, shippers were never short of vessel capacity when needed. He noted that pre-COVID, even shippers who entered into contracts with certain rates to ship a certain volume, often walked away from the contracts where there were cheaper rates available in another shipping line. This position is also confirmed by Shipper 4.

Shipper 4, however, remarked that prior to the pandemic, the limitation faced in the place of capacity was the equipment available. Given that the shipper ships avocadoes and bananas, the shipper noted that issues arose with reefers in that when loading reefers often broke down and there was a need to source alternative reefer containers from alternative shipping lines. At that time, the major problem was the inconvenience of such break downs or unavailability. However, the situation has developed radically since the advent of COVID-19 pandemic and the other supply chain disruptions which materialised.

The above reflects the sentiment of Liner Expert 3 when he notes that the market before the pandemic was a shipper's market. According to him, even shippers who had subscribed for long term volume contracts often reneged on those contracts whenever they found a cheaper service in another liner company. However, the dynamics have changed today with the demand and supply imbalance in liner shipping, and the shippers are being 'cry babies' (Liner Shipper 4).

Shippers today note that obtaining vessel capacity has been a challenge. Shipper 5 reported that his company witnesses 'challenges obtaining equipment and vessel capacity on an ongoing basis.' Through its freight forwarders, the company understands that carriers are not willing to quote with a validity beyond a quarter, and in some cases even one month. This position is also confirmed by Shipper 2. The position of shippers interviewed is collaborated by the increasing trend of major retailers such as Amazon, Costco, Dollar Tree, Home Depot, Ikea, Target, Walmart, to charter dedicated vessels to ensure availability of capacity (Baertlein, Saul and

Cavale, 2021, Dixon, 2021). In a statement made by Home Depot's chief operating officer, 'we have a ship that's solely going to be ours and it's just going to go back and forth ... 100% dedicated to Home Depot,' (Dixon, 2021). Chartering of vessels is not immediately available to all shippers; as shown by the names mentioned, these are the biggest shipping and retail companies who can afford to take such positions. Furthermore, in so far as chartered vessels are not able to by-pass bottlenecks such as port congestions, hinterland connections as well as storage spaces in temporary container yards and final destinations (Knowler, 2021). Instead, the addition of new vessels to the global network may further plug the bottleneck, rather than relieve it. As such, vessel capacity availability remains an important consideration.

As noted already above in Chapter 2.2, vessel capacity unavailability is caused by a demand - supply imbalance. This imbalance is also exacerbated by some of the actions of shippers, e.g. blank sailings. Liner shipping expert 2 confirmed that certain shipping lines (although not the shipping line which he represents) deliberately beach/take out older vessels with high maintenance costs, thus further exacerbating the demand-supply imbalance. According to a report in the Lloyds Loading List, shippers allege that certain shipping lines also restrict capacity by reneging on previously negotiated contracts, forcing shippers to obtain capacity on the expensive spot marker (Waters, 2021, Chambers, 2021, Dixon, 2021).

MCS, the US market leader for home construction and home improvement markets, whose clients include major retailers such Target, Walmart, Home Depot and Lowe's, filed the suit in August 2021, to the Federal Maritime Commission (FMC), mentioning both Cosco and Mediterranean Shipping Co (MSC) (Chambers, 2021). Specifically with regard to capacity, MCS alleged that MSC and COSCO refused to provide it with sufficient commitments in their advance service contracts, instead providing only a fraction of the space MCS needed at substantially higher prices. It alleged that the shipping companies were illegitimately selling space allotted to MCS Industries under its service contracts to other shippers. COSCO has since settled its differences with MCS out of court in a seven paged agreement which intended to restore and reinforce the long-standing business relationship between the parties (Chambers, 2021).

This position is also confirmed by Shipping Lining experts interviewed. Although they note that it is not their company's policy to engage in such contract breaches, the company had gained clients due to the refusal of other shipping companies to honour previous commitments,

thus forcing the customer to disengage business with the shipping company. Liner Expert 2, in giving examples mentioned a major furniture retailer, who had their advance contracts with some other shipping lines also breached, such that they were left stranded with empty stores and warehouses during the peak of the pandemic. Liner Shipping expert 2 noted that furniture shipper approached the company in which he works amid this desperate position and was able to secure some capacity as well as signed some long-term contracts. The risk, he remarked, is ensuring that the shipper remains loyal in the long term to these contracts when the market reverses and prices are cheaper, and much more in favour of shippers.

