The Rise of Digital Platforms: Development of a Digital Strategy for Jumbo Maritime

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Thesis for the degree of MSc in Marine Technology in the specialization of
Shipping Management

The Rise of Digital Platforms: Development of a Digital Strategy for Jumbo Maritime

By

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Performed at

Jumbo Maritime

This thesis SDPO.18.012 is classified as confidential in accordance with the general conditions for projects performed by the TUDelft.

09-05-2018

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Preface

The research described in this thesis is performed in order to complete the Marine Technology Master at the Delft University of Technology in the specialization of Shipping Management. For this research I studied the area where the traditional heavy lift shipping industry faces the disruptive forces of digital technology. This topic has been very challenging, because the research area is almost unexplored and my knowledge of digital platforms and the underlying economics, the heavy lift shipping industry and Jumbo were rather limited prior to the start of this project. The exciting diversity of disciplines involved in this research motivated me to learn about the diverse aspects and to shape a coherent multi-disciplinary project. The multi-disciplinary approach of this research, in my view, fits very well in the specialization shipping management.

This research would not have been completed without the support during the entire process of this research of people from Jumbo, the TU Delft, my family and friends, starting with the persons from Jumbo. First, I would like to thank my company supervisor, Kasper van der Heiden, for giving me the opportunity to conduct this research project at Jumbo and for guiding me throughout this project. Kasper's quote 'Als je niet kunt delen, kun je ook niet vermenigvuldigen' has been a great source of inspiration for me. Secondly, I would like to thank Bart Zielhuis from Jumbo, for his effort and involvement during our monthly meetings and especially for giving direction during this research. Finally, I would like to thank Duke, Michel, Joeri and Sjoerd, my fellow graduate students at Jumbo, for the helpful study related conversations and fun during breaks that stimulated the free spirit.

Many thanks to Eddy van de Voorde and Koos Frouws, my supervisors from the TU Delft, for the help, guidance and discussions throughout this project. Eddy van de Voorde especially provided me the economic foundations for this research. Koos Frouws guided me from a maritime technology perspective and I will never forget his Frisian words 'net min', after one of our meetings. Thank you Hans Veeke, for being member of the exam committee for this research.

Family and friends, thank you for the support and the discussions that enabled new insights and thoughts. Last and not the least, I would like to thank Elke for the support and the encouragements that kept me going.

Lex Hagenbeek

Delft, 20-04-2018

Abstract

Digital platforms are on the rise and have affected strategic conduct and market structure in industries. The impact of digital platforms on the heavy lift shipping industry is not clear to Jumbo and they, as a supplier in this industry, need a digital strategy in order to seize the new opportunities and to defend their position against the threats in their industry that are driven by digital platforms. This research provides a strategic advice to Jumbo, by the analysis of the impact of digital platforms on the heavy lift shipping industry and by addressing the opportunities and threats to Jumbo based on their position in the by digital platforms affected market space. A framework is developed by literature research into the impact of digital platforms on industries that can be applied to the heavy lift shipping industry. The market structure and strategic conduct in the heavy lift shipping industry are explored by a market analysis and Jumbo's strategy and performance in the industry are explored by a company analysis. The types, value adding processes, effects and strategic implications of digital platform in the heavy lift shipping industry are addressed by the application of the framework to the market characteristics from the market analysis. The meaning of digital platforms to Jumbo is deduced from Jumbo's position in the heavy lift shipping industry and their potential approach. Strategic options for Jumbo are developed and assessed and finally a strategic advice is provided to Jumbo.

The heavy lift shipping industry consists of two different market segments. The special segment is characterized by high complexity transportation services and a concentrated supply side. The commodity segment is characterized by low complexity transportation services and a fragmented supply side. The impact of digital platforms is therefore different in both market segments. The exchange of information is improved by information links in bi-lateral relations in both market segments. The exchange of information and the coordination of transactions is improved by marketplaces in multi-lateral relations in the commodity segment only. The reduction of transaction costs caused by marketplaces is not expected to increase the demand of the current charterers and potentially attracts charterers that currently choose for alternative transportation modes. The reduction of transaction costs provides opportunities to the shipowners that are active in the special segment to improve their market access to the commodity segment to increase the utilization of their fleets. The impact of digital platforms in the heavy lift shipping industry is associated with strategic implications for shipowners, charterers and (digital) intermediaries, whose actions will influence the actual impact. Jumbo is a main player in the special segment, but stagnating demand increases their dependence on the commodity segment as a source of revenue and their low level of flexibility limits their market access to the commodity segment. A pro-active approach by Jumbo to information links is proposed in order to retain and attract customers in the special segment and to minimize the risk of becoming obsolete. A re-active approach by Jumbo to marketplaces is proposed in the commodity segment, because the opportunity of increasing their market access to the commodity segment by establishing a marketplace does not outweigh the risk of investment and channel conflicts.

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Chapter 1

Introduction

This chapter provides an introduction of this research. First, the background of this research is discussed in section 1.1. Secondly, the problem statement is discussed in section 1.2. Subsequently, the goal of this research is formulated in section 1.3. The scope of this research is discussed in section 1.4. Finally, the structure of this report is explained in section 1.5.

1.1 Background

Jumbo Maritime is a heavy lift shipping and offshore installation contractor and is active in a traditional and capital intensive niche market. Jumbo is a family owned company, founded in 1965 with their headquarters based in Schiedam, the Netherlands. Jumbo currently owns and operates ten Heavy Lift Crane Vessels (HLCVs) with a 650 tons to 3000 tons combined crane capacity, serving the top segment of the heavy lift shipping industry. Jumbo tramps their ships world wide and has representative offices and agents around the globe. Their network of sales representatives and agents is aimed for maintenance of ongoing customer relationships, business development and processing inquiries for their transportation, lifting and installation services.

The heavy lift shipping industry has been transformed from a seller's market to a buyer's market, because of a severe oversupply of tonnage and stagnated demand due to the financial crisis and the decreased oil price. Jumbo has been in a monopolistic position for decades, but currently their customers have more opportunities and Jumbo has to share their market. Jumbo is navigating through challenging times in which the oversupply of tonnage and a lack of profitable contracts imply strong competition, which means they are looking for opportunities to find more and new customers and to increase the utilization of their assets.

In other industries, digital platforms have already provided these opportunities to suppliers in markets. Progress in Information Technology (IT) has been driving traditional firms and start-ups to leverage digital platforms to connect supply and demand in markets, even uncovering latent supply and addressing unmet demand. Several digital platforms have impacted market structure in other industries, for example Airbnb and Uber have disrupted the hospitality and the taxi industry, without even owning the required capital assets in these industries. These platforms provide benefits for the demand side to buy for lower prices, to access a wider and more diverse range of supply at lower search costs and to have more transparency in terms of price, service and quality. At the same time, these digital initiatives offer opportunities for the supply side of markets to unlock excess capacity, generate extra income and to market goods and services to more and new prospective clients.

On the other hand some incumbent sellers face the threat of stronger competition and dependency on dominant platform companies. In some industries, incumbents have seized the opportunity of being a first mover in digital initiatives, establishing barrier to entry for competitors or third parties that are or about to introduce digital initiatives. Digital platforms have already emerged in the maritime industry, initiated by both demand and supply side of maritime markets and by both traditional and digital intermediaries. Even in Jumbo's industry digital platforms have been initiated in the form of online chartering marketplaces in the freight market of the heavy lift shipping industry. These marketplaces have not yet proven to be as successful and effective as Airbnb or Uber. The rise of these digital initiatives and the potential effects and strategic implications and effects in the heavy lift shipping industry should not be neglected, because Jumbo could be exposed to the opportunities and threats of these digital initiatives.

1.2 Problem Statement

Digital platforms have had implications on strategic conduct and changed market structure in several industries. These systems have been initiated by incumbent sellers, buyers and traditional or new intermediaries industries. The emergence of these digital platforms, driven by innovation in information technology, offer new opportunities and create new threats to sellers, buyers and intermediaries in industries. In the maritime industry and even in breakbulk and project shipping, digital platforms have already emerged in the form of online chartering marketplaces. These digital platforms have not yet proven to change the market structure of the heavy lift shipping industry. The rise of these digital initiatives emphasizes the importance to be aware of the effects and strategic implications of digital platforms in the heavy lift shipping industry. The effects of these digital platforms to the heavy lift shipping industry are not clear to Jumbo and they, as a seller in this market, need to be aware of the new opportunities and threats that are brought by current and potential digital initiatives in their industry.

Jumbo needs to develop a digital strategy to seize the opportunities and defend their position against the threats from digital initiatives in the heavy lift shipping industry by sellers, buyers and intermediaries. By a digital strategy is meant the initiation and or participation of information systems in order to contribute to profit maximization for Jumbo. This strategy has to be well-substantiated by the effects and strategic implications of digital platforms in the heavy lift shipping industry.

1.3 Goal

The goal of this research is to contribute to profit maximization for Jumbo by the development of a digital strategy in order to seize the new opportunities for Jumbo and to defend their position against the new threats in the heavy lift shipping industry that are driven by digital platforms.

1.4 Research Scope

The research scope is based on the desired focus of Jumbo Maritime and on the available data for this research. This research focuses on the impact of digital platforms that facilitate the exchange of information and that coordinate transactions in bi-lateral and multi-lateral relations in vertical market settings that have potential to affect the freight market of the heavy lift shipping industry. The types, value adding processes, effects and strategic implications of digital platforms are in the scope of this research.

The focus is on the market structure of the freight market of the heavy lift shipping industry during the market analysis. The structure of the demand side and supply side of this industry are in the scope. The strategic conduct of shippers, shipowners, and intermediaries in this industry are in the scope of this research. Distinction is made in the commodity segment and the special segment, because market structure and strategic conduct are different in each of these segments. The distinction in segments is based on the weight of the cargoes that are transported in these segments.

This research focuses on Jumbo's current strategy, commercial procedures of Commerce Shipping and their performance during the company analysis. The analysis of Jumbo's strategy focuses on their fleet, organization, value chain, objective and cooperation. The analysis of Jumbo's commercial procedures focuses on business procedures conducted by Commerce Shipping and on the media and channels of information exchange with their customers. The analysis of Jumbo's performance focuses on their profitability and on the potential to increase the yield of their fleet.

The types, potential value adding processes, effects and strategic implications of digital platforms in the heavy lift shipping industry are qualitatively analyzed, making a distinction in the impact on the commodity segment and the special segment, because the market structure is different for these market segments.

The opportunities and threats of digital platforms to Jumbo are qualitatively addressed separately for the special segment and the commodity segment. The opportunities and risks are addressed for a pro-active approach and a re-active approach in each market segment by Jumbo.

The required organizational changes are out of the scope of this research during the formulation and assessment of strategic options. The selection and the actual implementation of a digital strategy for Jumbo are beyond the scope of this research, because this research is only advisory to Jumbo.

1.5 Research Outline

This research is built up from three parts. Part I consists of literature research into the impact of digital platforms on industries, a market analysis of the heavy lift shipping industry and a company analysis of Jumbo. Part II contains an analysis of the impact of digital platforms on the heavy lift shipping industry and the meaning of this impact of digital platforms to Jumbo. Part III contains the formulation and assessment of strategic options in order to provide a strategic advice to Jumbo.

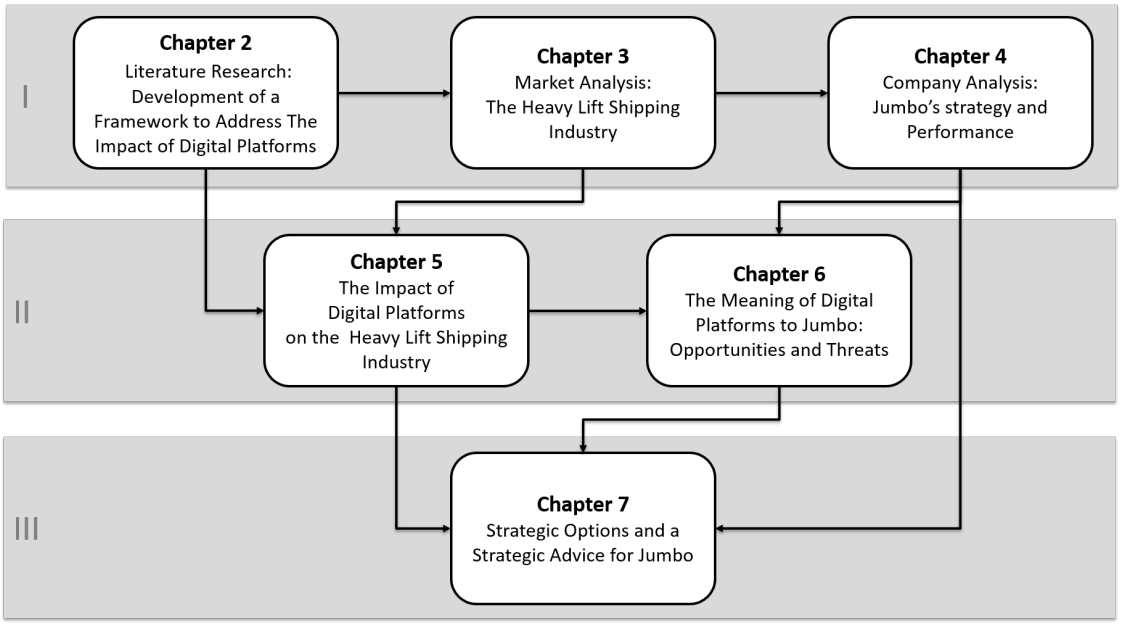


Figure 1.1: Research Outline

Figure 1.1 summarizes the outline of this research. Chapter 2 provides literature research into the characteristics of digital platforms and the impact of digital platforms in industries. A framework is developed that can be used to address the impact of digital platforms on the heavy lift shipping industry. This framework includes the characteristics, value adding processes, effects and the strategic implications of digital platforms in industries.

Chapter 3 provides a market analysis focused on the freight market in the heavy lift shipping industry. The market analysis serves as a context for the company analysis of Jumbo in chapter 4 and is used together with the framework to analyze the impact of digital platforms on the heavy lift shipping industry in chapter 5. The market analysis is performed by investigating the demand side, the supply side and the coordination of transactions between these sides, making a distinction in the special segment and commodity segment. The demand side of this industry is analyzed by studying the types, number and size distribution and behaviour of charterers. The supply side of this industry is analyzed by studying the types, number and size distribution and strategies of shipowners. The coordination of transactions in this market is analyzed by studying the current media of market coordination in this industry and the role and market power of shipbrokers and freight forwarders in this market.

Chapter 4 provides a company analysis that addresses Jumbo's market position and power in the heavy lift shipping industry and addresses the strengths and weaknesses of Jumbo's current strategy and business procedures. Jumbo's market position, market power and

the impact on the heavy lift shipping industry together form the basis to address the opportunities and threats of digital platforms to Jumbo. Jumbo's market position and power and the strengths and weaknesses of Jumbo's strategy are addressed by analyzing their business objective, fleet, organization, value chain and cooperation with other parties. The strengths and weaknesses of Jumbo's business procedures are analyzed by investigating the current organization of Commerce Shipping, the nature of the exchange of information. Moreover, the potential to increase the yield of Jumbo's fleet is investigated by the analysis of the voyages and stowage plans from 2016.

The impact of digital platforms on the special segment and the commodity segment of the heavy lift shipping industry is analyzed in chapter 5. This analysis is performed by the application of the framework that is developed in chapter 2 to the characteristics of the heavy lift shipping industry that are addressed in chapter 3. The expected digital platform types and value adding processes are addressed for the special segment and the commodity segment. The effects and potential initiators of information links and marketplaces in the heavy lift shipping industry are addressed.

The meaning of digital platforms to Jumbo is analyzed in chapter 6, based on Jumbo's position in the by digital platforms affected market space. The opportunities and threats of digital platforms to Jumbo are addressed, distinguished in a pro-active and re-active approach by Jumbo to digital platforms in the special and commodity segment. The addressed opportunities and risks can be used in chapter 7 in order to formulate and assess strategic options for Jumbo.

Strategic options are formulated in chapter 7 by a Strengths Weaknesses Opportunities Threats (SWOT) analysis. The strengths and weaknesses from chapter 4 and the opportunities and risks from chapter 6 are used as inputs for these four SWOT analyses. The strategic options are assessed by an opportunity and risk assessment. Finally, a strategic advice is provided to Jumbo that is based on the opportunity and risk assessment of the strategic options.

Chapter 2

Literature Research: Development of a Framework to Address The Impact of Digital Platforms on the Heavy Lift Shipping Industry

This chapter provides literature research into the characteristics of digital platforms, the value adding processes, the effects and the strategic implications in industries. The literature research that is provided in this chapter is supported by examples of digital platforms in industries. The goal of this chapter is to develop a framework that can be used to address the impact of digital platforms on the heavy lift shipping industry in chapter 5. The impact of digital platforms in industries is dependent on different aspects, which makes it challenging to develop a framework that can be used to address the impact of digital platforms in the heavy lift shipping industry.

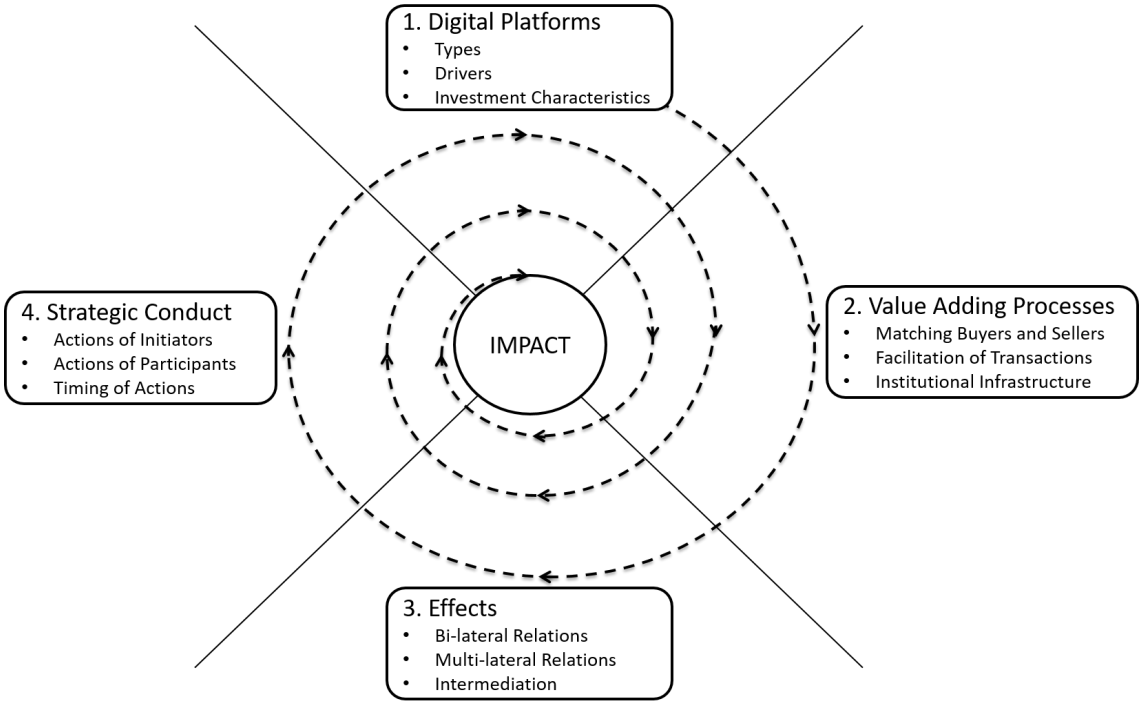


Figure 2.1: A Framework for the Impact of Digital Platforms in Industries

This research proposes to develop a framework that is built up from four parts as shown in figure 2.1. The parts of the framework involve aspects of digital platforms that influence the eventual impact of digital platforms in industries, which are discussed separately. The first part is discussed in section 2.1 and will be used to address the characteristics, types and drivers of digital platforms in the heavy lift shipping industry. The second part of the framework is discussed in section 2.2 and will be used to address the potential value adding processes of digital platforms in the heavy lift shipping industry. The third part of the framework is discussed in section 2.3 can be used to address the effects of digital platforms in the heavy lift shipping industry. The fourth part of the framework is discussed in section 2.4 and is used to address the strategic implications of digital platforms in the heavy lift shipping industry. The long term impact of digital platforms market structure industries depends on the confluence of the different aspects involved in the framework, as will be concluded in section 2.5.