Liner Shipping Expert 3 noted that problem of capacity is only encountered by shippers who fail to treat shipping strategically, and instead treat shipping as a commodity. According to this expert, treating shipping strategically would involve long term negotiation of contracts and agreements with shipping lines which show some level of loyalty and commitment, some level of give and take. He notes that in the pre-COVID market, this might have meant paying a little more than the market rate (a premium) to guarantee this, and in the present COVID market, it is certain to be lower than the ever-soaring spot rates. However, he noted that without this, the position of the market simply has more demand than supply and therefore it is expected that some shippers will suffer from this. It is acknowledged that market imbalance currently affects vessel capacity availability such that services demanded cannot always be met by supply. However, the liner network remains inefficient in as much as the efficiencies are caused by some of the deliberate actions of the shipping lines in further limiting this capacity, such as reneging long term contracts.

Furthermore, the position of the Liner Shipping Expert 3 though compelling, does not answer the query of shippers, such as MCS, who find vessel capacity is limited, despite having advance long-term contracts, or freight forwarders who are unable to get quotes beyond a month's horizon as noted by Shipper 2 and 5. Questions are also raised on the unequal bargaining power between shipping companies and shippers. The unequal bargaining power between shipping companies and shippers, further exacerbated by the market consolidation (top 3 alliances control over 85% of global trade), COVID disruptions, mean that shipping companies can choose to renege contracts at will. Negotiations might also be adversely in favour of shipping companies, as against shippers because of this inequality in bargaining powers. As noted by Shipper 1, when negotiating contracts with shipping companies, certain elements are a matter of 'take it or leave it'. He notes that even though the sales personnel who is with you could

empathise with your position, he/she is usually unable to act given that there are company imposed legal forms off the back of which it can negotiate.

Also, shippers who do not command enough volume to enter into long term contracts with shipping companies are essentially disenfranchised from obtaining capacity. Perhaps there is a sense of futility with this position given the shortage of supply in the market. This is a usual position with any market where demand outweighs supply. However, measures should be taken to limit shipping companies from further limiting supply, so as to reduce the impact on these types of shippers. Moreover, the decision of the United States Federal Maritime Commission (FMC) will be interesting and perhaps a catalyst for further investigation into the activities and practices of shipping companies. It could provide impetus for shippers who are parties to advance contracts with shipping companies to pursue legal redress under the contract laws of the relevant regions.

Also, the United States Ocean Shipping Reform Act introduced in August 2021, which seeks to give to the FMC more powers to investigate shipping lines, may also yield interesting results for global liner shipping. Although some trade experts advise the US government to abstain from proscribing rules for the industry, urging instead to allow the market correct itself (Kulisch, 2021) it is arguable that where there are unfair and unjust practices occurring, the invisible hand of the market cannot simply correct these practices. Demand and supply imbalances may be corrected by the market, however supply imbalances caused by purposeful limitation of capacity, is not likely to be corrected by market forces. This is especially relevant noting the very dominant and oligopolistic liner shipping market which is presently existent. There might be a need for the laws to step in to review practices and provide some safeguards for shippers, especially smaller shippers whose volume shipped does not put them in a position cannot negotiate directly with the shipping companies. It is arguable that shipping companies who do not engage in such practices have no real reason to query introduction of such laws.

6.4 Cost Effectiveness

Analysis and results from the cost effectiveness metric are analysed in three ways; the actual cost of freight, the transparency of freight, and demurrage and detention costs.

6.4.1 Actual Cost of Freight

One of the primary benefits of containerisation is lower costs due to standardisation in use of container transport and economies of scale at nodes and terminals (Rodrigue, 2020). These lower costs are expected to the benefit the customer through lower costs of shipping services (EU BER Document, 2019). Therefore, the cost of shipping is an important efficiency metric for shippers. In the expert interviews conducted, both shippers and shipping companies agree that cost is an important consideration. Liner shipping expert 1 notes that from a commercial perspective, every liner network planning starts with one factor- freight. He notes that freight is the 'baseline/driving factor' in a network design. This is also collaborated by Liner Liner Expert 2, who notes that a network can actually be brought down to the container level, i.e. the cost of shipping a container from one place to another. Major developments in the shipping industry including slow steaming, liner ship gigantism, innovative propeller engineering and paint innovations, have been borne on the back of reducing costs of liner shipping (Liner Expert 2), arguably more so than the purported environmental drives.

Table 2.4 give evidence of the development of freight costs from 2017 – 2021. In the world of overcapacity pre-COVID, liner shipping companies barely struggled to breakeven. As shared by Liner Expert 2, many shipping companies had freight rates even lower than the slot costs; therefore, were making heavy losses. He noted that several shipping companies received support from governments in which they are headquartered in other to avoid bankruptcy. The story is much different today. Liner Expert 3 notes that shippers in the market today play the 'victim/cry baby' because it has become a liner shipper's market. He notes that for years and years, while the shipping companies struggled, it was a shippers' market, rates were low, and shippers were able to pit companies against each other in a competition for rock bottom prices. Other liner shipping experts also support this position, albeit less bluntly.

Furthermore, liner shipping experts agree that the present realities from a position of the cost of freight are caused by the trade imbalance discussed in Chapter 2.2 and Chapter 6.3 above. Basic economic theories support the position that when demand outstrips supply, prices go up (Mankiw and Taylor, 2020). Therefore, until the global demand falls and supply chain disruptions, including port congestions, unavailability of truck drivers (in some countries), etc, ease off, the cost of shipping is likely to remain high. There are also concerns on the future of ports and port congestions. As noted above, liner shipping has mainly being a catalyst for the

development of the ports. However, ports and terminals have not always developed as quickly as liner shipping companies have. Concerns remain in the industry amongst experts, including leading maritime shipping analyst/consultants on the wisdom of building even bigger ships and adding such to an already congested global liner networks (Sand, 2021, Knowler, 2021, Jensen, 2021).

This is also echoed in the comments of Liner Expert 2 who notes that these mega ships can call in only very few ports in the world, need to meet port requirements of draft, crane height, etc. After the Suez Canal blockage by the 20,124 TEU vessel, these bottlenecks of ports, waterways and canals were made evident to the world. Furthermore, the disastrous impact it can have on global supply chains; from businesses to individual households, was evident. Thus, the operational and commercial prudence of Ever Green's acquisition of the biggest Ever Ace vessel with 23, 992 TEU, with the same constraints still within the global supply chain must really be questioned. This is supported by Liner Expert 2's trite observation that these vessels are increasing very inefficient, and in reality, do not actually maximise economies of scale – which was the original justification of growth in vessel capacity.

Citing the example of HMM Algeciras which is a 23,964 TEU vessel, the biggest vessel as at August 2021, which on its maiden voyage sailed with just over 19,000 TEU (19,621) – i.e. just above 80% of its total capacity (Port Technology International, 2020). The Ever Ace vessel which is the current biggest ship with 23,992 TEU capacity departed on its maiden journey from the Qingdao Port at Shanghai loaded with only 6,200 TEU (less than 30% of its total capacity) (Maritime Executive, 2021). As noted by Liner Expert 2, a liner ship should be at least 85% utilised in order to ensure these economies of scale. He notes that there is a sense in which the race to acquire the biggest vessel is not about cost optimisation and to the benefit of the shipper, but simply for the prestige or glorification of the liner shipper company. When asked about the acquisition of some even bigger vessels by some shipping companies, in light of the present bottlenecks in the global liner network, he notes that although he does not have a sit at such strategic decisions, he does not believe there is a justification for such acquisitions from a strategic network planning perspective. He notes that the company in which he works is not currently acquiring bigger vessels, and he believes it is because they are thinking about their networks from the perspective of the global network.

6.4.2 Transparency of Freight

Another comment on costs is with regard to the transparency of costs by shipping companies. Shippers interviewed complain about the structure of freight and surcharges. Shipper 3 noted in his interview that ‘if there's one thing annoying about ocean freight carriers, is they have a very limited alphabet of 26 letters, but they find a combination of three letters to put a surcharge on in any form. So, if you take the 26 letters, and you find out how many combinations you can make, it's exactly the amount of combinations and surcharges that you can find.’ Shipper 5 collaborates this noting that that ‘the cost structure is very untransparent and carriers come up (and are allowed to do so!) with new surcharges every other day: Emergency imbalance Surcharge (EIS)*, Peak Season Surcharge (PSS), Low Water Surcharge, etc’. Definitions of these surcharges are given in Appendix II below. Shipper 4 and 5 note that some of these surcharges ‘make no any sense’ have no relation to the actual cost of shipping’. This is shown upon review of some of the surcharges in Appendix II – the question is often which arises is why shippers should be made to bear the costs of these surcharges. It appears that shipping companies transfer all risks associated with shipping to the customer through surcharges.