2.1 The Rise of Digital Platforms

The purpose of this section is to understand the characteristics of digital platforms. The definition of digital platforms is discussed in section 2.1.1. The drivers of digital platforms are discussed in section 2.1.2. The potential of digital platforms in the heavy lift shipping industry is discussed in section 2.1.3, concluding that only digital platforms that exchange information in this industry and improve the coordination of transactions. Inter-Organizational Information Systems (IOS) are introduced in section 2.1.4 as systems that facilitate the exchange of information and improve the coordination of transactions between multiple organizations. Information links and marketplaces are introduced in section 2.1.5 as types of IOS. The functional structures of these types are discussed in section 2.1.6 for information links and marketplaces. The characteristics of capital investment in digital platforms are discussed in section 2.1.7. Finally, the findings of this section are discussed in section 2.1.8

2.1.1 The Definition of Digital Platforms

Digital platforms lack a definition as mentioned in a research on the implications of digital platforms performed by TNO. According to van Eijk et al., studies on digital platforms do not provide a definition, but authors use examples to explain digital platforms. They mention the most broad definition of a digital platform as (technological) basis for delivering or aggregating services or content from service or content providers to end-users [van Eijk et al., 2015].

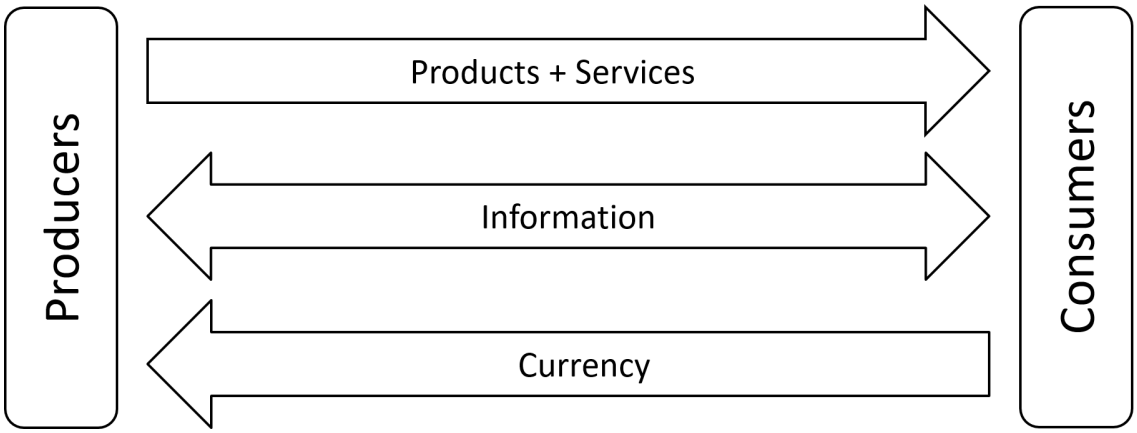


Figure 2.2: The exchange of value between producers and consumers

According to Parker et al. a platform is a business model that is based on the creation of value by the facilitation of interactions between producers and consumers. The creation of value is enabled by the open, participative infrastructure of the platform for these interactions and this infrastructure sets governance conditions for the participants. [Parker et al., 2016]. Parker et al. argue that the value that is exchanged on a digital platform between producers and consumers can be information, goods or service and currency. A schematic representation of the exchange of value between producers and consumers is shown in figure 2.2. The exchange of value between participants of a digital platform has improved by the digital technologies, that have enabled producers and consumers to connect more accurately, easier and at higher speed [Parker et al., 2016]. The drivers digital platforms are discussed in section 2.1.2.

2.1.2 Drivers of Digital Platforms

Digital technologies are on the rise and stakeholders in many different industries have experienced change by digital initiatives. The economy and society are going through a digital revolution and the impact of this digital transformation is as far reaching as the industrial revolution, according to Chalons and Dufft [Châlons and Dufft, 2017].

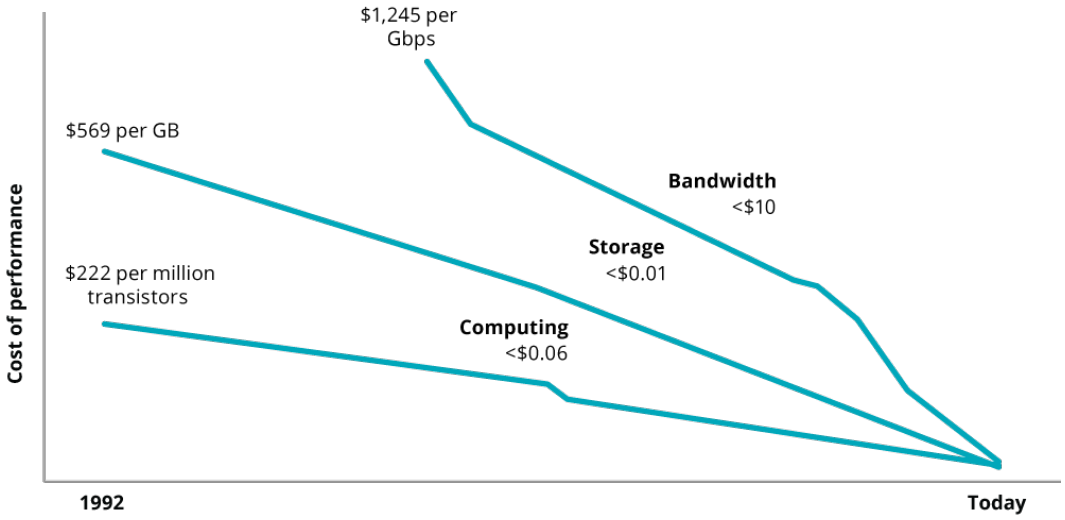


Figure 2.3: Decreasing transmission, storage and computing costs [Mussomeli et al., 2016]

As data computing, storage and transmission have become less expensive over the years, information technology has spread to a wide range of industries. The decreasing costs of computing power, storage capacity and transmission band-with of data are shown in figure 2.3 [Mussomeli et al., 2016]. These cost reductions have led to increased investment in information systems for firms to support both existing internal and external processes, to achieve higher efficiency's by reducing the time and cost of data processing. These technologies have not only supported existing processes, but have caused the change of these processes instead of supporting existing processes [Châlons and Dufft, 2017].

The change that is brought by digital technology to industries is often referred to as digital disruption. In a report on digital disruptive intermediaries by Capgemini, the definition of digital disruption is presented as changes that are enabled by digital technologies that occur at a pace and magnitude which disrupt established ways value is created, which can be within or across markets [Riemer et al., 2015]. Parker et al. argue that the digital disruption has occurred in two stages. The first stage is characterized by online systems for the distribution of goods and services, which led to low marginal distribution costs for firms, allowing these firms to target and serve large markets with smaller investment [Parker et al., 2016]. Netflix is an example of a firm that changed their business model from a physical distribution of content to a digital distribution of content. In the second stage of disruption, in addition improving the efficiency of distribution, the internet acts as a creation infrastructure and coordination mechanism and digital platforms are leveraging these capabilities to create new business models [Parker et al., 2016]. For example, Airbnb and Uber have created new markets by orchestrating the market coordination of suppliers and customers [Airbnb, 2017, Uber, 2017]. The role of digital platforms in the heavy lift shipping industry is discussed in section 2.1.3.

2.1.3 Digital Platforms in the Heavy Lift Shipping Industry

The rise of digital platforms has affected strategic conduct and market structure is industries, but the role of these platforms in the freight market of heavy lift shipping industry is unclear. The suppliers in this freight market are the shipowners and the customers are the charterers. These parties are discussed more elaborately in chapter 3. The nature of the exchange in this industry has to be investigated in order to address which transactions can be facilitated on a digital platform and which can only be coordinated more efficiently.

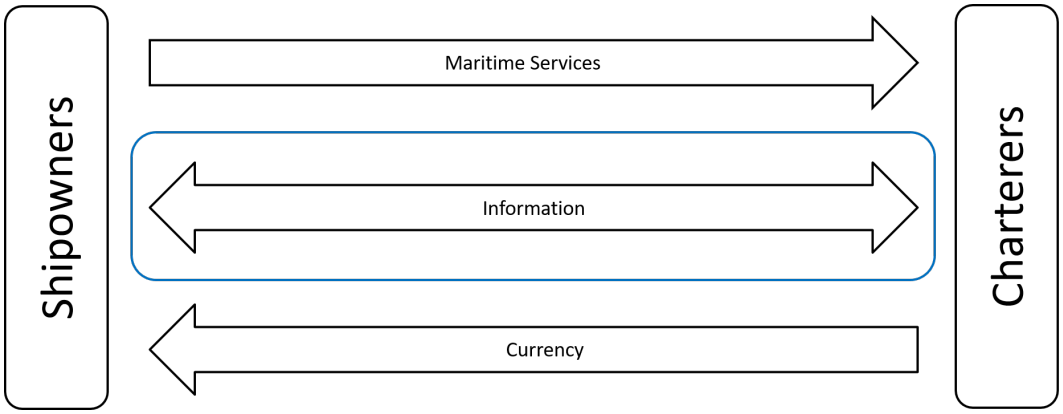


Figure 2.4: The Market Exchange in the Heavy Lift Shipping Industry

The nature of the exchange in this industry is shown in figure 2.4. The transactions in the heavy lift shipping industry are service and currency, coordinated by the exchange of information. The maritime transportation, lifting and installation services are transferred from shipowners to charterers (in some cases shipowners also act as charterers). Obviously, these transaction of maritime services are physical and cannot be facilitated on a digital platform. The transaction of currency originates from charterers that pay for the heavy lift shipping services of shipowners. These transactions are facilitated by banks and are nowadays not facilitated by digital platforms. The exchange of service and currency between shipowners and charterers is coordinated by the exchange of information. Shipowners share information about positions or availability, prices and contractual terms. Charterers send Requests for Quotation (RFQ's) which contain for example specifications of cargoes, the Port of Loading (POL), Port of Discharging (POD) and willingness to pay. The exchange of information in the heavy lift shipping industry is currently facilitated through face to face contact, telephone calls and email conversations in which intermediaries such as brokers and forwarders are involved, as will be discussed in chapter 3. Digital platforms can provide the infrastructure for the exchange of information in order to improve the coordination of transactions between charterers and shipowners in this industry. The Jumbo Position List is an example of such a system, that supports the communication of the positions of Jumbo's fleet and enables clients to submit inquiries a fixed form. Other examples of information exchanges in the heavy lift shipping industry are ShipNext [Shipnext, 2018] and Opensea.pro [Opensea.pro, 2018], online chartering marketplaces that are discussed more elaborately in chapters 4 and 5. From the characteristics of the exchange of service, currency and information in the heavy lift shipping industry can be concluded that the focus of this research has to be on digital platforms that facilitate the exchange of information, which is indicated by the blue circle in figure 2.4. Literature related to Inter Organizational Information Systems (IOS) [Bakos, 1987] covers the area of these digital platforms, including the strategic implications of these systems and impact to market structure. The definition and characteristics of an IOS are discussed in section 2.1.4.

2.1.4 Inter-Organizational Information Systems

Inter Organizational Information Systems are defined as systems based on information technology that cross organizational boundaries and whose purpose is the exchange of information-based products or services, as mentioned by Bakos [Bakos, 1987]. In later work, Bakos describes an IOS as a system that connects one or more firms to their customers or suppliers and can be used as 'strategic weapons', which introduction in industries can create opportunities and threats for market stakeholders of these industries [Bakos, 1991b].

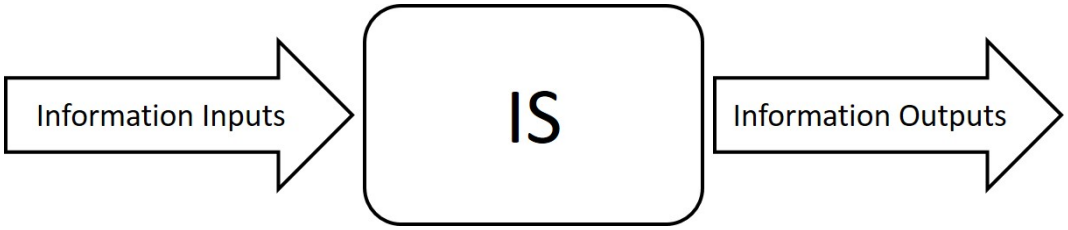


Figure 2.5: Information System [Bakos, 1987]

An information system is a system that transforms information inputs into information outputs, as shown in figure 2.5. The organizations that participate to an IOS are the providers of these information inputs and users of these information outputs. The IOS transforms and transfers the inputs from information providers to information users [Bakos, 1987]. The value adding processes that transform information inputs into information outputs are discussed in section 2.2.

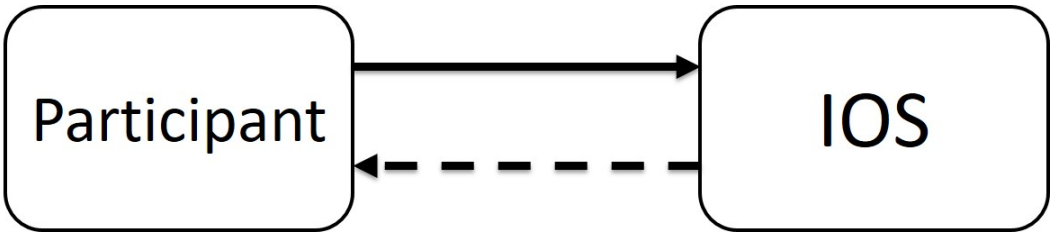


Figure 2.6: Participant in an IOS [Bakos, 1987]

The role of a participant of an IOS is shown in figure 2.6. Value is added by participants at both or multiple sides of an IOS, meaning that participating organizations create and consume value during participation in an IOS. An IOS without active participants on both sides can be considered as worthless, because the IOS itself only facilitates and orchestrates the creation and consumption of value by participating organizations [Bakos, 1987]. The term organization can be understood as follows: an individual performing a task, a work group including many individuals, an organization consisting of several groups, an industry with a number of firms or the entire economy or society as a whole [Bakos, 1987]. The potential participating organizations of an IOS in the context of buyer-seller relation in the freight market of the heavy lift shipping industry are charterers, shipowners, brokers and forwarders. Two types of IOS are discussed in section 2.1.5: information links and marketplaces.

2.1.5 Information Links and Marketplaces

Malone et al. provide two categories of IOS's based on the theory by Williamson that economies have two basic mechanisms for the coordination of transactions: markets for the external coordination of transactions and hierarchies for the internal coordination of transactions [Williamson, 1975]. Malone et al. argue that new information technologies are making both hierarchies and markets more efficient [Malone et al., 1987].

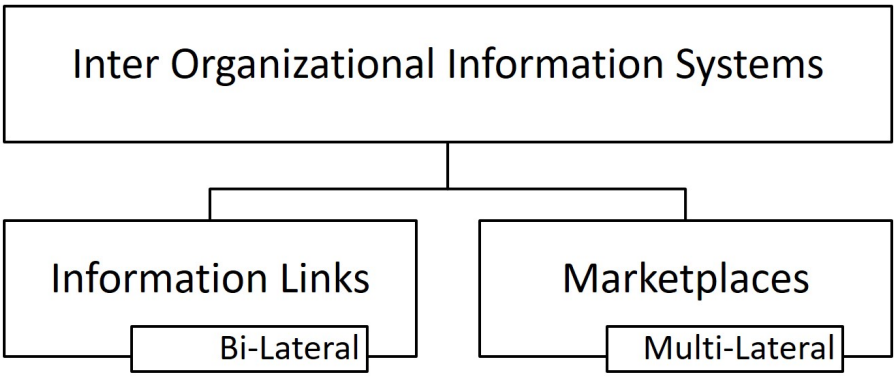
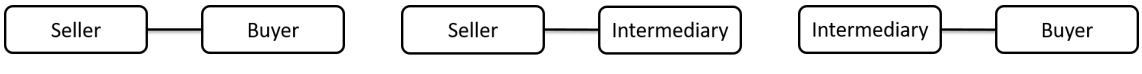


Figure 2.7: Typology of IOS [Bakos, 1987]

Bakos calls these electronic hierarchies information links, that improve the efficiency of gathering information and communicating information across the organizations that participate to this system, an impact that can be modelled as improved performance of information channels between organizations. The introduction of an information link can improve the coordination at the interface between a customer a supplier [Bakos, 1991b]. Bakos also mentions electronic markets, just as Malone et al., which he describes as an IOS that allows the participating buyers and sellers to exchange information about product offerings and prices. The key distinction between these two IOS types, according to Bakos, is that the information links are situated in a bi-lateral relationship, while electronic marketplaces are situated in a multi-lateral setting and the goal of this marketplace is to establish bi-lateral buyer-seller relationships [Bakos, 1991b]. The types of IOS are shown in figure 2.7, including the nature of coordination mechanism which can be bi-lateral in the case of a hierarchy or a multi-lateral in the case of a market. From this point IOS that improve hierarchies and markets are called information links and marketplaces respectively. Bakos argues in his PhD thesis [Bakos, 1987] that the taxonomy of IOS's can be based on the following characteristics: 1) the functional structure or 2) the value adding process of a system. The functional structures of information links and marketplaces are discussed in section 2.1.6.

2.1.6 Functional Structure of Information Links and Marketplaces

The functional structure of information links and marketplaces depends on the types and role of organizations involved in the system [Bakos, 1987]. The type of organizations involved in an IOS can be sellers, buyers or market intermediaries. The involved organization can be the owner of the system that orchestrates the system infrastructure or a participant of a system. The owner of information links and marketplaces can also be a participant of their own system. The functional structure is discussed first for information links and subsequently for marketplaces.

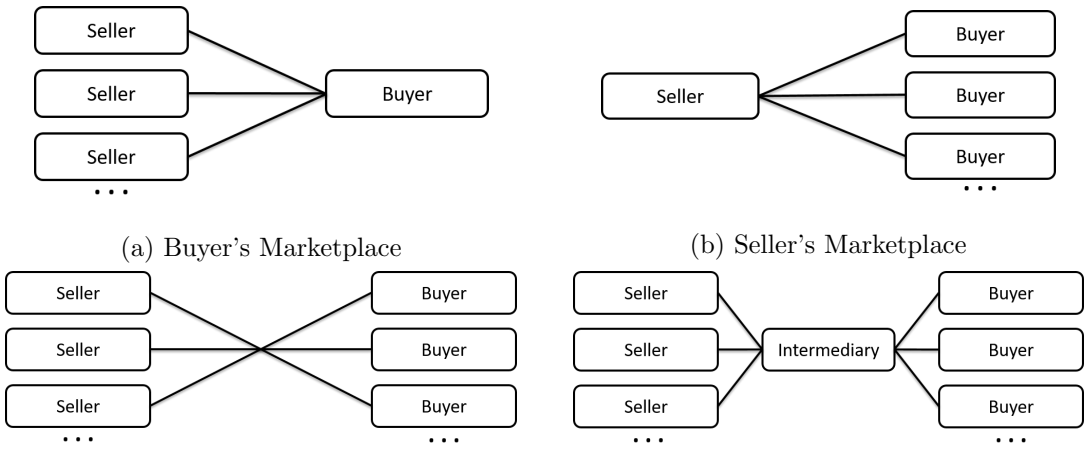


(a) (b) (c)

Figure 2.8: Functional Structures of Information Links

Figure 2.8 represents the functional structures of information links. Information links can be established between a seller and a buyer (figure 2.8a), between a seller and an intermediary (figure 2.8b) or between an intermediary and a buyer (figure 2.8c). The function of an information link is gathering and communicating information across the participating organizations, to improve the coordination at the interface between a customer and a supplier and to lower the costs of this coordination. The cost reduction of this coordination can be modelled as a reduction in the processing and response time of information channels and an increase in their capacity [Bakos, 1987]. The value adding functions of information links are discussed more elaborately in section 2.2.

An information link can be both a separate system or part of a wider market system. If an information link is established as a separate system, this information link is an investment by the involved seller, buyer or intermediary. This investment is done in order to improve the efficiency of their coordination. In this case, the bi-lateral buyer-seller relationship has already been established by either a traditional market or a separate marketplace. An information link can also be part of a marketplace, but only if a bi-lateral buyer-seller relation is established after this buyer and sellers have found each other on the marketplace to which this information link is part of.



(a) Buyer's Marketplace (b) Seller's Marketplace

(c) Consortium Marketplace (d) Intermediary Marketplace

Figure 2.9: Functional Structures of Marketplaces

Marketplaces digitally facilitate the exchange of information in order to improve the coordination of transactions in buyer - seller relations. In a marketplace, the participants can be buyers, sellers or even intermediaries. These three categories can also have authority and control over the marketplace. Moreover, these participant can be both providers and consumers of information input and outputs. The firm operating the system is referred to as the intermediary which may be a market participant: a buyer, seller, independent third party or a consortium of multiple firms [Bakos, 1991a]. An overview of these possible functional structures of marketplaces is shown in figure 2.9. Figure 2.9a represents a marketplace that involves a (group of) buyer(s) connected to multiple participating sellers.

In this case, the buyer has control and authority over the marketplace and the sellers can decide to join the marketplace in order to sell their product to the buyer through this marketplace. The buyer is also a participant of the marketplace, next to the owner that has authority over the marketplace. A procurement system is an example of the first case, for example Covisint, which was initiated in 2000 by General Motors, Ford and Daimler-Crysler to improve the procurement of products from suppliers of car parts [Kisiel, 2001]. Covisint has been founded by a group of buyers, which can also be viewed as a consortium marketplace as shown in figure 2.9c.

Figure 2.9b represents a marketplace that involves a (group of) seller(s) connected to multiple participating buyers. In this case, the seller has control and authority over the marketplace. The buyers can participate to the marketplace in order to search for and procure products that are offered on the marketplace of the seller. A webstore and booking portal are both examples of the latter case, for example a reservation system of an airline. The supplier's marketplace can serve as a sales channel for the owner of this type of marketplace. In some cases, the owner of a supplier's marketplace allows other suppliers to join his system in return for a fee, which transforms the supplier's marketplace into a market inter-mediation utility. Amazon and Bol.com both started as an online book shop, after which they both allowed other suppliers of books and even other goods to be sold through their system.

Figure 2.9d represents a marketplace controlled by an intermediary. The traditional or digital intermediary as control and authority. Multiple suppliers and sellers participate in this marketplace type. Funda is an example of a marketplace that has been initiated by traditional intermediaries: the Nederlandse Vereniging van Makelaars (NVM). Dutch housing brokers established a system to list prices and information of properties in the Dutch housing market. Skyscanner is an example of a marketplace that is established on top of the reservation systems of airlines by a digital intermediary. In the case of Skyscanner, the functional structure as shown in figure 2.9b provides the basis for the marketplace of Skyscanner, that results in the functional structure as shown in figure 2.9d. In the same way, Booking.com is a marketplace that lists prices and information about availability, reviews and prices of hotels and other accommodations for travellers on their website. Some marketplaces that have been initiated by digital intermediaries have caused new markets to emerge. For example Airbnb created a marketplace for temporary accommodation that is rent from hosts of properties to guests. Uber created a marketplace for drivers and riders to share rides in urban mobility.

From the diverse possible structural functions of information links and marketplaces that have been discussed can be concluded that sellers, buyers and intermediaries in markets can be both the owners and participants of these systems. The investment in the systems is driven by the effects of the value adding processes to coordination of transactions in bi-lateral and multi-lateral settings. The characteristics of capital investment in information links and marketplaces are discussed in section 2.1.7.

2.1.7 Characteristics of Capital Investment in Digital Platforms

The characteristics of capital investment in IOS distinguish these systems from other types of capital investment, because these systems 1) have the ability to lower the cost of processing information, 2) require large fixed development costs for the development of these systems and 3) can become more valuable to their participants as more organizations join these systems [Bakos, 1987].

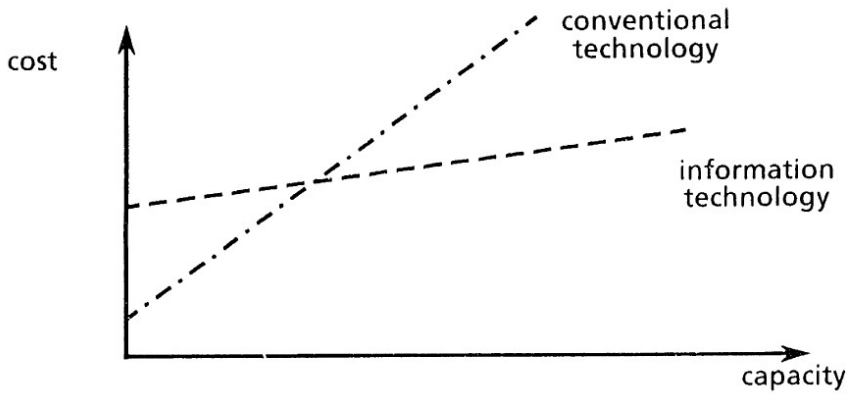


Figure 2.10: The fixed and marginal costs of IOS [Bakos, 1987]

The economies of scale are achieved as an information system, once in place, is able to process information at high capacity for low marginal cost compared to a manual or conventional system. However, large capital investment and expertise is required for system development and setup, compared to investment in conventional technology for example email or phone calls. The relatively high fixed costs of an information system have to be justified by the low marginal costs of the system is deployed [Bakos, 1991b].

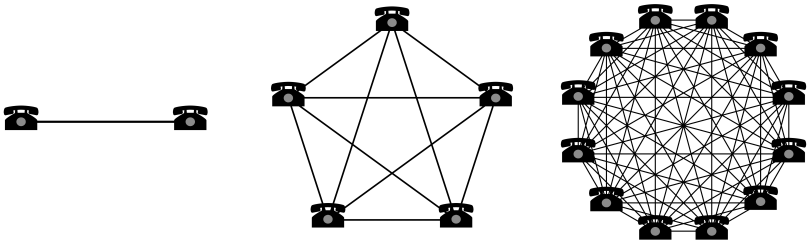


Figure 2.11: Network Effects for Telephones [Parker et al., 2016]

Marketplaces with large installed bases create more value for their participants, who are provided with a wider selection of potential buyers and sellers. An example of network externalities or network effects is shown in figure 2.11, in case of the telephone. When there is only one user of this telephone network, no connections are possible and the telephone is useless. However when there are more users of the telephone, using a telephone becomes more valuable. Network effects, referring to the impact that the number of users of a platform has on the value created for each user, take advantage of technological improvements on the demand side, for example the wide adoption of the smart phone among consumers. Network effects are driven by for examples efficiencies in social networks, demand aggregation, app development [Parker et al., 2016]. These initiatives managed to scale fast at low marginal cost because of demand economies of scale, also known as network effects, instead of supply economies of scale. Supply economies of scale, were driven by production efficiencies, which reduce the marginal cost of creating a product or service. Airbnb and Uber have been able to expand very fast at low marginal costs, without owning assets: Airbnb owns none of the accommodations listed on their marketplace for rent and Uber does not own the vehicles of the drivers that are connected to Uber. Both marketplaces Airbnb and Uber have grown so fast at low marginal costs, by providing the infrastructure and setting the rules for the coordination of transactions, instead of owning the accomodation or vehicles.

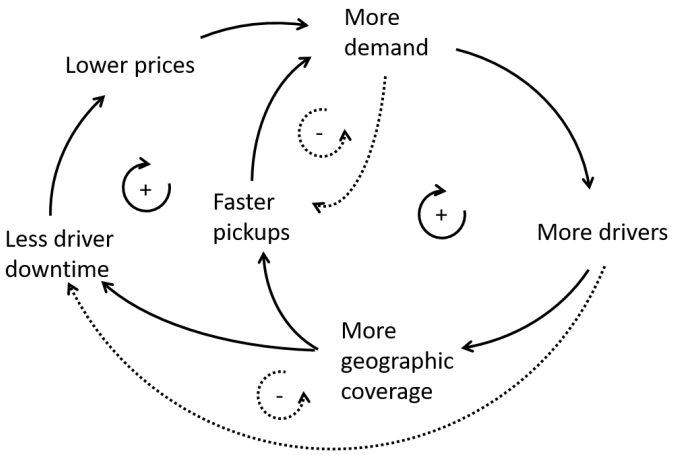


Figure 2.12: Four Types of Network Effects Faced by Uber [Parker et al., 2016]

If the number of participants to a digital platform is reached, at which the value of participation outweighs the cost of participation, participants are attracted to the platform [Parker et al., 2016]. Network effects in a two-sided market are not only influenced by the number of users to achieve a critical mass, but the number of producers and consumers in this two-sided market has to be in the right balance. For example, if only one host lists his accommodation on Airbnb in a certain city, the marketplace of Airbnb would not be valuable for guests that are searching for accomodation in this city. The owner of the platform has to invest in the attraction of sufficient number of users on each side of the platform, referred to as the chicken-or-egg problem [Parker et al., 2016]. Network effects can be distinguished in same-side and cross-side network effects, which both can be positive or negative. Positive network effects refer to the ability of a platform community to produce significant value for each user of the platform. Negative network effects refer to the possibility that the growth in number of users of a platform community can reduce the value produced for each user. Network effects that are created by the impact of users from one side of the market on other users from the same side of the market are same-side network effects. Network effects that are created by the impact of users from one side of the market on other users from the other side of the market are cross-side network effects [Parker et al., 2016]. Uber faces all four types of network effects: positive, negative, same-side and cross-side network effects, as shown in figure 2.12.

2.1.8 Intermediate Conclusions

The digital platforms that are or about to be introduced in the heavy lift shipping industry are characterized as Inter-Organizational Information Systems. The owners and or participants of the diverse configurations of information links and marketplaces can be sellers, buyers or intermediaries. The owner of the digital platform has authority over the digital platform, determines its infrastructure through which value is added by the participants and the associated effects. Investment in digital platforms require large fixed costs for the development of the system and low marginal costs of processing information and digital platforms, especially marketplaces can become more valuable as more participants join the system. The value adding processes that cause effects to the coordination of transactions in bi-lateral and multi-lateral settings are discussed in section 2.2.

2.2 The Value Adding Processes of Digital Platforms

This section discusses the value adding processes of digital platfroms in industries. The goal of this section is to identify the value adding processes of information links and marketplaces and to address the conditions that favour these digital mechanisms that add value. The roles of information links and marketplaces in markets are discussed in section 2.2.1. The value adding processes are discussed in section 2.2.2 for the matching function of a market, in 2.2.3 for the facilitation of transactions and in 2.2.4 for providing the institutional infrastructure. Finally, the findings of this section are concluded in section 2.2.5.

2.2.1 The Value Adding Processes to the Coordination of Transactions

The value adding processes of information links and marketplaces are partially different and partially similar. As discussed in section 2.1, information links only include value adding processes in bi-lateral buyer-seller settings and marketplaces include value adding processes in bi-lateral and multi-lateral buyer-seller settings.

Table 2.1: Market Functions [Bakos, 1998]

Market Function	Sub-function
Matching	Determination of Product Offerings
	Search
	Price Discovery
Facilitation of transactions	Logistics
	Settlement
	Trust
Institutional Infrastructure	Legal
	Regulatory

Markets serve three main functions according to Bakos: matching buyers and sellers, facilitation of transactions and institutional infrastructure [Bakos, 1998]. These main functions consist of sub-functions, as indicated in table 2.1. The matching and the facilitation of transactions is often executed by intermediaries in traditional markets and the institutional infrastructure is usually divided among intermediary and regulatory bodies [Bakos, 1998]. Giaglis et al. argue that marketplaces perform the same functions as traditional markets with increased efficiency and reduced transaction costs driven by information technology [Giaglis et al., 2002]. The value adding processes of information links do not involve the matching function of a market, because the matching function of a market is in a multi-lateral setting and not in a bi-lateral setting. In the following sections, the value adding processes of digital platforms are discussed that support the market functions from table 2.1. Bakos' market functions provide a structure to describe the value adding processes of information links and marketplaces. This structure will also be utilized in chapter 3 to describe the current coordination of transactions in the freight market of the heavy lift shipping industry. In chapter 5, these market functions will be used again to discuss the potential value adding processes of digital platforms in the heavy lift shipping industry.

2.2.2 Matching Buyers and Sellers

A traditional market, or a marketplace, functions as a medium for sellers to determine their offering of products and services and for buyers and sellers to locate each other. Further it forms a mechanism for price discovery [Bakos, 1998]

Table 2.2: Matching Buyers and Sellers

Market Sub-function	Value Adding Processes
Determination of Product Offerings	• Market Analytics Tools
Search	• Effective Search Tools • Matching Algorithm
Price Discovery	• Fixed Price • Price Algorithm • Auction • Negotiation

The sub-functions of the matching function of a market are shown in table 2.2. The determination of product offerings means that sellers are provided with information about demand in a market, which allows sellers to determine their economic inputs in terms of capital, technology and labor. In this way, sellers can develop products or services with characteristics that match the needs of buyers [Bakos, 1998]. An example of a value adding process that supports this market function is the market monitoring function of Uber. Uber presents the balance of demand for rides and supply of rides on a heat map, that can be used by drivers to move to a location at which demand is high compared to supply. Another example of the determination of product offerings are airlines that can gather information about the behaviour and demand of passengers and can determine their prices based on this information.

The search function of a market is necessary for buyers before selecting their purchases in order to consider price and product characteristics. Sellers have to search in order to find and approach prospective buyers of their products [Bakos, 1998]. During the search of buyers for sellers and vice versa, buyers and sellers face search costs. Marketplaces provide value adding processes that enable buyers and sellers to search for more and better alternatives, while reducing the search effort and cost. Booking.com is an example of such a marketplace that allows travelers to find a hotel room that suits their needs, by aggregating the offerings of a very large amount of hotels and by providing travellers tools to filter and order the offered rooms. In addition to effective search tools, marketplaces can involve matching algorithms to match buyers and sellers. Uber for example matches a rider with a certain demand automatically to a connected and available driver though their marketplace. The search function is especially effective in fragmented markets, in which the search scope is very large and differentiated and in which search for buyers and sellers is a costly activity and involves differentiated product or service offerings of sellers and heterogeneous preferences of buyers [Riemer et al., 2015, Dawson et al., 2016, Parker et al., 2016].

The price discovery function of a market is the determination of prices at a level that demand and supply in a market clear, enabling trade [Bakos, 1998]. Pricing mechanisms can be diverse and the applied price mechanism depends primarily on the market type and characteristics. Auctions are applied in stock markets, negotiations in open street markets and firm offers or fixed prices in retail stores. Marketplaces can have the same price discovery mechanisms as the price mechanisms of a traditional market [Giaglis et al., 2002]. An example of a marketplace that has the same price mechanism is Ebay, that uses fixed prices set by sellers, the auction and the negotiation mechanism. In addition to tradi-

tional price discovery mechanisms, marketplaces can also involve totally new mechanisms for price discovery [Giaglis et al., 2002]. For example Uber has a surge pricing mechanism, in which prices are calculated by an algorithm that is based on the marginal costs of a ride and the conditions of demand and supply of a certain geographic area in the marketplace of Uber.

2.2.3 The Facilitation of Transactions

After a bi-lateral relation between an seller and a buyer is established through the matching function of a conventional market or a marketplace, the transportation of the product or service to the buyer and the transfer of the payment to the seller have to be arranged. These transactions require a certain level of trust that protects participants from opportunistic behaviour by other participants.

Table 2.3: The Facilition of Transactions

Market Sub-function	Value Adding Processes
Logistics	• Monitoring and Coordination Tools • Distribution of Documentation
Settlement	• Payments
Trust	• Reputation System

The value adding processes associated with the functions for the facilitation of transactions are shown in table 2.3. Information technology allows the improvement of the coordination of logistics in terms of fast, transparent and timed deliveries and reduced inventories. An example of logistics monitoring and coordination tools is the track and trace systems, which is included in the logistics service of Amazon and Bol.com, after a product has been purchased by a consumer through these marketplaces. These coordination tools can be realized by using the GPS of smartphones or other sensors that enable the monitoring of logistics, which is also utilized by Uber for the coordination of drivers and riders that have been matched. In addition to coordination tools, the distribution of documentation associated with a transaction can be realized digitally, for example in the reservation systems of airlines include the distribution of tickets in addition to their market related functionality [Bakos, 1991a].

The payment that has to be transferred from a buyer to a seller, can be facilitated monitored and controlled by intermediaries such as creditcard companies or banks. Digital intermediaries have emerged such as iDeal that is incorporated in many e-commerce websites and marketplaces, for example in Bol.com.

A certain level of trust has to be established, before buyers and sellers are willing to enter into a transaction. The protection of buyers and sellers to opportunistic behaviour is even more important in marketplaces than in traditional markets [Giaglis et al., 2002]. Digital intermediaries establish trust by providing an infrastructure for participants to submit reviews and rankings, by storing these reviews and rankings in a central database and to enable the participants to view the reputation of the counter-party and take this reputation into account for their decision to transact. Dellocras discusses online feedback mechanisms enabled by the internet and calls these 'large scale word-of-mouth networks' [Dellarocas, 2003]. Uber and Airbnb are examples of marketplaces that utilize the reputation mechanism to enhance trust. Other trust-building strategies are limiting entry, certification of quality and insurance against transactions, however these are not digital functionalities of a marketplace. Uber sets standards for the vehicles and drivers that limit

the entry of vehicles of poor quality to their system. The reservation systems of airlines or booking websites of hotel chains are examples of marketplaces in which trust is realized by the brand or reputation of supplier. Airbnb insures guests against bad transactions the hosts do not adhere to contractual obligations. Piscini et al., discuss blockchain technology a a trust enabling technology for three types of trust: 1) identification, 2) transparency during transactions and 3) trust in contractual fulfillment [Piscini et al., 2017]. Industries that are characterized by extreme information asymmetries and high variations of service quality are susceptible to the value adding processes of digital platforms that contribute to the trust building function of a market [Riemer et al., 2015, Parker et al., 2016].