Secondary sources such as the TradeWinds and LoadStar, leading maritime online news outlets, collaborate this position expressed by shippers (Lewis, 2021, Wackett, 2021). The Loadstar reported that ‘ocean carriers are becoming ever more creative with the names for huge surcharges they are loading on top of already colossal FAK rates’ (Wackett, 2021). The news outlet reports on Hapag-Lloyd’s ‘value-added surcharge’ of $5,000 per 40ft, on transpacific shippers (Wackett, 2021). Hapag Lloyd explained to customers that this surcharge was due to “extraordinary demand from China and the resulting operational challenges along the transport chain” (Wackett, 2021). According to a Loadstar’s European NVOCC contact, “It’s outrageous, of course… but in fairness to Hapag, at least they tell you. Other lines don’t and we only find out when we try to book, and then it’s a ‘take it or leave’ choice” (Wackett, 2021). Other carriers such as Zim, Cosco and ONE, are already charging Asia to US west coast shippers in excess of $7,000 per 40ft for so-called value-added products, on top of their FAK rates (Wackett, 2021). On October 1, Maersk also introduced a new mandatory surcharge, the Container Protection Surcharge (CPS), which will apply from 1 November for shipments to Italy, is intended to protect shippers against financial losses due to container damage (Jumelet, 2021). The surcharge is mandatory on types of goods.

Maersk justifies the CPS surcharge on the basis that it protects shippers from paying up to an amount of 200 euros for container repairs and cleaning costs if something has gone wrong with an import container in Italy (Ibid). The imposition of such mandatory charges is that it is almost paternalistic in some measure- it seems to protect shippers; it seems to set some form of joint insurance policy and charges a mandatory premium. Yet, shippers can choose to simply pay the 200 damage fees or even insure elsewhere for such risks. Furthermore, surcharges such as LWS which raise a surcharge on the shipper for low water levels in a way absolves liner companies completely from taking on any risk – rising and falling water levels should be an implied risk in shipping. The extent to which these implied risks which businesses ordinarily should take on when they choose to operate within a field, can simply be pushed to the customers is a question for further exploration. It should be noted that surcharges are typical in other means of transportation. However, they are usually quite limited and not nearly as ubiquitous.

Liner shipping expert 3 when asked about these surcharges does not speak to the arbitrariness of these rates but instead notes that shippers who are in negotiated contracts with shipping companies do not find themselves in the position of arbitrary imposition of such charges. He notes that there are clauses (described by Shipper 3 as 'all in tariffs') in such contracts to protect shippers – i.e., a clause against imposition of new surcharges. Again, such give and take implies that the shipper would pay a slight premium. Accordingly, he again echoes the need for shippers to treat shipping strategically by entering into advance contracts with shipping lines which protect interests of both parties more robustly. Though understandable, the limitations of that position have been noted in Chapter 6.3 above.

One of the points noted in that regard was the unequal bargaining powers of the parties involved. This is expressed in the paragraph above as the 'take it or leave it' choice of shippers. When speaking to Shipper 3, personnel within a leading global agricultural brand, who ordinarily should be supposed to have almost equal bargaining power to shipping companies, he notes that contracts with shipping companies in this regard are essentially based off of framework contracts which do cover some elements, such as all in tariffs. These framework contracts are drafted by the liner shipping company's extensive legal team, and deviation from these framework contracts are 'challenging, time consuming and up until now bear very little results.' These framework contract he notes have the underlying legal support from IMO regulations and UN Shipping Regulations such as the Hague and Hague Visby Rules. These he

notes provide some form of legal backbone for the framework contracts but given that the Hague/Hague Visby Rules in their present state support the liner companies as analysed in chapter 6.2 above, these provide little comfort.

6.4.3 Demurrage and Detention Costs

Closely related to transparency of freight are costs levied for use of containers by shipping companies. Demurrage and detention charges are an important tool for shipping lines to ensure the efficient use of their container equipment (container-xchange.com, 2020). Demurrage are costs incurred by the shipper for the use of the container within the terminal beyond the free time period granted by the carrier (UNCTAD, 2018b). On the other hand, detention is the cost incurred for the use of the container outside of the terminal or depot, beyond the free time period (UNCTAD, 2018b). Free time granted by most shipping lines is on average 3-5 days (container-xchange.com, 2020; project-44.com, n.d). For shipping lines, it is essential to turn their containers around as fast as possible and, in consequence, container users should be discouraged from using equipment for longer periods (container-xchange.com, 2020).