2.2.4 The Institutional Infrastructure

Finally, the marketplace functions as an institutional infrastructure that specifies the laws, rules and regulations that govern market transactions [Bakos, 1998]. Digital platforms can provide the rules for the enforcement of legal rules and behaviour in markets.

Table 2.4: Institutional Infrastructure

Market Sub-function	Value Adding Processes
Legal	• Set of Rules of System
Regulatory	• Conflicts*

The functions that provide the institutional infrastructure of a market and the value adding processes that support these functions are shown in table 2.4. Authentication mechanisms, deposits to ensure payments and quality certificates characteristics are provided on marketplaces and a necessary to counter the legal uncertainties [Giaglis et al., 2002]. The characteristics of the institutional infrastructure in markets have some overlap with the trust building mechanisms as discussed in section 2.2.3. For example the monitoring tools and the sensors that provide transparency in the logistics in a market can be coupled to smart contracts, in order to digitally ensure contractual fullfilment [Piscini et al., 2017].

Regulation is a topic for digital platforms such as Airbnb and Uber [Schneider, 2017]. In the case of Airbnb, hotels face increased competition from consumers that market their accomodation on Airbnb. The host of accommodation that is rented through Airbnb does not have to comply to the rules to which hotels do have to comply. In the case of Uber, the conventional taxi companies have been 'protected' by licences, because the taxi industry is regulated. When Uber enabled consumers to provide the same (or even a better) service as conventional taxi companies do, the taxi companies face increased competition from suppliers that do not have to comply to the same set of rules. Despite this topic about regulation conflicts does not involve the value adding processes of digital platforms, it is an important note that new suppliers can potentially enter industries, enabled by digital platforms, as it is the case with Airbnb and Uber.

2.2.5 Intermediate Conclusions

The value adding processes of digital platforms have potential to contribute to the market functions, but the applicability and the effectiveness of these processes depend on the specific market conditions and situations. The market conditions and characteristics of the heavy lift shipping industry have to be investigated first, before addressing which value adding processes have potential to be effective in the heavy lift shipping industry. For example, a high level of fragmentation favours the effective search tools to be effective. After the market structure of the heavy lift shipping industry has been addressed and the current way of matching the charterers and shipowners, the current way transactions are facilitated and the current institutional infrastructure have been investigated in chapter 3, the potential value adding processes of digital platforms in the heavy lift shipping industry can be discussed in chapter 5. The effects of digital platforms in the heavy lift shipping industry are caused by the value adding processes discussed in this section. Section 2.3 focuses on the effects of the improved coordination of transactions in industries.

2.3 The Effects of Digital Platforms in Industries

This section discusses the effects caused by the value adding processes of digital platforms in industries. First, three effects of information technology are discussed in section 2.3.1. The effects of information links are discussed in section 2.3.2. The effects of marketplaces are discussed in section 2.3.3. The effects of reduction of transaction costs incurred by buyers and sellers in markets are discussed in 2.3.4 and 2.3.5. The consequences of digital platforms to the role of intermediaries in markets are discussed in section 2.3.6. Finally, the findings of this section are concluded in section 2.3.7.

2.3.1 Three Effects of Information Technology

Ordanini and Pol argue that one of the most important effects of IT is removing the trade-off between information width and information depth [Ordanini and Pol, 2001]. By information width is meant the number of individuals who benefit from it and by information depth is meant the richness of the message in a communication relationship. This effect is called the electronic communication effect by Malone et al. and means that new information technologies have reduced both time and cost of communicating information. The electronic communication effect benefits both information links and marketplaces [Malone et al., 1987].

Table 2.5: Technical Effects by IOS's

Effect	Information Links	Marketplaces
Communication	✓	✓
Integration	✓	~
Brokerage	✗	✓

Two other effects that are mentioned by Malone et al. are the electronic integration effect and the electronic brokerage effect. The electronic integration effect involves improved internal coordination and lower internal or bi-lateral coordination costs. The electronic brokerage effect is associated with improved external coordination and thus reduced external or multi-lateral coordination costs, also known as market transaction costs [Gurbaxani and Whang, 1991]. An overview of the three mentioned effects and the applicability to information links and marketplaces are summarized in table 2.5. The effects of a reduction of coordination cost for transactions in bi-lateral relations are discussed in section 2.3.2 and for transactions in multi-lateral relations in section 2.3.3.

2.3.2 The Electronic Integration Effect of Information Links

The electronic integration effect occurs when multiple organizations use information technology to create joint and interpenetrating processes [Malone et al., 1987]. The benefits of the electronic integration effect are usually captured most easily in information links, but they can be apparent in marketplaces as well. The time saved and the errors avoided by the fact that data need only be entered once is one of the main benefits, according to Malone et al., but they suggest that other important benefits of close integration of organizational processes are possible in specific situations [Malone et al., 1987]. Bakos suggests that inventories and information exchange are economic substitutes in vertical markets [Bakos, 1987].

A recent example of this economic substitute effect is visible in e-commerce in markets for consumer products. Bol.com, the Dutch equivalent of Amazon, offers products from its own physical warehouse, but also sells products from other stores. When a shopper has bought a product and a bi-lateral relation is established, track and trace systems improve the coordination of this relation, by providing information about the delivery times to the shopper. Another example is Uber, the ride sharing application. When a rider is matched to a driver, establishing a bi-lateral relation, GPS trackers help the rider and driver to track each other's locations and to find each other almost effortlessly. The conventional taxi industry lacks this service, making it more difficult for a passenger and a driver to locate each other after a bi-lateral relation is established in a phone call between the taxi centre and the passenger. In this case, the inventory level equals the time driven idle by the taxi, and the waiting time for the passenger. Other passengers do not call the taxi centre but look for a taxi at a taxi stand, where taxis are waiting in a line. This line of waiting taxi's represent the inventory levels in this case. The effects of digital platforms of the bi-lateral coordination provide benefits of closer integration of processes and as explained by these specific examples. The potential effects in the heavy lift shipping industry are discussed in chapter 5 and potential applications and effects for Jumbo specific situations are discussed in chapter 6.

2.3.3 The Electronic Brokerage Effect of Marketplaces

The electronic brokerage effect is of benefit primarily in the case of marketplaces. A broker is an agent who is in contact with many potential customers and suppliers and who, by filtering these possibilities, helps match customers and suppliers to each other [Malone et al., 1987]. The electronic marketplaces that serve as intermediaries between buyers and sellers in a vertical market, are likely to reduce the search costs that buyers have to incur to acquire information about seller prices and product offerings [Bakos, 1987]. These effects are realized by the value adding processes as discussed in section 2.2. The value adding processes of marketplaces that have been discussed in section 2.2 improve the coordination of market transactions and reduce the cost of this coordination of transactions. Transaction costs are incurred when using market mechanisms to allocate resources in a world of imperfect information [Lipczynski et al., 2017]. Transaction costs may be viewed as the economic equivalent of friction in physical systems. If friction is too great, no movement will occur and if transaction costs are too high, no economic activity will occur [Wigand, 1997]. The presence of transaction costs prevent transactions in markets not to occur at competitive equilibrium [Bailey, 1998]. Transaction costs consist of four types: 1) the cost of searching for products sellers and buyers, 2) the costs of setting up and carrying out the contract, 3) monitoring costs to ensure the terms of the contract are met and 4) adaption costs that are incurred in making changes during the life of the contract [Wigand, 1997]. Bailey discusses transaction costs in the scenario of a disintermediated market and in the scenario of an intermediated market [Bailey, 1998]. In the disintermediated market, the transaction does not require an outside participant to coordinate the exchange between the buyer and the seller and the transaction costs are incurred by buyers, sellers or both. The buyer has to incur transaction costs to search for the existence, product and price information and to communicate and negotiate with potential sellers before he can purchase the product. The seller has to incur transaction cost to disseminate information to promote market exchanges [Bailey, 1998] and to search for buyers [Wigand, 1997]. The effect of the transaction cost is to decrease the quantity exchanged between the seller and the buyer, regardless who absorbs the cost [Wigand, 1997]. In an intermediated market, the transaction cost may be absorbed by an intermediary, that can be a matchmaker or a marketmaker [Yavas, 1992]. According to Spulber, an intermediary

is an economic agent that buys from suppliers and resells to buyers or that helps buyers and sellers to meet and to transact [Spulber, 1996]. The intermediaries may be in a better position to lower transaction costs than a buyer or a seller, because the intermediary is involved in many repeated transactions, develops a set of relationships and experience that may lower the transaction cost [Bailey, 1998].

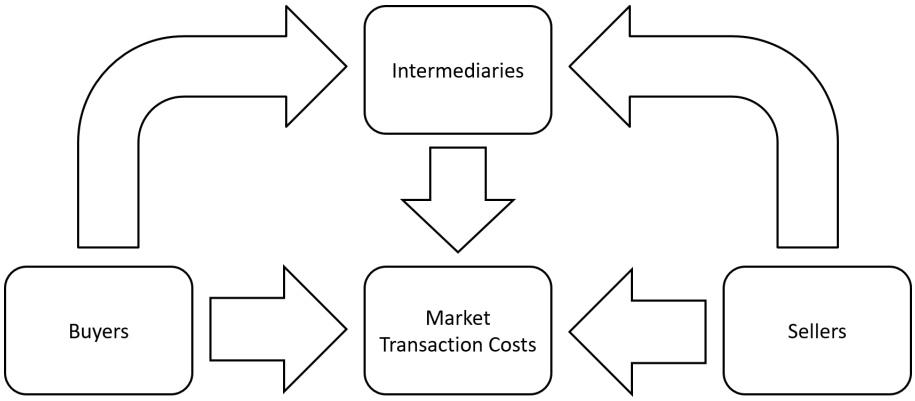


Figure 2.13: Market Transaction Costs

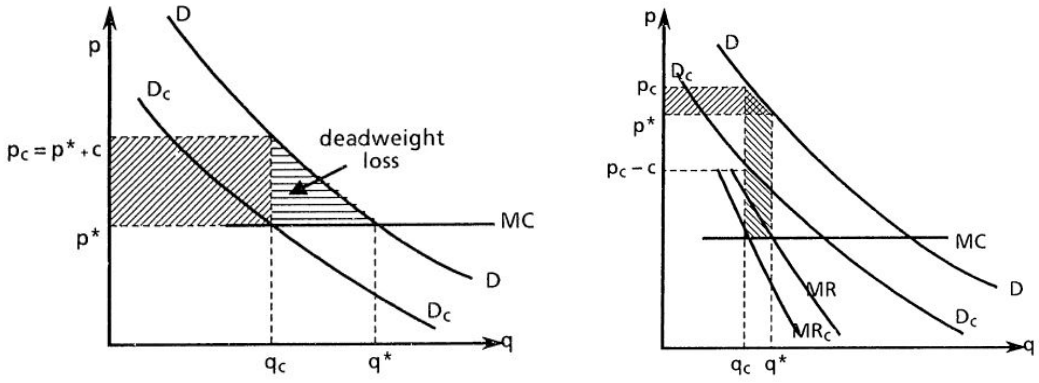
Figure 2.13 shows an overview of transaction costs that are incurred by buyers and sellers to show the relations of buyers, sellers and intermediaries to transaction costs. Buyers and sellers may both incur transaction costs to transact with each other and may be helped by intermediaries that can absorb (some of the) transaction costs in order to assist buyer and sellers in enabling this market exchange or to improve the efficiency of this market exchange. The allocation of transaction costs (and the reduction of transaction costs) is very difficult to determine, so this research proposes to discussed the reduction of transaction costs separately for transaction costs incurred by buyers, sellers and intermediaries. The effects of the reduction of transaction costs are discussed in section 2.3.4 for the costs incurred by buyers and in section 2.3.5 for the costs incurred by sellers. The consequences of a reduction of transaction costs incurred by buyers and sellers to the role of intermediaries are discussed in section 2.3.6.

2.3.4 The Reduction of Buyers' Transaction Costs

The allocation of market search costs (and the reduction of market search costs) is different in competitive and monopolistic market settings. In a competitive market, buyers are the ones that benefit from decreased search costs and have incentives to lower these costs. In a monopoly, sellers are the ones that benefit from decreased search costs, but only if these sellers are uncontested monopolists. If the market power of sellers is based on search related costs incurred by buyers, the impact of reduced market search costs is different in commodity and different markets [Bakos, 1987].

In a perfect competitive market, the amount of alternatives that can be considered by prospective buyers is extremely large and information about product offerings and seller prices is perfect. In these market settings, the sellers are price takers, resulting in an equilibrium in which price equals marginal costs, and sellers achieve no profits beyond a fair return on the employed capital resources. In the real world off-course, costless perfect information about market prices is an unrealistic assumption. In a monopolistic market, sellers are price setters, due to a low amount of alternatives that can be considered by prospective buyers, because the sellers are incontestable monopolists or due to exploiting of search related costs. An uncontested monopolist is able to set the profit maximizing level of output at the intersection of marginal cost and marginal revenue, resulting in a

price that is higher than marginal cost. The profit margins obtained by this monopolist will attract potential entrants to enter the market, but as long as the barriers to entry are sufficient to block entrants, the monopolist is able to maximize its profits. Another way in which monopolistic power can be acquired by sellers is due to the exploitation of buyer's search cost that prevent buyers from considering all product offerings and prices from sellers.

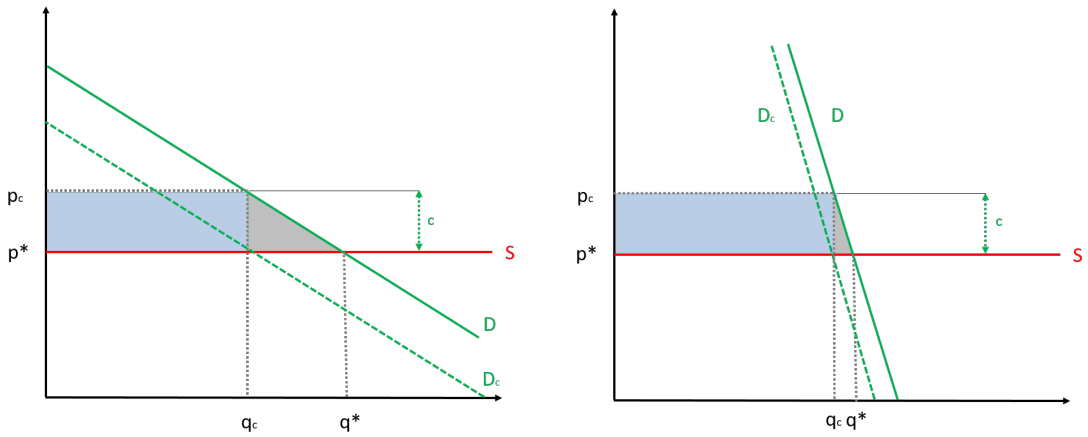


(a) Competitive Market

(b) Monopolistic Market

Figure 2.14: The Allocation of Buyer' Search costs [Bakos, 1987]

In figure 2.14a, a model of a competitive market is presented, assuming a downward sloping aggregate demand, constant seller marginal costs, buyers face a constant search cost c and this search cost shifts the demand curve from DD to D_cD_c. In this case, buyers bear all the search costs, because they have to pay a price equal to $p^* + c$, instead of p^*. An inefficiency loss of cq_c is the result, caused by the cost c of search. A deadweight loss $q - q_c$ is another result of the search costs, because $q - q_c$ buyers are priced out of the market (the downward shift of the demand curve) [Bakos, 1987]. In competitive markets, buyers are the ones that have a stronger incentive to reduce the search costs, as they are the ones that fully bear the cost of search [Bakos, 1987]. In figure 2.14b, a model of a monopolistic market is presented, with the same assumptions as in the competitive case, but including a shift of the marginal revenue curve from MR to MR_c. In this case, the search related costs are shared by the buyers and the sellers, resulting in a smaller price increase. The elasticity of buyer demand determines who bears most of the search costs [Bakos, 1987]. Uncontested monopolists attempt to lower search and other overhead costs in their markets in order to achieve the profit maximizing level of output. Sellers that acquire monopoly power based to the exploitation of buyers' search costs (in otherwise competitive markets) would have a disincentive to help lowering these costs [Bakos, 1987].



(a) PED = High

(b) PED = Low

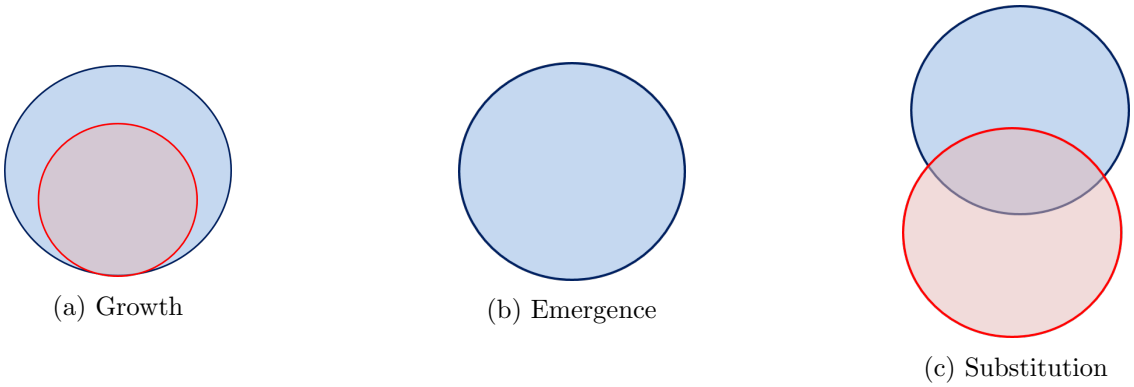
Figure 2.15: Modelling Search Costs Incurred by Buyers in Markets

The search costs that buyers have to incur in order to search for product and price information result in a deadweight loss, because buyers are priced out of the market in the presence of search costs, as discussed for competitive and monopolistic markets. Figure 2.15 shows the effect of search costs in a competitive market: the search cost c causes a shift of the demand curve from D to D_c, which results in a deadweight loss represented by the grey triangle, a reduction of quantity demanded from q^* to q_c and a price increase from p^* to p_c at the market equilibrium. The size of the deadweight loss depends on the Price Elasticity of Demand (PED). The PED is a convenient measure for the responsiveness of quantity demanded to a change in price [Lipczynski et al., 2017].

$$PED = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\Delta Q}{\Delta P} * \frac{P}{Q} \tag{2.1}$$

The formula of PED is represented in equation 2.1, where $\Delta P = P_A - P_B$ and $\Delta Q = Q_B - Q_A$. The effect of the search cost c is modelled for a market with a high PED in figure 2.15a and in a market with a low PED in figure 2.15b. The deadweight loss due to the search cost c in figure 2.15a is larger than the deadweight loss in figure 2.15b, because more buyers are priced out of markets characterized by a high PED compared to markets characterized by a low PED. In other words, the increase of quantity demanded caused by the reduction of buyers' search costs may be larger in markets with a high PED than in markets with a low PED. A reduction of transaction costs caused by a marketplace may cause a market to grow, as shown in figure 2.16a.

In an article from Bakos, the market-making functionality of electronic marketplaces during the processes of price discovery and identification of product offerings in commodity and differentiated markets is studied, focusing on the effects of reduced market search costs [Bakos, 1997]. Commodity markets involve commodity products such as some agricultural products, minerals or government bonds. All sellers are assumed to offer identical products, so the role of an electronic marketplace is only providing information about the existence and the price of a seller. Differentiated markets are characterized by heterogeneous consumer preferences and differentiated product offerings. In differentiated markets, the role of an electronic marketplace provides information about product characteristics on top of the existence and prices of product offerings.



(a) Growth (b) Emergence (c) Substitution

Figure 2.16: Market Effects due to a Reduction of Transaction Costs

The search costs that buyers have to incur in order to acquire information about market prices and/or product offering enable sellers in otherwise competitive markets to extract monopolistic rents, even when search costs are extremely small. The search related functionality of an electronic marketplace reduces the search costs that buyers have to incur. The effect of reduced market search cost will be most extreme in commodity markets, because intensive price competition can reduce seller price to marginal costs. Reviewing commodity markets, Bakos argues that electronic marketplaces can promote price competition among sellers by increasing the availability of price information and moving a market online can have a dramatic impact on seller profits and producer surplus [Bakos, 1997].

Most real world markets are differentiated markets, which is also true for both market segments in the heavy lift shipping industry, as will be discussed in chapter 3. Because the effects of digital platforms on the heavy lift shipping industry have to be addressed, the impact of reduced search costs in commodity markets are out of the scope. In differentiated markets, the cost reduction of obtaining price and product information will improve market efficiency and will reduce seller profits. The presence of differentiation in product offerings prevents buyers to compare only on prices. Sellers even benefit from reduced search costs in differentiated markets, if the search costs without a marketplace would prevent buyers from locating them. If search costs fall from moderate to near zero, sellers are made worse off since buyers can more easily find the lowest cost seller, while buyers benefit from the lower prices and their improved ability to find products that fit their needs [Bakos, 1997]. When search costs are sufficiently high, buyers will be forced out of the market, even if they are offered a zero price [Bakos, 1991a]. New markets may emerge in the case search costs fall from very high to moderate, and both sellers and buyers benefit in this case [Bakos, 1997]. The introduction of electronic marketplaces enable the emergence of new markets or prevent the breakdown of existing ones. Airbnb and Uber are examples of marketplaces that have enabled the emergence of new markets, as shown in figure 2.16b. Before the introduction of these marketplaces, it has not been possible to hire accommodation or to grab a ride so conveniently. Airbnb and Uber even enabled consumers to compete to hotels and taxi companies respectively. The accommodations from hosts that are listed on Airbnb serve as substitutes for hotel accommodation and the drivers that are active on Uber serve as substitutes to taxi companies. The effect of substitution of markets is schematically shown in figure 2.16c.

2.3.5 The Reduction of Sellers' Transaction Costs

The reduction of market friction due to the introduction of marketplaces mainly benefits buyers, because sellers face more intense competition and have to differentiate themselves by setting lower prices. However, the reduction of transaction costs of sellers enables sellers to search for a larger number of alternative buyers as well and to have more opportunities for marketing their products and services to prospective buyers. Bailey argues that sellers can also adopt price discrimination pricing strategies and that the internet enabled reduction of menu costs and market information costs makes price discrimination feasible for sellers [Bailey, 1998]. Menu cost arise when sellers change their prices. Market information costs have to be incurred by sellers in order to gather market information such as the behaviour of customers or different customer types.

Price discrimination is the charging of different prices for the same product or service to different consumers. Sellers can practise price discrimination in several ways. First degree price discrimination involves making the price per unit of output dependent on the identity of the purchaser and on the number of outputs purchased. Second degree price discrimination involves making the price per unit of output dependent on the number of units purchased. Third degree price discrimination involves making the price per unit depend on only the identity. In each case of price discrimination, the market for the products must be divisible into sub-markets, in which there are different demand conditions [Lipczynski et al., 2017]. In the case of first degree price discrimination, which is rarely encountered in practise, the consumer surplus is fully captured by the producers surplus. In the other two cases of price discrimination there still exists a certain amount of consumer surplus.

Sellers can harness digital technology in order to gather more and precise market information and can automatically change their prices based on this market information through price algorithms [Bailey, 1998]. Examples of the internet as a tool for the practice of price discrimination can be found at airlines that are able to track the search history of prospective customers and charge higher prices to these customers on route they already searched for, as these customers are willing to pay higher prices for these flights.

2.3.6 The Consequences to the Role of Intermediaries

Marketplaces are serving roles that have been taken by intermediaries for decades, such as searching, risk reduction or having market knowledge. Intermediaries can be threatened by the advent of marketplaces in their industries, because the functionality of marketplaces may perform the same role as intermediaries for reduced marginal cost. For example, travel agents have been bypassed by airlines that established online reservation systems. Industries that involve non-scalable gatekeepers [Parker et al., 2016] and industries that are characterized by large fees from intermediaries [Dawson et al., 2016] are susceptible for digital disruption.

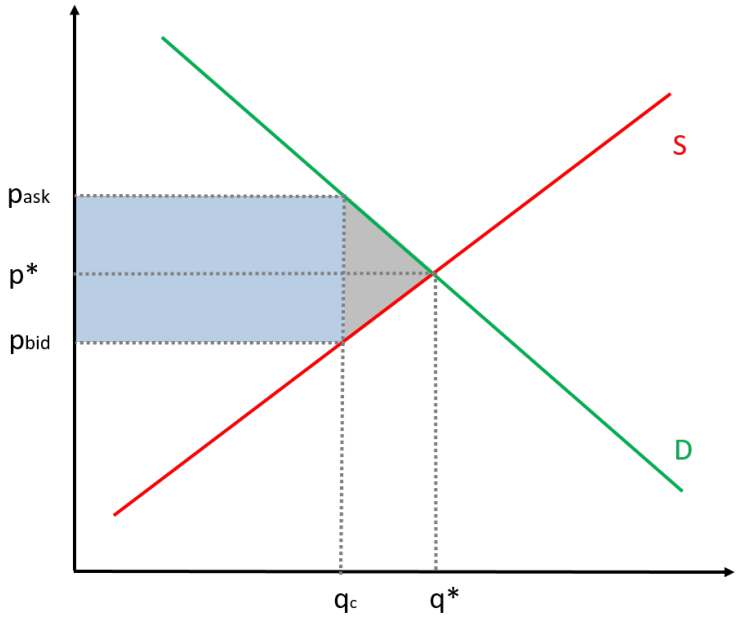


Figure 2.17: The Bid Ask Model [Spulber, 1996]

If the intermediary is in a better position than buyers and sellers to incur market transaction costs, buyers and or sellers are willing to pay intermediaries a fee, which is the revenue for the intermediary as modelled in figure 2.17 by the blue area [Spulber, 1996]. Several authors that studied the changing nature of intermediation due to IT, as they speak of scenarios dis-intermediation [Malone et al., 1987], re-intermediation [Giaglis et al., 2002] and cyber-mediation [Sarkar et al., 1995, Giaglis et al., 2002]. Dis-intermediation occurs when buyers and sellers transact directly in a market without the need of a traditional intermediary, who faces the pressure of elimination. However, these traditional intermediaries may find opportunities to differentiate themselves, through price, service and augmented products in the scenario of re-intermediation [Giaglis et al., 2002]. In the scenario of cyber-mediation, new types of intermediaries rise that provide an infrastructure support for the market functions that are restructured by the rise of digital technology [Giaglis et al., 2002].

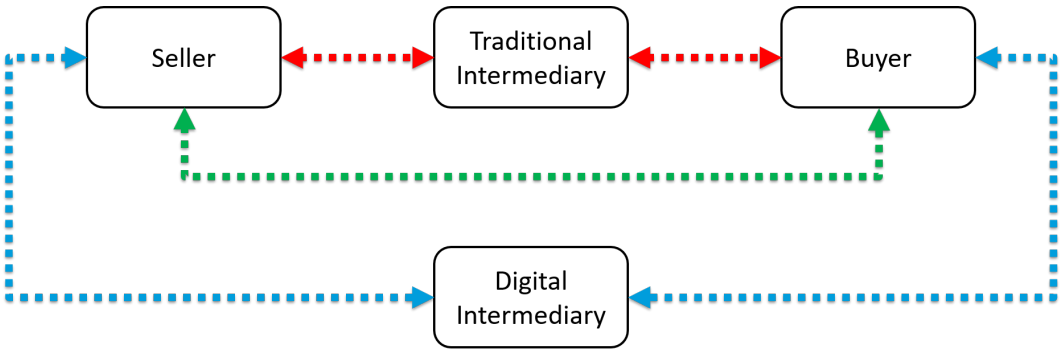


Figure 2.18: Three Scenario's of Intermediation

The scenarios of intermediation are shown in figure 2.18 for dis-intermedation (green), re-intermedation (red) and cyber-mediation (blue). The scenarios for intermediation in the heavy lift shipping industry will be discussed in chapter 5.

2.3.7 Intermediate Conclusions

The effects of digital platforms are the communication effect and two coordination effects: the integration effect and the brokerage effect. The bi-lateral coordination is improved by information links and this results in the substitution of information for inventory. Marketplaces can improve the coordination of transactions in multi-lateral relations and a reduction of market transaction costs.

Marketplaces lower market transaction costs for buyers to compare product offering that can have diverse consequences, depending on the market initial market structure. Reduced transaction costs for buyers can increase the number of alternatives compared by buyers, leading to increased price competition if buyers have the ability to compare the alternatives on price information. The effect of marketplaces on price competition in the heavy lift shipping industry depends on the charterer's ability to compare the services of alternative shipowners on the specification and availability of their vessels and price.

The growth of demand can be realized by a reduction of buyers' transaction costs and depends on the PED in a market. A reduction of buyers' transaction costs can result in the growth of the demanded quantity in a market, if the PED is high, modelled as a near flat demand curve. If the PED is low, modelled as a near vertical demand curve, the reduction of buyers' transaction costs is not expected to cause growth of demanded quantity in a market. The PED of the freight market in the heavy lift shipping industry has to be addressed in order to discuss the potential growth of the quantity demanded caused by the reduction of charterers' transaction costs.

The search costs of buyers and sellers to locate each other may be so high that market exchanges are prevented because of these search costs. A marketplace that helps sellers and buyers to lower their cost of search may enable market exchanges that would not occur without the reduction of search costs realized by the marketplace. The current media for search in the heavy lift shipping industry should be investigated, in order to discuss the ability of a marketplace to lower the search effort of charterers and shipowners, resulting in the emergence of market exchanges.

The reduction of the market information costs and menu cost of sellers provides opportunities to sellers to adopt price discrimination strategies. The current price setting mechanism of shipowners in the heavy lift shipping industry should be investigated in order to discuss the shipowners ability to price discriminate, in order to increase their producer surplus and reduce the consumer surplus of charterers.

Finally the reduction of market transaction costs incurred by buyers and sellers have consequences for intermediaries, who's role may be threatened by the introduction of marketplaces. Scenarios of dis-intermediation, re-intermediation and cybermediation have been discussed. The current role and market power of forwarders and brokers in the heavy lift shipping industry has to be investigated, in order to discuss the impact of marketplaces on their role and market power and in order to discuss the potential scenarios for intermediation in the heavy lift shipping industry.

The effects of the improved coordination enabled by information links and the reduction of transaction costs enabled by marketplaces may drive shipowners, charterers, forwarders, brokers and digital intermediaries to invest in these systems. The strategic implications of the effects of digital platforms are discussed in section 2.4.

2.4 The Strategic Implications of Digital Platforms

This section discusses the strategic implications of digital platforms in industries. The sources of competitive advantage are discussed in section 2.4.1. The strategic implications of marketplaces are discussed in section 2.4.2 for sellers, in section 2.4.3 for buyers, in section 2.4.4 for digital entrants and in section 2.4.5 for traditional intermediaries. The complexity of the impact of the joint actions of market stakeholders in terms of initiation of and participation to marketplaces is discussed in section 2.4.6. Finally the findings of this section are concluded in section 2.4.7.

2.4.1 Competitive Advantage through Information Technology

Digital platforms can be used as a strategic weapon in industrial competition, according to Bakos, and this strategic potential creates problems and opportunities for firms in which these systems have been or about to be introduced [Bakos, 1991b]. Bakos and Treacy established a theoretical model to understand the role of IT to increase competitive advantage for firms. In this model, competitive advantage is based on bargaining power of a firm over its customers or suppliers and on the comparative efficiency of a firm, which refers to the ability of a firm to produce a product at a lower price relative to other products perceived as equivalent [Bakos and Treacy, 1986].

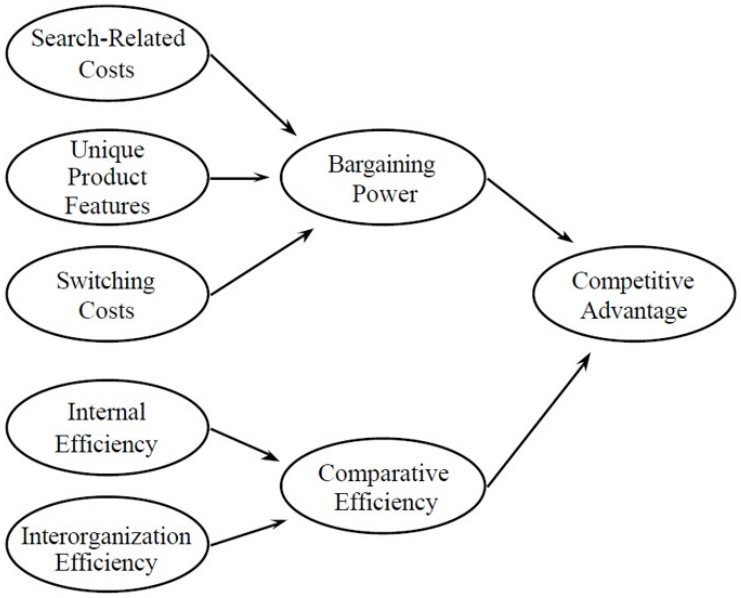


Figure 2.19: Causal Model for Competitive Advantage through Information Technology [Bakos and Treacy, 1986]

The causal model for competitive advantage from Bakos and Treacy is shown in figure 2.19. Bargaining power can be improved by lowering or raising switching costs over suppliers and customers, providing unique product features and reducing or exploiting search related cost. Comparative efficiency is improved by improving the internal or interorganizational efficiency [Bakos and Treacy, 1986]. Information technology has an impact on these causes for bargaining advantage and comparative efficiency, as firms face the opportunity to leverage digital platforms in order to increase bargaining over their customers or suppliers and to increase their competitive advantage over their competitors [Johnston and Vitale, 1988].

Information links as separate system improve the efficiency of the bi-lateral relation of buyers and sellers. The incentive of sellers in a market to invest in these systems improving the comparative efficiency, by integrating processes of their customers to their own processes. Moreover the incentives of a seller in a market is proving unique product offerings that differentiates the seller from competitors and raising switching costs over one's customers to other systems. Buyers in a market are not able to lower switching costs through investment in information links, however buyer may have the incentive to automate their procurement procedures to their suppliers. Intermediaries may be expected to initiate information links to sellers and buyers to differentiate themselves.

The strategic implications of marketplaces are more complex than the strategic complications of information links, because the owner and participants may be sellers, buyers, intermediaries and digital intermediaries that have similar and joint incentives [Bakos, 1987]. The owner of the marketplace determines the infrastructure of value creation on the marketplace, which means that the expected effects of this infrastructure of value creation has to be in line with the incentive of the owner. These effects should also in line with the incentives of the participants, because without participants, the marketplace generates no value. This means that the owner of a marketplace should be able to attract a sufficient number of participants in order to justify their costs of participation. The digital initiatives from sellers, buyers, digital intermediaries and intermediaries are discussed in next sections.

2.4.2 The Digital Initiatives from Sellers

The motivation of sellers is to attract buyers to purchase their products rather than the products from their competitors [Malone et al., 1987]. Bakos mentions that the potential reduction of monopolistic price that is caused by a marketplaces means that sellers as a group have no incentive to introduce a marketplace offering price and product information in a competitive differentiated market [Bakos, 1991a]. However, individual sellers might benefit from initiating marketplaces, even including information about prices, because of improved market access, dis-intermediation or the potential of acting as an intermediary.

Airlines have introduced reservation systems, that have been enabled by the internet, to increase their market access and to bypass travel agents [Porter, 2008]. To counter the effects of a reduction of search costs for buyers, airlines have implemented very complex price structures for their flights in order to make it very difficult for their customers to compare alternatives on price [Bakos, 1991a]. Despite sellers do not benefit from reduced market search costs in most cases, they have intentions to price discriminate their customers, because marketplaces enable them to lower menu costs and costs of market information, which makes it feasible to automate dynamic prices. Price discrimination makes it possible to achieve higher profits without increasing their costs [Bailey, 1998]. Sellers could increase the level of differentiation of product offerings, for example airline have initiated frequent flyer programs to achieve this goal [Bakos, 1991a]. Amazon and Bol.com both started as online book stores, but invited other sellers of books and other products to join their system for a fee, as discussed in section 2.1.6. Malone et al. argue that the best strategy for sellers may be to control the type of system eventually introduced [Malone et al., 1987]. Established systems can raise the barriers of entry for third-party information providers in order to delay or avoid the competition from systems offered by digital intermediaries [Bakos, 1991a]. However, the digital initiatives from sellers may also lay the foundation for the marketplace initiated by a digital intermediary, as discussed for Skyscanner in section 2.1.6.

2.4.3 The Digital Initiatives from Buyers

Buyers have the opposite incentives of sellers and would appreciate the introduction of a marketplace that enables comparisons of price and product information, in order to find the product offerings that better match their needs [Malone et al., 1987]. A single buyer or a coalition of buyers can introduce a system that satisfies the incentive of the buyer(s) [Bakos, 1991a]. An example of a marketplace initiated by the buyer side of a market is Covisint. Several automakers including Daimler-Chrysler, Ford, GM and Nissan invested $500 million in the marketplace. Covisint's ownership structure and auction format heavily favored auto companies and forced suppliers into fierce price competition. The suppliers of parts left the platform and the investors sold the residual assets for a only $7 million [Alstyne et al., 2016]. Most markets are more concentrated on the seller side, which means that a single buyer may be too small to introduce a market system and may lack the clout to induce seller participation [Bakos, 1991a]. In markets that are fragmented on the demand side, a (digital) intermediary steps in that has the resources and sophistication to establish a marketplace that favours buyers, for example in the case of Booking.com and Airbnb.

2.4.4 The Digital Initiatives from Digital Intermediaries

Digital intermediaries have the incentive to act as an information broker, and to charge users of their marketplace for their participation. Booking.com and Skyscanner started to act as an information broker in the hospitality and airline industry respectively, providing competition to intermediaries (travel agents). Airbnb started to act as information brokers in a market that did not exist yet before the introduction of Airbnb. These digital intermediaries earn from the fees that are paid by the participants of the marketplace. Parker et al. mention several ways for a digital intermediary to capture value from participants: charging a transaction fee, charging for access and charging for enhanced access [Parker et al., 2016].

Before a digital intermediary as an owner and orchestrator of a marketplace is able to capture value from its participants, the marketplace should include an infrastructure that results in a distribution of pay-offs that attracts participants to both sides of the market. The digital intermediary should have the financial resources in order to develop the system and in order to attract participants. Digital intermediaries especially can attract participants in industries that are fragmented on both sides of the markets, because in such markets, buyers do not have the power to induce seller participation and sellers do not have the power to induce buyer participation.

Digital intermediaries have to attract both the supply side and demand side to their marketplace, by generating a distribution of pay-offs that favours both sides of the market, for example by minimizing the friction of participation or by subsidizing participation on or two sides of the marketplace [Parker et al., 2016]. Some digital intermediaries started their network locally, in order to test their system at low cost, for example Uber and Airbnb started both in San Francisco and expanded later to other cities in the USA, after which global expansion followed. If a digital intermediary succeeds to attract a critical mass of users on each side of the marketplace, network effects can accelerate the attracion of new and more participants. These network effects create an early mover advantage, because early movers have the opportunity to build a larger installed base compared to late movers. Network effects make established systems more attractive to new users, reducing the need for intermediaries to compete for these users on a price basis [Bakos, 1991a].