Shipper 2 notes that apart from looking to schedule reliability and transit times, other conditions such as detention and demurrage times and penalties are also important considerations to explore when choosing a liner company. He notes that typically a shipper would appreciate a longer shipping time in order to ensure that they are able to take delivery of the container and return it appropriately. He notes that sometimes and with some shipping lines, it is difficult to determine when actually the free time starts counting for example. He noted that sometimes the liner company would prescribe that the free time for a demurrage starts counting from the time the ship berths. He notes that this is unrealistic noting that at that point the shipper has no access to the container. He further notes and echoes the sentiments of logistics expert, Mikel van Dikel, who notes that with port congestions being witnessed, even when the shipper or logistics operator is ready and willing to deliver empties or drop off containers at ports, the terminals are operating so close to full capacity that the shipper/losgistics operator is unable to do so. In this case, he notes that shipping lines still maintain the penalties, even though it was completely out of the control of the shipper. Shipper 4 interviewed also echoed similar sentiments as an exporter. She notes that when the vessel is delayed and containers are sent at the agreed time, the shipper still incurs extra costs from the shipping line. In essence, shippers bear the brunt of the lack of port capacity even where they have acted accordingly in all regards.

An Ocean Transparency and Visibility Project Report estimates that beneficial cargo owners pay millions annually in demurrage and detention fees alone (project-44.com, n.d.). Container-exchange in its report estimates an average of $123 after 7 days and $537 after 14 days across ports and shipping lines in detention and demurrage. These possibility of waiving such costs by shipping companies is often slim. A logistics expert remarked in discussion with him that in many situations, this is a long-winded debate on why the shipper should be absolved of the responsibility. He notes that in many situations, shippers give in and pay the penalty in order to continue getting services from shipping companies- who would exercise rights such as holding back on future shipments of the shipper. Shipper 1 notes that there is a sense in which the sales and marketing arms of shipping companies feel helpless too with regard to such charges. He notes that his contact person within the shipping company usually does empathise with his position but the usual response to a request for a waiver is that such penalties cannot be waived beyond a certain amount with approval from the headquarters. This process is often daunting and hence shippers just resort to paying such charges.

Shipper 2 believes that a feasible commercial solution lies in intermodal transport solutions, such that shippers with import flows may return empty containers to shippers with export flows. This way, it relieves capacity of ports, while also aiding efficient movement of empties and availability of equipment. However, he notes that shipping companies are typically not able to effect this due to deep specialisation in roles in shipping companies, thus it is practically impossible to get these two flows to communicate. He gives an example of having import export flows and export flows done with the same shipping line, yet he spent over a year and half to get to convince them to allow him to use the same containers.

Again, the legal provisions which govern demurrage and detention situations are largely lacking. The sample Hapag Lloyd Bill of Lading specifically states in Clause 20 (1) that ‘any failure to give notification of the arrival of the Goods shall not involve the Carrier in any liability nor relieve the Merchant of any obligation hereunder’. Clause 20 (2) speaks to application of storage detention and demurrage charges for failure to take delivery of goods within the time provided in the Carrier’s applicable Tariff. The import of Clause 20(1) is that even where there is a failure to give notification of the arrival of the vesse, i.e., failure to take delivery in Clause 20 (2) is no fault of the merchant (consignee), the merchant (consignee) may still be liable for demurrage/detention charges. This reinforces the position above where consignees are willing and able to undertake their responsibilities vis -a-vis the carrier but are unable to meet this obligation, yet consignees must pay penalties for this failure. Shippers may

choose to seek legal redress under the general contract laws of the country in which they operate. However, depending on the country, these rights may be limited. The liner network could benefit from clear rules spelling out when free time begins to count and ends. But most importantly, waiver of penalties where shippers/consignees are willing and able to return empties/pick up containers but find themselves unable to due port congestions, inability to obtain slots from ports or other such bottlenecks beyond their control.

CHAPTER 7: CONCLUSIONS

Recent global events, such as the COVID-19 pandemic and Suez Canal blockage brought liner shipping to limelight. Reports on freight rates, port congestions and supply chain challenges increasingly appear in the pages of generic newspapers and journals. This is truly unprecedented for an industry which barely a decade before was considered 'invisible'. Container shipping, the global mechanism, which fuels the world's increasingly consumerist appetite was so well hidden out of our views and consciousness that it took only a global pandemic to expose the impact of liner shipping. Accordingly, it became important to answer the question; ***is liner shipping system efficient?*** To answer this question, 5 sub-research questions were defined and answered in this thesis.