An example of the first mover advantage is Thuisbezorgd.nl, a Dutch platform that enables consumers to order food from takeaway restaurants, including home delivery [Thuisbezorgd.nl, 2017]. The fragmented supply and demand side of this market was susceptible for the platform to be effective in this market and the user base of both restaurants and consumers grown, making this platform valuable. However, after years of success, Thuisbezorgd.nl increased their commission percentage to 13 % in 2017, cutting the restaurants' profits down. The restaurants in the Thuisbezorgd.nl case followed a wait and see strategy, that enabled Thuisbezorgd.nl to gain momentum in building their user base, which made the system even more valuable. The participating restaurants are dependent on Thuisbezorgd.nl as a distribution channel and quitting the system is associated with lower sales volumes for these restaurants. Bakos mentions that a well established early system may leave no feasible alternative for other potential entrants than to form a coalition against it and offer a credible competing system [Bakos, 1987]. The theory of Bakos is shown in the example of Thuisbezorgd.nl, as a coalition of restaurants started to establish a joint platform competing to Thuisbezorgd.nl, for an acceptable commission percentage, which is a challenging task because the installed base of Thuisbezorgd.nl acts as a barrier to entry. If the restaurants would have been first establishing a food delivery in their market, this platform and the installed user base would have created a barrier to entry for third parties like Thuisbezorgd.nl.

2.4.5 The Digital Initiatives from Intermediaries

The incentives of (traditional) intermediaries to initiate a system in order to defend their position, the re-intermediation scenario, and their market power in terms of commission in the case of matchmakers or their bid-ask spread in the case of marketmakers. An example of traditional intermediaries are travel agencies that struggle to develop new value propositions in order to differentiate them against the competition from the digital initiatives from hotels, airlines and even digital intermediaries and have to expand their reach through online subsidiaries [Novak and Schwabe, 2009]. Intermediaries are in advantage because they already have a base of sellers and buyers and already have the industry related knowledge that may be necessary for the development of the infrastructure of a platform [Giaglis et al., 1999].

The Nederlandse Vereniging van Makelaars (NVM) have been a first mover by introducing Funda as a digital platform on which prices and information of properties in the Dutch housing market are listed. Because the NVM was a first mover as initiator of Funda in the Dutch housing market in 2001, this platform has become the most frequently visited platform in the Dutch housing market up until now (41,7 million visitors monthly in 2018) [Funda, 2017]. The large user base of Funda acts as a barrier to entry for digital intermediaries in the Dutch housing market.

2.4.6 The Joint Forces of Digital Initiatives

Bakos mentions that IOS exhibit the essential characteristics of a game-theoretic situation [Bakos, 1987]. In this game-theoretic situation, at least two organizations are involved with different goals and objectives, the actual type of system realized and the benefits received by each participant, depend on the strategic actions of the involved organization and the interests of the participants are partially but not completely opposed [Bakos, 1987]. The involved organization in a market are sellers, buyers and (digital) intermediaries, having strategic options that may determine the pay-offs of the systems that are initiated but these strategic options are also influenced by the pay-offs of the systems that are established.

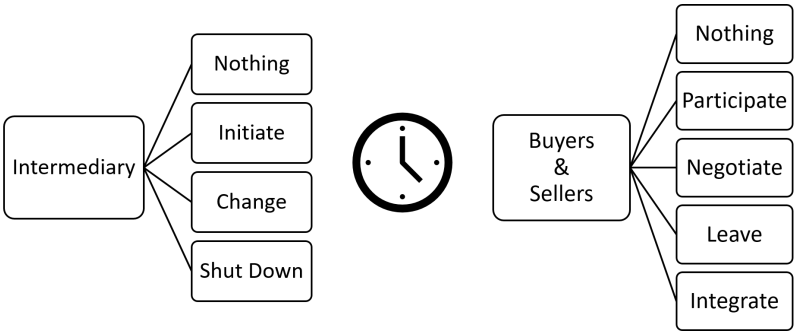


Figure 2.20: The Actions of Market Stakeholders

An overview of the actions that can be taken by market participants is shown in figure 2.20, distinguished in actions from intermediaries and actions from sellers and buyers. Intermediaries, whether traditional or digital, can take several actions: 1) do nothing, 2) announce a new marketplace, 3) set new prices or terms, 4) discontinue a marketplace [Bakos, 1987]. Buyers and sellers can take the following actions: 1) do nothing, 2) join a system, 3) terminate participation, 4) counteroffer the prices and terms of the system or 5) forward or backward integration by initiating their own system [Bakos, 1987]. The integration of sellers and buyers means that these market stakeholders can also start to act as an intermediary in their market by investing in a marketplace. The eventual outcome of the game depends on the actions, including timing of actions of the organizations involved and is the result of joint forces, establishing strategic interdependence. Bakos argues that the pay-offs of IOS can become very complex and strategically dependent, especially when the possibility is considered of a buyer or seller that joins more than one system at a time [Bakos, 1987]. Some systems will fail and systems will succeed, and some systems will be established on top of other systems, creating systems of systems as has been the case with Skyscanner. According to Bakos, the uncertainty about the value of new systems creates hesitation among potential adopters, causing firms to adopt a wait and see strategy, known as the penguin effect [Bakos, 1987]. Because of the uncertainties about the value of a system, the distribution of pay-offs are unclear to potential participants, while the distribution of pay-offs has a great effect on obtaining a critical mass in a system.

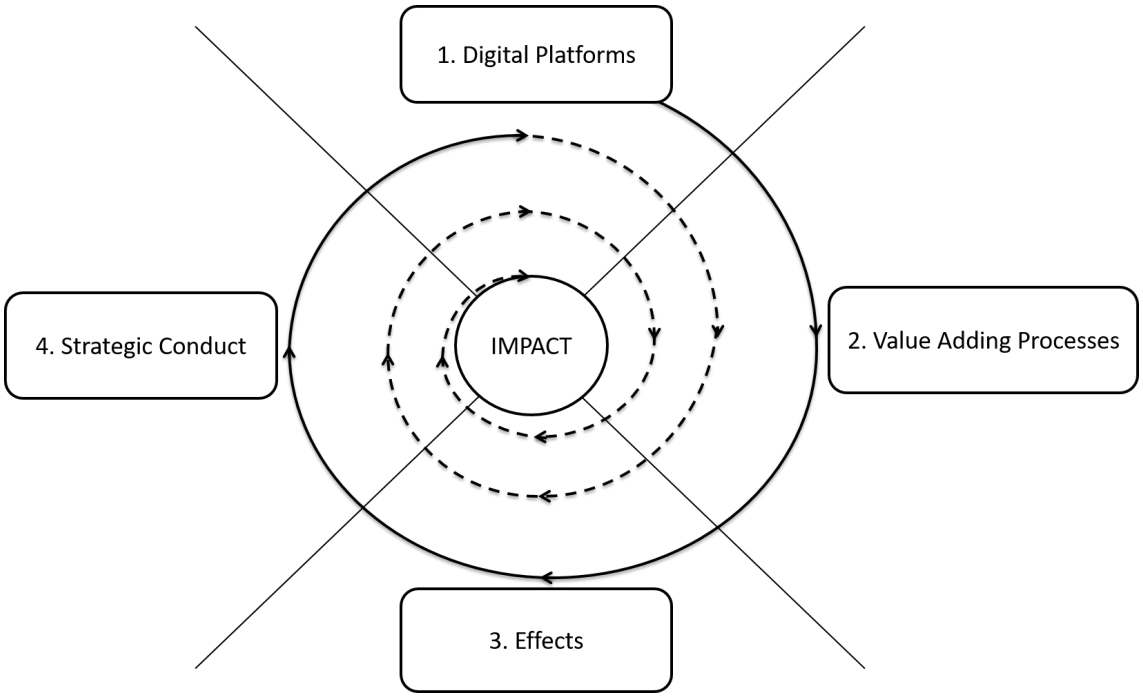


Figure 2.21: The Impact of Digital Platforms on Industries

After the discussion of the strategic implications of digital platforms for sellers, buyers and intermediaries in markets, the framework has been discussed for one cycle, as represented by figure 2.21. The nature of digital initiatives and behaviour of market stakeholders determine the type of digital platforms that are introduced and the value adding processes that lead to effects, which will influence the actions of market stakeholders. The actions and timing of actions of different types of organizations is not investigated for this research, meaning that the impact of digital platforms on the heavy lift shipping industry is only analyzed for the separate parts of the framework or for one cycle.

2.4.7 Intermediate Conclusions

The strategic implications of digital platforms are very complex, because the actions of market stakeholders determine the type of system that is actually introduced in a market, including the distribution of pay-offs that may be different for certain type of digital platforms, favouring certain type of organizations. Despite the eventual impact will not be addressed in chapter 5, the strategic implications of digital platforms for shipowners, charterers, brokers forwarders and digital intermediaries can be discussed. For the analysis of the strategic implications of digital platforms in the heavy lift shipping industry, the incentives of the market stakeholders and the ability of these market stakeholders to develop and establish a digital platform should be discussed.

2.5 Conclusions

Digital platforms are on the rise and have affected strategic conduct and market structure. It is very difficult to summarize the impact of digital platforms to industries in a general fashion, but the framework developed in this chapter can be utilized as a tool for analyzing the impact of digital platforms on the heavy lift shipping industry. The framework involves four different aspects of the impact of digital platforms in industries and each part of the framework can be applied to the characteristics of the heavy lift shipping industry in order to address the potential types, value adding functions, effects to the coordination of bi- and multilateral relations and the strategic implications of digital platforms in the heavy lift shipping industry.

The digital platforms that are or may be introduced in the heavy lift shipping industry are characterized as IOS, distinguished in information links and marketplaces, of which sellers, buyers, incumbent and new intermediaries can be the owner or participant. The potential value adding processes of information links and marketplaces in the heavy lift shipping industry depend on the industry characteristics. Based on the market structure and the coordination of transactions in the heavy lift shipping industry, the value adding processes that have potential to improve this coordination can be distinguished from those that do not have this potential. The value adding processes that support the matching functions of a market have potential to be effective in fragmented markets. The value adding processes that support the facilitation of transactions and the institutional infrastructure of a market included in an information link as a separate system in order to improve the coordination of bi-lateral relation or as part of a wider marketplace in order to reduce market friction for the users of a marketplace. The effects of information links and marketplaces in the heavy lift shipping industry are determined by potential value adding processes in this industry. These effects are improved coordination in bi-lateral relations an improved market coordination in multi-lateral relations. The effects of information links are depending on specific situations. The effects of marketplaces are associated with a reduction of transaction costs or market friction for the participants of the marketplace, that results in increase price competition, market growth, emergence or substitution and can have an impact on the role of traditional and new digital intermediaries in markets. The impact of a reduction of market friction is dependent on the level of fragmentation and differentiation of both sides of a market, the PED and the ability of buyers to compare the alternatives from sellers on price. The effects of information links and marketplaces bring strategic implications for sellers, buyers, intermediaries and digital intermediaries in industries. The incentives of these market stakeholders are partially the same and partially the opposite of each other. The impact of digital platforms is the result of the joint actions and timing of the actions of market stakeholders, which becomes very complex and therefore only the potential initiators of digital platforms in the heavy lift shipping industry are discussed in this research, without the strategic interdependence that is of great influence on the eventual impact.

The market analysis should address the following characteristics of the heavy lift shipping industry, that are determinant for the discussion of the four different aspects of the framework developed in this chapter: the extent of fragmentation and heterogeneity and the behaviour of the demand side, the extent of fragmentation and differentiation and strategic conduct of the supply side, the nature of market coordination and the role and market power of intermediaries and the type of market structure. The impact of digital platforms on the heavy lift shipping industry can be analyzed in chapter 5 by the application of this framework to the characteristics of that are addressed during the market analysis in chapter 3.

Chapter 3

Market Analysis: Market Structure and Strategic Conduct in The Heavy Lift Shipping Industry

This chapter provides a market analysis of the heavy lift shipping industry. The goal of this chapter is to address the market structure of the heavy lift shipping industry. The heavy lift shipping industry is the most difficult and complex sector in the shipping industry, as Stopford mentions in Maritime Economics [Stopford, 2009]. This research proposes to divide the heavy lift shipping industry in the commodity segment and the special segment for the analysis of the market structure, because the market structure is different in both segments. The analysis of the market structures of both distinguished market segments allows for a more accurate analysis, compared to the analysis of the market structure of the heavy lift shipping industry as a whole. The market structures of the commodity segment and special segment of the heavy lift shipping industry are addressed by analyzing the demand side, supply side and the coordination of market transactions in this industry. The fragmented demand side of the market involves different types of charterers that need transportation for different type of cargoes. The characteristics of the demand side of the industry are discussed in section 3.1. The supply side of the industry, consisting of shipowners or operators differentiated fleets and vessels, is fragmented in the commodity segment and concentrated in the special segment. The characteristics of the supply side of the market are discussed in section 3.2. The nature of the coordination of market transactions and the role of intermediaries in this coordination are discussed in section 3.3. The competition models of both segments of the heavy lift shipping industry are addressed in section 3.4, based on the market structure of these segments. Finally, the findings of this chapter are concluded in section 3.5. The market structure of both market segments conditions Jumbo's strategic conduct and performance that are analyzed in chapter 4. The impact of digital platforms on the heavy lift shipping industry is analyzed in chapter 5, based on the market structures of the different market segments and the framework that has been established in chapter 2.

3.1 The Demand Side of the Heavy Lift Shipping Industry

The demand side of the heavy lift shipping industry is discussed in this section. The charterers of the different types of project cargo are discussed in section 3.1.1. The number and size distribution of charterers is discussed in section 3.1.2. The heterogeneity of preferences and the behaviour of charterers are discussed in section 3.1.3. The drivers for demand for heavy lift shipping are discussed in section 3.1.4. Finally, the findings about the demand side of this industry are discussed in section 3.1.5.

3.1.1 The Charterer Types and Their Cargoes

The cargoes that are transported in the heavy lift industry, considered as project cargo or breakbulk, are too big to fit into a container. This means that specialized vessels have to be able to transport, load and discharge these cargoes. According to Stopford, there are three different cargo types that are transported in the heavy lift market: industrial cargoes (reactors of a power plant, refining columns or a container crane), offshore structures (jack-up rigs, semi-submersible rigs, moorings or jackets) and floating cargoes (small ships, ferries, yachts or barges) [Stopford, 2009], but within these types there still is a lot of variety in terms of size, weight or complexity of cargo handling. The most most dominant types of charterers in this industry are represented in table 3.1, including examples of cargo types that are shipped by these charterers.

Table 3.1: Overview charterers and examples of their cargoes

Charterer	Examples of Cargoes
Major Oil & Gas Companies	Reactors, Refinery Equipment, LNG Modules
EPC companies	Towers, Reels, Monopiles, Turbines, Mooring Systems
Manufacturers	Generators, Engines, Transformers
Major Mining Companies	Ship-loaders, Locomotives
Other	Yachts, Ferries, Barges, Small Craft

The major energy (oil, gas and renewable) companies need transportation of their cargo such as refinery equipment or modules to their factories or offshore projects. Examples of major energy companies are ExxonMobil, Shell, Gazprom, Chevron, BP, Dongfeng, Chevron or Total. These major energy companies frequently contract Engineering Procurement Construction (EPC) companies to arrange their whole project from detailed engineering design, to procurement of necessary materials and finally to deliver a functioning facility or asset to them. EPC companies can also be contracted by governments for infrastructure projects. The EPC companies on their turn subcontract heavy lift operators to transport their project material to their project sites, in some cases even including on-site installation. For example, Jumbo has been contracted several times for the integrated transportation and installation of transition pieces of an offshore wind farm. Examples of EPC companies are Petrofac, Saipem, Hyundai Heavy Industries, Samsung Engineering, Technip, WorleyParsons, Fluor, van Oord, Heerema and Boskalis. On some contracts, the direct charterer of a heavy lift vessel can be an EPC company, while the end client would be a major energy company. The EPC company in this case acts as both an intermediary and a charterer, which may cause confusion in appointing the identity of the client. The manufacturers need transportation of their products to their end clients. For example a manufacturer of a main engine for a large container vessel might need transportation of this oversized engine and charters a heavy lift vessel. Examples of manufacturers that are typically active as charterers in the heavy lift shipping industry are Wartsila, GE Aviation Energy, Siemens and Sandvik.

Major mining companies need transportation (and sometimes even installation) of their utilities, such as locomotives, bulldozers and ship-loaders or ship-unloaders that have to be installed at their terminals. Examples of major mining companies in the heavy lift shipping industry are Rio Tinto and BHP Billiton. The last category of charterers are producers or owners of floating cargo, such as yachts, ferries, barges, tug boats and more. When it is a better option in terms of safety or costs to transport these vessels on a heavy lift vessels than sailing the vessel to its destination, the producers or owners of floating cargo choose to charter heavy lift vessels. The charterers in the heavy lift shipping industry that need transportation for their floating cargoes are for example DAMEN Shipyards, the navy or diverse builders and owners of luxury yachts.

Figure 3.1: Charterer types and example of their cargoes in two segments

The market structure has to be addressed for the analysis of the impact of digital platforms on the heavy lift shipping industry. To address the market structure of the heavy lift shipping industry, a division is made in two market segments: the commodity segment and the special segment. The commodity segment is defined as the segment in which break-bulk or project cargo is transported, with a weight less than 500 tons. The special segment is defined as the segment in which project cargoes are transported that weigh more than 500 tons. The division of market segments is shown in figure 3.1, including examples charterers and typical cargoes. This segmentation simplifies addressing the structure of both demand and supply side of the industry, beginning with the demand side based on the number and size distribution of charterers in section 3.1.2 and the behaviour and preferences of charterers in section 3.1.3.

3.1.2 The Number and Size Distribution of Charterers

The number and size distribution of buyers in markets is a characteristic that can be used to analyze the susceptibility of the industry to digital platforms as discussed in chapter 2. The number and size distribution of buyers is not quantitatively determined, due to a lack of data about aggregate demand in this industry and especially about the source of demand. The market size of the heavy lift shipping industry, expressed as the yearly turnover in both the commodity and special segment, is estimated by Jumbo at $2.0 billion. The yearly turnover in the special segment is estimated at $0.5 billion and estimated at $1.5 billion in the commodity segment. It is not known how much of this revenue is from

the different charterer types, because the mentioned turnovers in the heavy lift shipping are just estimates provided by Jumbo. Despite the lack of data about the distribution of the sources of demand, it can be concluded that the buyer universe in this market is fragmented in both market segments. The buyer spectrum in the commodity segment is more fragmented than the buyer spectrum of the special segment. The source of demand is qualitatively analyzed, for both market segments in the heavy lift shipping industry.

The major energy companies and the EPC companies form the biggest source of demand in the special segment, as they need transportation of super heavy cargoes for their onshore and offshore projects. Some manufacturers of large and oversized products and shipyards also provide a significant source of demand for heavy lift shipping in this market segment.