The first sub-research question, 'h*ow can liner shipping be viewed as a system?'* was answered in Chapter 2. Liner shipping was shown to consist of an assembly of components – in this case, actors (shipping lines, terminals/ports, shippers/consignees, freight forwarders) who interact and affect one another's behaviour within the system. The most important element of a system is that ability for the collection of parts to accomplish an overall goal; in liner shipping, the overall goal is the fast, cheap, and reliable movement of goods around the world. The role of this chapter within the framework of this thesis was to set a background for the understanding of the liner shipping network, i.e., how it is developed, the actors within the network and how the operates.

The second sub-research question: *how can contracts in liner shipping be viewed as a network?* was answered in Chapter 3. Major contracts in liner shipping were explored; contract of carriage, bills of lading, liner shipping cooperative agreements and terminal agreements. These contracts, though regulating the interactions of different actors within liner shipping, also ultimately impact one another. For example, the bill of lading which regulates the interaction between the shipper and the liner shipping company also is closely connected and impacted by the contract of carriage. International maritime conventions which also form the framework on which these contracts are negotiated were also explored in this sub-research question. This question sets the context for the analysis of the behaviour of actors within the liner network as they do not act in a vacuum. Contracts and international conventions regulate and govern behaviours, and thus, also impact the operation of the liner network.

The third sub-research question: [w]*hat are the measures of (operational) efficiency of the liner shipping system?* was answered in Chapter 4. Efficiency was analysed from the perspective of shippers. Liner shipping was designed to provide faster, cheaper and reliable services and from this three metrics were developed: these three metrics address this fundamental design objective of liner shipping: service quality, vessel capacity availability and cost (freight). Service quality speaks to the ability of the shippers to send and receive their goods when needed and as agreed with the shipping lines. Vessel capacity availability refers to the ability of the shippers to secure space on vessels, as well as secure equipment (containers) to make this possible. Cost speaks to the ability of shippers to send their goods at affordable and transparent rates.

The fourth sub-research question: [h]*ow can the network of contracts be accessed on these efficiency metrics? was* addressed in Chapter 6. It was found that that the network of contracts (specifically bills of ladings) and the international conventions provisions do not offer support for the efficiency metrics as analysed from the perspective of shippers in regard to all efficiency metrics. As shown in Chapter 6 above, when analysed in light of the imbalance of negotiating powers between shippers and shipping companies, this position is untenable and eventually creates a system of no checks and balances. The effect of this is that efficiency on these metrics is relegated to the willingness or goodwill of the parties. As has been shown in Chapter 6 above, in situations of disruptions or a market which favours one side over the other, the goodwill to take actions which promote efficiency is often lacking.

The final sub-research: *[h]ow can the operational performance of liner shipping be assessed based on these efficiency measures?* was addressed in Chapter 6 as well. The planning of the liner shipping network was shown to be a thorough and rigorous process. From the interviews with the liner operators, it was shown that liner companies invest in a lot in building the networks. However, in terms of the actual operations of the network, there is a lot to be desired. Service reliability was shown to be quite poor during these days at 33%. The situation was much better pre-COVID, but as shown by the shippers' comments and the data not entirely perfect. Vessel capacity availability was also shown to be poor today, and both shippers and liner experts confirm, along with secondary sources, that capacity is often limited on purpose by shipping companies This position, in light of the third efficiency metric, is highly undesirable noting the very high cost of shipping at the moment as well as the perceived lack of transparency in these freight costs.

Given the analysis above, we return to the research question; *is the liner shipping system efficient?* A succinct answer is given in the comments of an interviewed shipper: '[The liner shipping network] is very inefficient and even paradoxical. Schedule reliability has never been so low, capacity never so tight but at the same time cost of shipping has never been so high.' It is important to note that shipping lines alone cannot be blamed for this inefficiency. Global trade imbalance, limited port capacity and limited hinterland connectivity are other factors which threaten liner network efficiency.

However, there are instances in which the liner companies exacerbate the situations with supply restrictions, sporadic and arbitrary imposition of surcharges, introduction of new mega vessels into the global liner network, and perhaps unrealistic promises to customers in order to maintain a competitive edge in the industry. This coupled with the fact that the inadequacy of the available international maritime laws means that shippers are often left greatly dissatisfied.