(a) Standard Container

(b) Flatrack Container

Figure 3.2: Containers as an Alternative for Heavy Lift Shipping

Manufacturers are frequent charterers in the commodity segment. Cargoes that have dimensions or a weight less than 50 tons can be shipped in a container (figure 3.2a) or on a flat rack container (figure 3.2b), which is often cheaper because of the cost advantage of container vessels over multipurpose and heavy lift vessels for these cargoes. This means that manufacturers attempt to design their products within dimensions of containers, especially the product that would be shipped in the lowest end of the commodity segment. The EPC companies are also active as charterers in the commodity segment, as they need transportation for their smaller cargoes in large projects such as reels, crates, anchor chains and small pipes. The charterers in the commodity segment often approach forwarders to arrange transportation for commodity cargoes. The forwarders are able to efficiently combine multiple shipments into one shipment or to arrange full end to end transportation, including rail, road or inland transportation and storage. This means that forwarders are often considered as customers by shipowners. The role of these forwarders is discussed more elaborately in section 3.3.

3.1.3 The Heterogeneity of Charterers' Preferences and behaviour

The charterers in the heavy lift shipping industry have the objective to maximize the value of the transportation of their cargoes for the lowest price as possible. This difference between value and price is also known as the consumer surplus [Lipczynski et al., 2017]. The heterogeneity in charterer types implies differentiated perceptions of value for these charterers and different behaviour of the various charterer types.

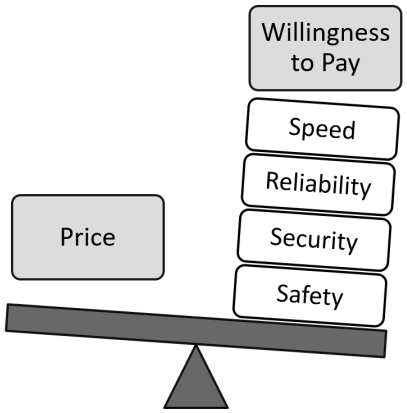


Figure 3.3: Charterers' Consideration: Price vs Willingness to Pay

The willingness to pay of charterers for the transportation of their cargoes can be diverse terms of speed, convenience, safety and reliability depending on their preferences, as presented in figure 3.3. Depending on the type of customer and the purpose of their shipment, some of these values outweigh others, of which some examples are used to explain different preferences and perception of value for diverse charterers in this industry.

An EPC company that needs to transport a piece of equipment to an offshore project site, for a project that is characterized by tight deadlines and high costs if delay or downtime occurs, the values speed and reliability outweigh a high price that has to be paid to a reliable and or high speed shipowner. Consider an EPC company that needs a reactor to be transported to a project site, and the cost of delay in this project is assumed to be $5 million per day. In this case, reliability is the most important value for the charterer, as the cost of delay are so high. This means the EPC company will charter a vessel from a reliable shipowner and often pays a higher price for a dedicated vessel in order to minimize the risk of delay. A dedicated vessel means that a vessel is chartered exclusively to one charterer, which means that a shipowner is not allowed to ship completion cargoes.

A charterer type that needs transportation for cargo that is on stock, a low price outweighs flexibility of the time of loading and discharging, meaning that this type of charterer chooses for flexible laytime. In a thesis conducted for Damen Shipyards by Smits, the behaviour of Damen as a charterer in the heavy lift shipping industry is studied [Smits, 2016]. One of the major findings of Smits is the impact of the by charterers offered flexibility in laytime on the prices that are quoted by heavy lift shipping operators. Smits modelled the shipping costs in the heavy lift shipping industry, that the average prices quoted for shipping three different vessel types built by DAMEN are drastically decreased offering a more flexible laytime. Based on three vessel types that are shipped from Vietnam to either Rotterdam, Vera Cruz, Lagos or Sharjah, the costs for DAMEN would be reduced 20% by offering 28 flexibility days or reduced by 40% by offering 112 flexibility days, compared to offering 1 day of flexibility for loading the cargo. The reasons for the impact of a larger number of offered laytime days found by Smits are 1) increased chance of find a (cost efficient) ship close to the port of loading, 2) increased chance for the shipping company to find additional cargo on the spot market and 3) increased competition among shipping companies for this shipment [Smits, 2016].

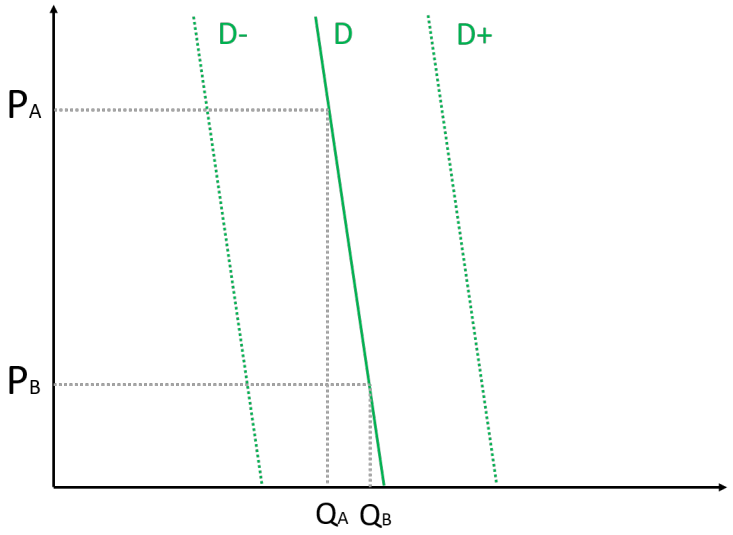


Figure 3.4: Demand Curve in (Heavy Lift) Shipping

In addition to the charterers' perception of value, changes in price adjust behaviour of charterers. The demand curve shows how charterers adjust to changes in price if other demand determinants remain constant [Lun et al., 2010], and this curve is almost vertical [Stopford, 2009], as shown in figure 3.4. The PED in shipping is very low or inelastic, according to Stopford and the main reason is the lack of any competing or substituting transport mode. Charterers need the cargo and until they have time to make alternative arrangements, must ship in regardless of costs [Stopford, 2009]. The charterers in the heavy lift shipping industry have the alternative to split their cargoes in components that enable them to transport their cargoes in containers at reduced cost, but which leads to a higher cost or risk of assembly. If other determinants of demand than price are not constant, the demand curve in figure 3.4 shifts from D to D^+ or D^- in the case of an increase or decrease of demand respectively. The drivers of demand for heavy lift shipping, which shift the demand curve, are discussed in section 3.1.4.

Table 3.2: Two Options for charterers to Arrange their Transportation

	Future	Spot
Segment	Special & Commodity	Commodity
Lead Time	1 Year +	1 Month +
Price	Stable	Volatile
Risk	Relatively Low	Relatively High

The charterers have two options in general for fixing a ship for their cargo considering lead time: the spot market and the future market. According to Jumbo, the lead times of the spot market and future market are 1 to 3 months and 3 months to 3 years respectively. The characteristics of both options are listed in table 3.2. The future market is characterized by low risk for charterers, as they have a relatively high chance to find a ship for their cargo X. In the future market, the shipowners face the risk of not finding a cargo Y that leads to a profitable contract after discharging cargo X, when a vessel is open for a new cargo. The spot market on the other hand is characterized by a relatively high risk of not finding a convenient vessel for the charterer's cargo. If there are some convenient vessels available on this route, the charterer faces the opportunity of paying a relatively low price, because these available shipowners are willing to fix the cargo, as such fixtures would increase their utilization. In the current condition of the market, that

is characterized by a severe oversupply of vessels, the price of shipping cargoes in the spot market is relatively low, compared to the future market. If there are no convenient vessels available on the route, the charterer often has to pay a high price in the spot market, hence a vessel has to be positioned for the cargo in this case.

Charterers face the choice to ship large fully assembled cargoes or to ship small disassembled cargoes. They also have to consider the component size, when a cargo is shipped in multiple components. The choices that are made in these kind of considerations impact the total cost of a project. Some examples are provided to clarify these considerations. When a LNG plant is designed for example by a major gas company, the charterer can choose to construct the LNG plant on site and ship small parts to the project site. In this case the installation costs are relatively large compared to the shipping costs. An alternative could be constructing the plant from large modules by producing large modules and shipping these modules to the project site. In this case the shipping costs are relatively high compared to the installation costs. The decision during the design depends on the situation. A major oil company may consider the section length of a pipeline from a gas plant, during the preparation phase of such a project. Increasing the pipeline section length may require a larger and more expensive heavy lift vessel to ship these sections. On the other hand, an increased pipeline section length decreases the required number of sailings to execute a shipment, which might lead to lower costs and thus a lower price for charterers.

In some cases the regional culture of charterers has influence on the way and timing of chartering. Korean and Italian charterers for example are likely to send out RFQs just weeks or a month before their cargo has to be shipped. Japanese charterers on the other hand are more likely to send RFQs months or even years before the shipment is executed.

A charterer has multiple options for the approach of shipowners, which can be direct or indirect via forwarders and or brokers. In most cases a charterer sends a RFQ to the operator, broker or forwarder, often through emails or phone calls. This RFQ is received by the shipowner directly from the customer if there is a strong or recurrent relationship between both parties, often the case in the special segment. When there isn't a certain relationship between both parties, especially in the commodity segment, the RFQ is send to brokers and or forwarders that can leverage their networks and approach multiple shipowners. Sometimes even more intermediaries are involved, resulting in a chain of intermediaries. During the preparation phase of large projects, major oil and gas companies send surveys to qualified shipowners to provide cost estimate for different scenarios. The operators provide an indication of costs, so the EPC company is able to plan the project in such way that the costs are minimized. Sometimes the operators are even asked for their newbuilding plans, to know the limits of dimensions of modules of a power-plant or a factory, because these dimensions are constrained by the vessel (deck) dimensions.

3.1.4 The Drivers of Demand for Heavy Lift Shipping

The demand for heavy lift shipping is characterized by volatility, because there are several drivers for demand in this industry, which are significantly influenced by volatile political and macro-economic circumstances. These drivers are discussed in this section because they have an impact on the quantity of demand for heavy lift shipping, causing a shift of the demand curve (figure 3.4) and eventually on the freight rate in the heavy lift shipping industry.

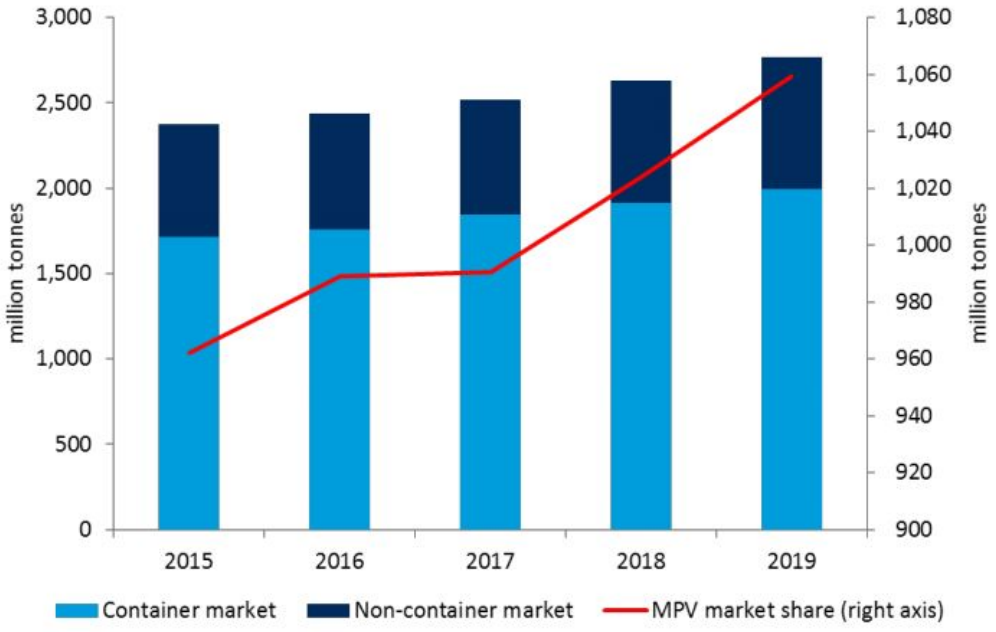


Figure 3.5: Development of dry cargo demand [Drewry, 2017]

The development of dry cargo demand is shown in figure 3.5 including the market share for multipurpose or breakbulk cargo as indicated by the red line. According to Drewry, the MPV marketshare has grown from 970 million tons in 2015 to nearly 1,000 million tons in 2017. Drewry predicts this market share to grow to 1,060 million tons in 2019 [Drewry, 2017]. The most significant drivers of demand for heavy lift shipping are the crude oil price and the viability of renewable energy. The impact of these joint forces on the demand for heavy lift shipping is very difficult to predict, as discussed in this section.

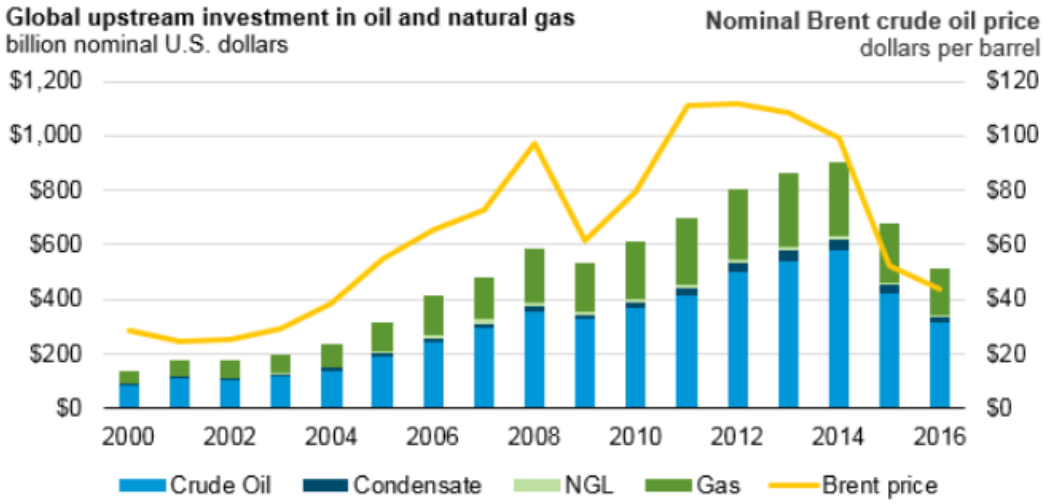


Figure 3.6: World Upstream Oil and Natural Gas Capital Investment [Energy Information Administration, 2018]

The crude oil price is a key indicator for demand of heavy lift shipping industry, as running projects in the oil and gas industry require transportation of project cargo. For decades, the oil and gas industry has been the most important source of demand for heavy lift shipping. The investment in oil and gas extraction shows a strong correlation with the crude oil price, as indicated in figure 3.6. High oil prices often indicate a need for more supply of oil and thus larger investment in exploration and production, while low oil prices reduce this investment activity [Energy Information Administration, 2018].

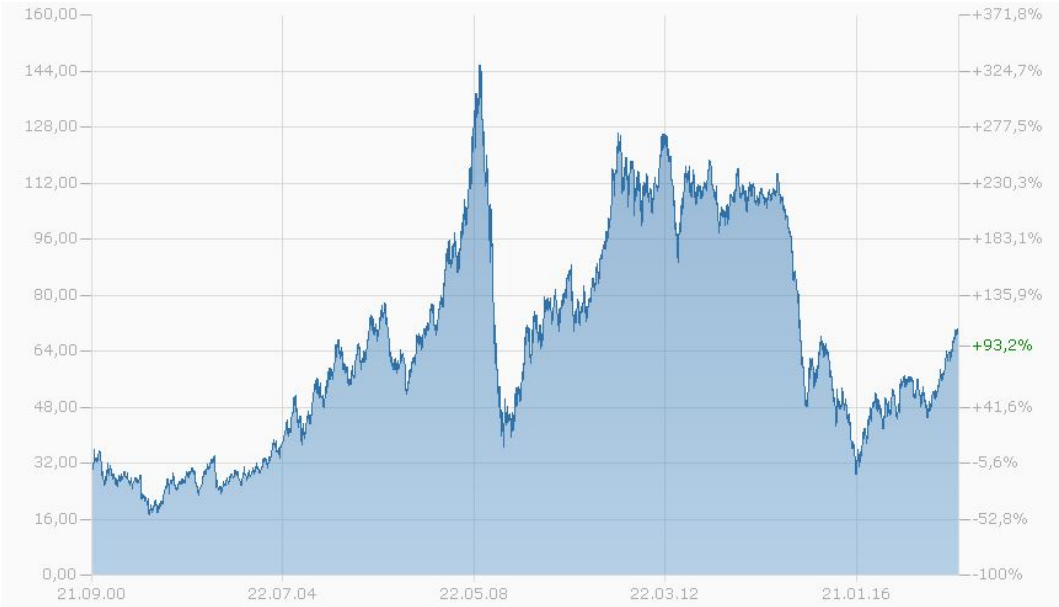


Figure 3.7: Oil Price (Brent) [$/barrel] [Finanzen.nl, 2017]

The main variables that influence the oil price are demand for oil, OPEC and non-OPEC supply of oil, the US Dollar, war and conflict and speculation [Sainsbury, 2017]. The crude oil price had fallen dramatically from over $110 per barrel during July 2014 to less than $30 per barrel in July 2015. From the trough in 2015, the oil price rose to $50 on average in 2016 and nearly up to $70 in December 2017, as shown in figure 3.7.

Renewable energy is becoming more economically viable and the renewable energy sources in this sector may compete to conventional energy sources in some areas in the world, even without governmental subsidiaries. Onshore wind is already commercially viable, and offshore wind energy is following, as prices were expected to decrease to 100 €/MWh by 2020. Tenders for the Borssele 1&2 projects (700MW) were set at 72.7 €/MWh in July 2016 and in September 2016 to 54.5 €/MWh for the Borssele 3&4 projects (700MW) [GWEC, 2016]. These lower costs for offshore wind are moving large investment in this sector in Europe (currently 90 percent of offshore wind) Asia (currently 10 percent of offshore wind) and North America, even though these prices are from projects in relatively shallow waters and exclusive of transmission costs (6-12 €/MWh) [GWEC, 2016]. These cost reductions are achieved by technological improvements for example the installation of larger turbines, enhanced control systems and improved foundations like suction buckets and floating platforms for floating turbines. These cost reductions drive the growth of demand for transportation of project cargo. Some other developments in renewable energy might be promising for demand growth for the heavy lift market, for example wave and tidal energy plant installation, which could be even combined with offshore wind power, where power storage might become more and more important [GWEC, 2016].

3.1.5 Intermediate Conclusions

The demand side of the heavy lift shipping industry can be divided in the commodity and the special segment based on the weight of the cargoes that are transported: less than 500 tons for the commodity segment and more than 500 tons for the special segment. The total turnover in this industry is $2.0 billion, of which $1.5 billion comes from charterers in the commodity segment and $0.5 billion comes from charterers in the special segment. The demand side of this industry is fragmented, because there large number of charterers especially in the commodity segment. In the special segment, the demand side is less fragmented as the only charterer types in this segment are major energy and EPC companies. The preferences and behaviour of charterers is very diverse, due to different perceptions of value and cultural differences. The demand for heavy lift shipping is not sensitive to price changes, resulting in a low PED in this industry. The oil price is the key indicator of demand for heavy lift shipping, because the oil and gas industry is the main source of demand for overseas transportation of project and breakbulk cargo. From 2015 to 2017, investment in the oil and gas industry has stagnated due to a low oil price of $ 30 to $ 60 per barrel during these years. The rise of the oil price to $ 70 per barrel in December 2017 and in combination with growth of the renewable energy industry may drive the growth of demand in the heavy lift shipping industry.