The liner network is a system. An important element of systems is the ability to self-correct through feedback. It is expected that over time, the liner network will self-adjust so that schedule reliability will improve, costs will fall, and vessel capacity availability will also improve. The feedback system of the liner network system has exposed certain bottlenecks which are currently impact efficiency of the system. Therefore, it is expected that as these bottlenecks are unplugged, efficiency will also improve, i.e., as ports capacity expands, global trade imbalance and hinterland connectivity improve, demand will fall to meet supply and the freight is expected to self-correct as well.

From this, the first recommendation for the liner shipping system can be gleaned. It is important that other actors in the system are developing at the same rate as liner shipping companies. Port capacity is a bottleneck, so investment in port capacity expansion is necessary and must be addressed, even in a world without COVID-19. The Suez Canal blockage is also a glaring case for the need for expansion of important channels and waterways as ships get bigger. Strong hinterland network is also important to move containers in and out of ports efficiently in order to limit congestion at ports. These will aid in increasing service reliability, vessel capacity availability and invariably cost. Secondly, it is recommended that shipping lines to take into account the global liner network in making strategic decisions on fleet size and mix. The situation of the global liner network does not support addition of bigger vessels, and neither does the economics support such an investment where vessels are operating very much below

capacity. It is time the efficiency and economic justifiability of these bigger vessels are called into question, on a practical level.

Furthermore, there are certain aspects of liner shipping cannot be expected to self-correct on a permanent basis until the legal structure on which the industry is built is updated. Therefore, it is recommended that rules to address delay and deviations should be introduced to encourage a certain level of commitment by liner companies regardless of existing contractual relations will be beneficial. Rules to also protect shipping lines such that long term agreements with shippers are not reneged when costs and prices drop must be introduced. In the same vein, rules to protect shippers and consignees such that long term agreements with shipping companies are not reneged with disruptions will also prove beneficial. An investigation of surcharges which are sporadically invented and applied mandatorily on shippers is also important. There should be parameters to justify which types of surcharges can be introduced, and potentially give shippers an option to opt in or out. An example of such a surcharge is the container protection surcharge. These legal updates will give the liner network a healthy backbone on which to operate such that where there are disruptions in the future, both parties (shippers and shipping lines) are adequately protected.

This thesis relied heavily on expert interviews, and therein lies its limitation; the sample size of the interviewees. This is limitation with sample size is especially with regard to the liner companies. All 4 liner experts interviewed were all from one company and invariably many comments were given from the perspective of this company. On some instances, the interviewees note that their position markedly differs from what they know other shipping companies do, thus their views did not always represent the perspectives of the industry. A way to balance this was the use of the triangulation methodology, using secondary sources of information and independent analysis to collaborate evidence collected from shippers interviewed. Nevertheless, an area of improvement or further research will be to conduct such interviews on a much more global perspective, increasing the sample size and geographical spread of both liner shipping experts and shippers interviewed. This will give a more robust approach to the topic.

APPENDIX

Appendix I

Rotterdam Rules (Excerpts)

Article 21

Delay

Delay in delivery occurs when the goods are not delivered at the place of destination provided for in the contract of carriage within the time agreed.

Chapter 5

Liability of the carrier for loss, damage or delay

Article 17

Basis of liability

1. The carrier is liable for loss of or damage to the goods, as well as for delay in delivery, if the claimant proves that the loss, damage, or delay, or the event or circumstance that caused or contributed to it took place during the period of the carrier's responsibility as defined in Chapter 4.

2. The carrier is relieved of all or part of its liability pursuant to paragraph 1 of this article if it proves that the cause or one of the causes of the loss, damage, or delay is not attributable to its fault or to the fault of any person referred to in article 18.

3. The carrier is also relieved of all or part of its liability pursuant to paragraph 1 of this article if, alternatively to proving the absence of fault as provided in paragraph 2 of this article, it proves that one or more of the following events or circumstances caused or contributed to the loss, damage, or delay:

(a) Act of God;

(b) Perils, dangers, and accidents of the sea or other navigable waters;

(c) War, hostilities, armed conflict, piracy, terrorism, riots, and civil commotions;

(d) Quarantine restrictions; interference by or impediments created by governments, public authorities, rulers, or people including detention, arrest, or seizure not attributable to the carrier or any person referred to in article 18;

(e) Strikes, lockouts, stoppages, or restraints of labour;

(f) Fire on the ship;

(g) Latent defects not discoverable by due diligence;

(h) Act or omission of the shipper, the documentary shipper, the controlling party, or any other person for whose acts the shipper or the documentary shipper is liable pursuant to article 33 or 34;

(i) Loading, handling, stowing, or unloading of the goods performed pursuant to an agreement in accordance with article 13, paragraph 2, unless the carrier or a performing party performs such activity on behalf of the shipper, the documentary shipper or the consignee;

(j) Wastage in bulk or weight or any other loss or damage arising from inherent defect, quality, or vice of the goods;

(k) Insufficiency or defective condition of packing or marking not performed by or on behalf of the carrier;

(l) Saving or attempting to save life at sea;

(m) Reasonable measures to save or attempt to save property at sea;

(n) Reasonable measures to avoid or attempt to avoid damage to the environment; or

(o) Acts of the carrier in pursuance of the powers conferred by articles 15 and 16.

4. Notwithstanding paragraph 3 of this article, the carrier is liable for all or part of the loss, damage, or delay:

(a) If the claimant proves that the fault of the carrier or of a person referred to in article 18 caused or contributed to the event or circumstance on which the carrier relies; or

(b) If the claimant proves that an event or circumstance not listed in paragraph 3 of this article contributed to the loss, damage, or delay, and the carrier cannot prove that this event or circumstance is not attributable to its fault or to the fault of any person referred to in article 18.

5. The carrier is also liable, notwithstanding paragraph 3 of this article, for all or part of the loss, damage, or delay if:

(a) The claimant proves that the loss, damage, or delay was or was probably caused by or contributed to by (i) the unseaworthiness of the ship; (ii) the improper crewing, equipping, and

supplying of the ship; or (iii) the fact that the holds or other parts of the ship in which the goods are carried, or any containers supplied by the carrier in or upon which the goods are carried, were not fit and safe for reception, carriage, and preservation of the goods; and

(b) The carrier is unable to prove either that: (i) none of the events or circumstances referred to in subparagraph 5 (a) of this article caused the loss, damage, or delay; or (ii) it complied with its obligation to exercise due diligence pursuant to article 14.

6. When the carrier is relieved of part of its liability pursuant to this article, the carrier is liable only for that part of the loss, damage or delay that is attributable to the event or circumstance for which it is liable pursuant to this article.

Article 24

Deviation

When pursuant to applicable law a deviation constitutes a breach of the carrier's obligations, such deviation of itself shall not deprive the carrier or a maritime performing party of any defence or limitation of this Convention, except to the extent provided in article 61.

Appendix II

Emergency Imbalance Surcharge.

In the case of multiple ports of destination, the amount of inbound cargo exceeds the amount of outbound cargo, as a result of which the shipping companies are faced with large quantities of empty containers on the quayside, which are no longer used for export. In order to be able to transport these containers to the nearest hub for reuse, an Emergency Imbalance Surcharge (EIS) is charged on the outward cargo so as to cover these costs.

Logistics Glossary. (n.d.). *EIS*. [online] Available at: https://www.logisticsglossary.com/term/eis/ [Accessed 15 Oct. 2021].

Peak Season Surcharge

As from early August, an enormous peak arises in the transports from the Far East to the West. This usually lasts until early November. Consequently, the shipping companies impose a Peak Season Surcharge. This surcharge is levied for all shipments from Asia (with the exception of Japan). The shipping companies reserve the right to extend the PSS, if so dictated by the circumstances.

Logistics Glossary. (n.d.). *PSS*. [online] Available at: https://www.logisticsglossary.com/term/pss/ [Accessed 15 Oct. 2021].

Low Water Surcharge (LWS)

As from January 10th, carriers are implementing an LWS Surcharge for all cargo shipped to or via Montreal. Due to the current water level of the St Lawrence River, ships have a limited loading capacity. This means that fewer containers can be loaded on board. Shipping companies compensate for this by introducing a Low Water Surcharge. The port of Montreal is only accessible via this St Lawrence River.

embassyfreight.be. (n.d.). *LWS Surcharge for cargo shipped to and via Montreal*. [online] Available at: https://www.embassy-freight.be/en/news/lws-surcharge-for-cargo-shipped-to-and-via-montreal/ [Accessed 15 Oct. 2021].

Appendix III

Transcripts of interviews have not been provided to protect the confidentiality of the interviewees. This was the precondition on which all interviewees granted interviews to the author of this paper.

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