3.2 The Supply Side of the Heavy Lift Shipping Industry

This sections discusses the supply side of the heavy lift shipping industry. First, the heavy lift fleet and categories of heavy lift vessels are discussed in section 3.2.1. The diverse categories of shipowners are discussed in section 3.2.2. The number and size distribution of the shipowners are discussed in section 3.2.3. The strategic conduct of shipowners is discussed in section 3.2.4. The development of the size and the characteristics of the heavy lift fleet is discussed in section 3.2.5. Finally, the conclusions from the analysis of the supply side of the heavy lift shipping industry are provided in section 3.2.6.

3.2.1 The Fleet of Heavy Lift Vessels

The suppliers of heavy lift shipping, shipowners, are operators and or owners of vessels that are capable of transporting, loading, unloading and installation of the break-bulk and project cargo which are called heavy lift vessels. Stopford appoints three categories of heavy lift vessels, which are concerned with the transport of project and breakbulk cargoes [Stopford, 2009].

(a) Heavy Lift Crane Vessel

(b) Multi Purpose Vessel

(c) Tug Barge System

(d) (Semi-Submersible) Deck Carrier

Figure 3.8: Four Categories of Heavy Lift Vessels

Examples of these three categories of heavy lift vessels are presented in figure 3.8. The first category contains vessels that are fitted with cranes working in tandem, the Heavy Lift Crane Vessels (HLCV's) and the Multi Purpose Vessels (MPV's), as shown in figure 3.8a and 3.8b. The other two categories of heavy lift ships are powerful tug barge systems and (semi-submersible) deck carriers, as shown in figure 3.8c and 3.8d respectively. Especially the last category of heavy lift ships is intended for the heaviest and largest cargoes, for example large cruise vessels or floating rigs. Because the goal of this research is to develop a digital strategy for Jumbo, the focus is on the markets that are served by Jumbo and thus on the markets served by other owners and operators of HLCVs and MPV's.

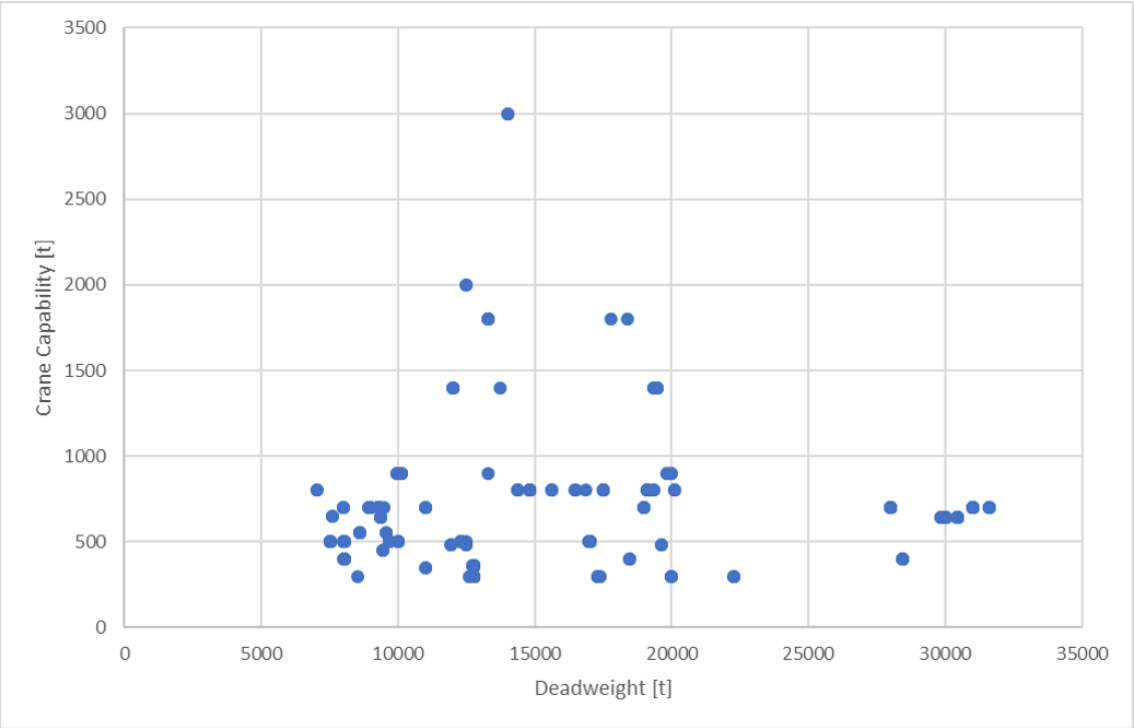


Figure 3.9: Heavy Lift Fleet (2017)

The world fleet of MPV's and HLCVs is characterized by diversity, as shown in figure 3.9, that presents the combined crane capability and deadweight of nearly 270 heavy lift vessels from the top 15 operators of vessels that are fitted with minimum crane capability of 250 tons. The crane capability of the presented vessels varies from 250 tons up to 3000 tons. Vessels with a crane capability higher than 3000 tons do not exist in the heavy lift industry, because cargoes that are so heavy that more than 3000 tons lifting capability is required, are shipped on (semi submersible) deck shipowners (figure 3.8d). Most vessels of the fleet are found in the range of vessels fitted with 250 tons to 1000 tons crane capacity. In this range, the vessels have a deadweight of 7.500 to over 30.000 tons. In the range of vessels fitted with a combined crane capability of 1000 to 3000 tons the vessels have a deadweight of 12.000 to 20.000 tons. The various vessel characteristics can be considered as horizontal product differentiation, as these are all heavy lift vessels, fitted with cranes, but also as vertical product differentiation, as the quality of the vessels and the service of the owner have different levels [Lipczynski et al., 2017]. Three categories of shipowners in the heavy lift shipping industry are discussed in section 3.2.2.

3.2.2 The Shipowners in the Heavy Lift Shipping Industry

The heavy lift fleet, as shown in figure 3.9, is owned and operated by different parties that each have different characteristics. The composition of the fleets of the shipowners in terms of fleet size and vessel characteristics can be used to address the size distribution of sellers in the heavy lift shipping industry for the different market segments in section 3.2.3. The fleet size and vessel characteristics of each shipowner are related to the shipowners' strategies that are explained in section 3.2.4.

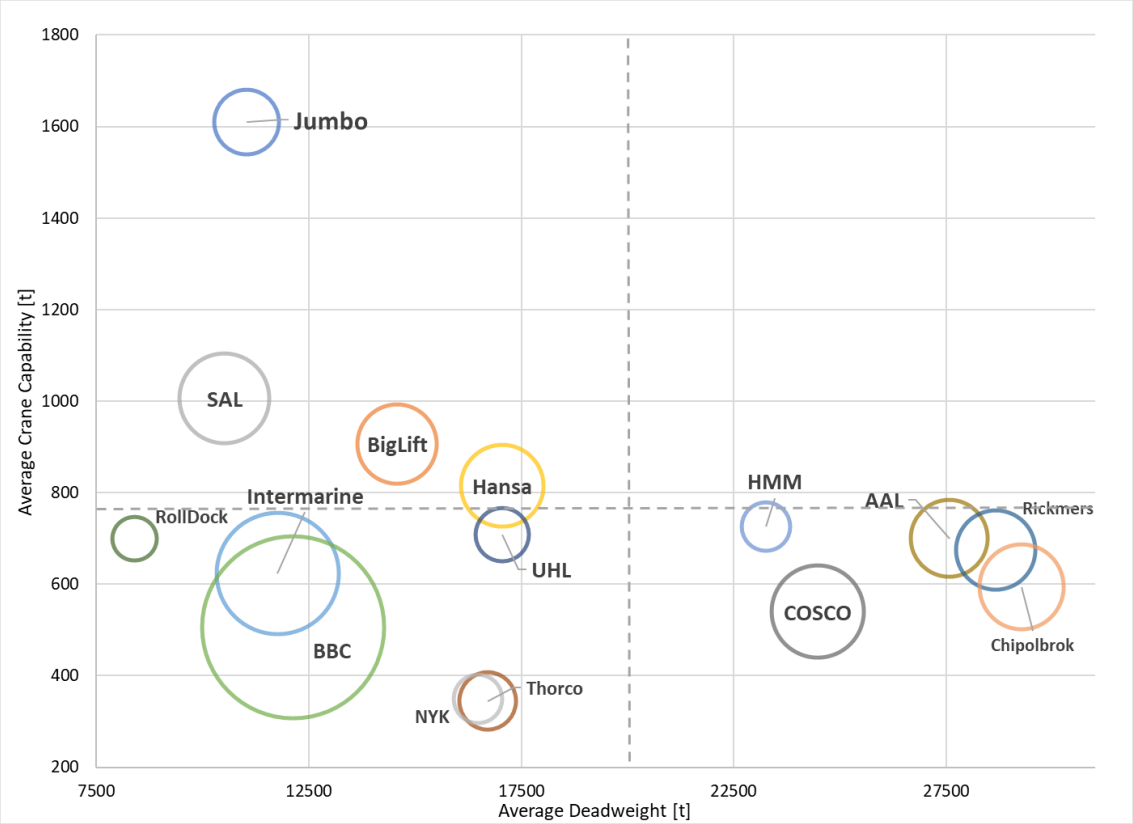


Figure 3.10: Market Positions of Top 15 Heavy Lift Operators (2017)

The number of vessels, average deadweight capacity and average combined crane capability are plotted in figure 3.10 for the fleets of the top 15 shipowners in the heavy lift shipping industry fitted with a combined crane capability of more than 250 tons. One should note that figure 3.10 only represents the fleet of heavy lift operators that is fitted with a combined crane capability of a minimum of 250 tons. For Jumbo, all vessels are taken into account to visualize their market position, hence all vessels of Jumbo have a crane capacity higher than 250 tons. For COSCO and BBC for example, a part of the fleet is fitted with crane capability less than 250 tons, so the market position of these shipowners as presented in figure 3.10 is not the market position of the whole shipping company, but the market position when only the vessels are taken into account that are fitted with a crane capability of 250 tons and more.

The shipowners can be divided into three categories, according to average deadweight capacity of their fleet and average combined crane capability. The High-end Tramp Operators, positioned in the upper-left corner of figure 3.10, are characterized by a relatively low number of vessels, a low average deadweight of 10,000 to 17,000 tons and a high average crane capability. The Low-end Tramp Operators, positioned in the bottom-left corner in figure 3.10, have vessels more or less the same average deadweight capacity as the High-end Tramp Operators, but these vessels are fitted with less crane capacity and the Low-end Tramp operators have larger fleets. The Low-end Liner Operators, positioned in the bottom-right corner of figure 3.10, especially differ from both Tramper Operators regarding the average deadweight capacity of tonnage, which is over 20,000 on average. It is noteworthy that there is no category in figure 3.10, that fills the gap in the upper-right corner, which would be a category of operators that have high deadweight capacity vessels fitted with a high crane capability. Vessels with a large deadweigth capacity are efficient of high trade volume routes and these routes are often situated between main ports that have

well developed infrastructures and onshore cranes for cargo handling, which would make the high capability cranes unnecessary for loading and discharging. The differentiation of the vessels in term of deadweight capacity ad crane capability is shown in Annex B.1 for the three categories of shipowners for a more detailed view of their fleets. The number and size distribution of the shipowners, the suppliers of the industry, are discussed in section 3.2.3.

3.2.3 The Number and Size Distribution of Shipowners

The number and size distribution of sellers in the heavy lift shipping industry is one of the indicators to address the susceptibility of the industry to the digital platforms as discussed in chapter 2. Before the number and size distribution of sellers can be determined, the market segment in which these indicators are determined have to be set. The market segments can be set by crane capability, which is set at a minimum of 250 tons for the vessels that are studied and shown in figure 3.9. The minimum crane capability can be changed in order to generate more segments.

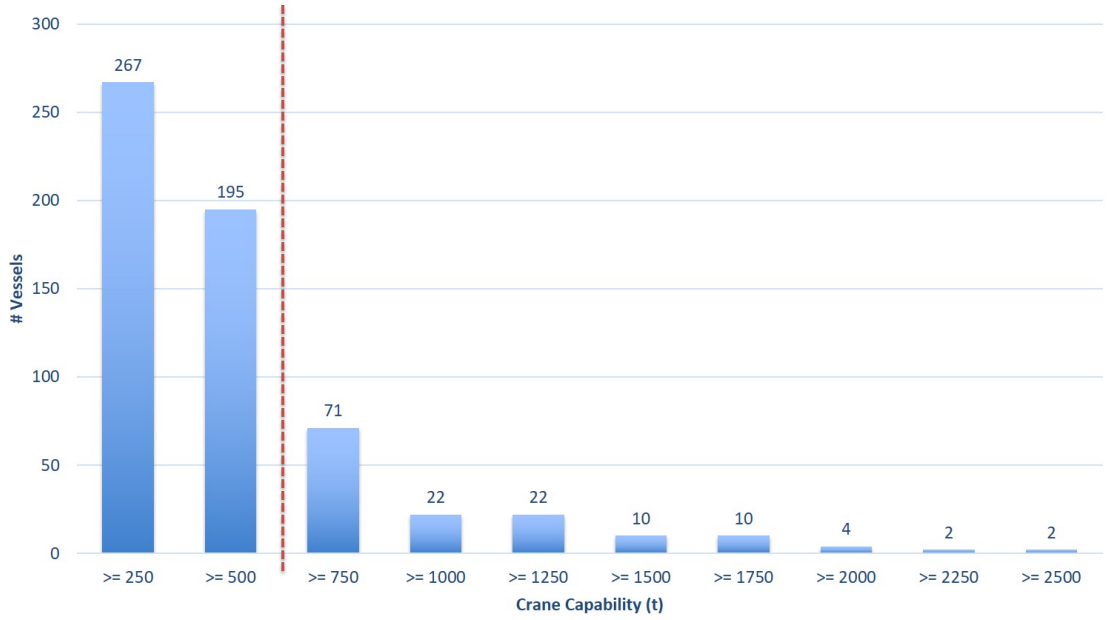


Figure 3.11: Number of Vessels for Different Levels of Required Crane Capability (2017)

The relation of the minimum crane capability to the number of capable vessels in the heavy lift industry is presented in figure 3.11. If the required crane capability is increased to define a market segment, the number of vessels that fit in this market segment is reduced. Considering the market segments as discussed in section 3.1, it is assumed that the special segment in which cargoes are shipped have a weight of more than or equal to 500 tons, can only be served by vessels fitted with a minimum crane capability of 1000 tons. The additional crane capability of 250 tons is required for 250 tons of lifting equipment such as spreader beams and other requirements such as a required outreach and or hoisting height. One should note that the effective operational lift capability of a vessel can be negatively influenced by other conditions such as weather and sea conditions. Moreover, a large required outreach or hoisting height negatively influences the operational lifting capability. The assumption that the special segment of the market can only be served by vessels with a crane capacity of 750 tons, this market segment is served only by 71 vessels, as indicated in figure 3.11. The commodity segment can be served by over 267 vessels, hence this segment could also be served by vessels fitted with lower crane capability than

250 tons. The heavy lift fleet is owned and or operated by dozens of shipowners. Some of these shipowners only have a few vessels and other shipowners and BBC has the largest fleet of 80 vessels equipped with a crane capability higher than 250 tons and 170 vessels in total. Considering the super heavy segment, in which cargoes have to be lifted weighing 1500 tons and more, only 4 to 10 vessels are currently capable of lifting and shipping such cargoes, assuming that the additional lifting capability required to lift the cargo is 250 to 500 tons. The 4 to 10 vessels capable to lift and ship cargoes of 1500 ton and more are owned by 3 players: Jumbo, Biglift and SAL. However, this doesn't mean that the last mentioned shipowners are the only shipowners in the super heavy segment, hence they face competition from operators of deck carriers.

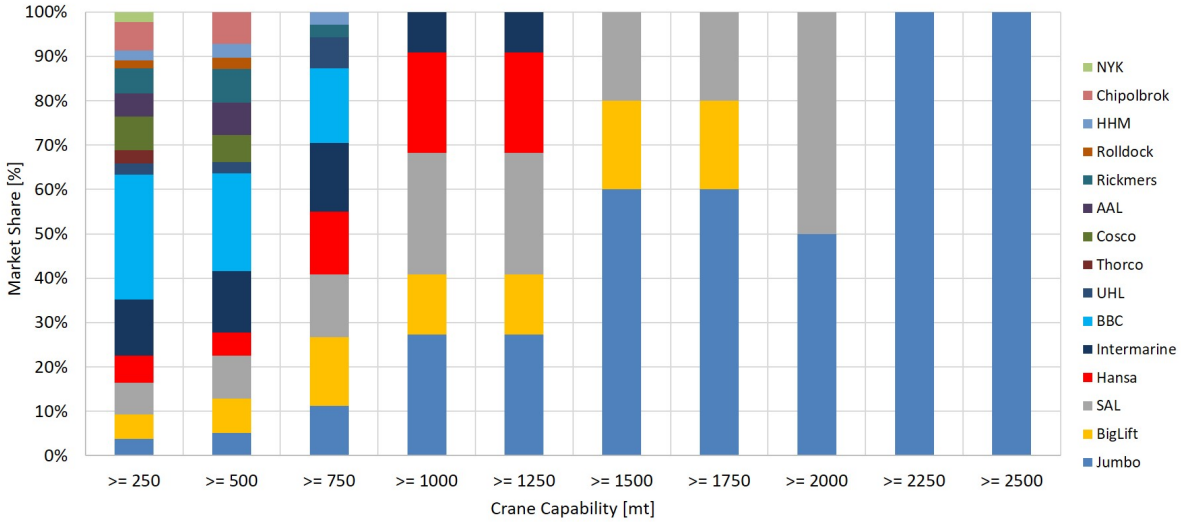


Figure 3.12: Market Share of Top 15 Heavy Lift Operators (2017)

The market shares of the top 15 operators are presented in figure 3.12, expressed as the share of the number of vessels in the heavy lift fleet. These market shares are determined for several market segments that are set by a minimum level of crane capacity. The market share of these operators should better be expressed in terms of revenue, but it is made difficult by the fact that data of shipowners' revenue is hard to obtain. Based on the $ 0.5 billion turnover in the special segment and the $ 1.5 billion turnover in the commodity segment, being estimated by Jumbo, the High-end Tramp Operators have a total revenue of $ 0.5 billion. The Low-end Tramp Operators and Liner Operators have a turnover of $ 1.5 billion.

For the market segment determined by a minimum required lift capability of 250 tons, the supply side of the industry is fragmented, hence there are over 15 shipowners active in this segment. BBC has the biggest market share of 28 percent in this segment. In the market segments of heavy lift vessels with a higher lift capability, the supply side of the market becomes more concentrated, hence there are less operators in the heavier segments. Jumbo owns about 3 percent of the vessels that are capable lifting more than 250 tons, but this market share increases when the minimum lifting capacity is increased. From figure 3.12 can be concluded that Jumbo is main player in the upper segment in the heavy lift shipping market. In the super heavy segment, Jumbo faces competition from SAL and Biglift.

3.2.4 Strategic Conduct of Shipowners

The shipowners that have been discussed in section 3.2.2 and 3.2.3 have different vessel and fleet characteristics. However all shipowners have more or less the same objective: profit maximization by fixing at the highest freight rates and operating at the lowest costs, maximizing the producer surplus. In this section, the strategic implications of the vessel and fleet characteristics are addressed that type the three different types of heavy lift operators. After the specific strategies of the shipowner types are discussed, general vessel features and information sharing are described as factors that contribute to competitive advantage. First, the strategies of High-end Tramp Operators are discussed.

Figure 3.13: High-end Tramp Operator: Jumbo [Jumbo, 2017b]

The High-end Tramp Operators, of which an example is presented in figure 3.13, each operate a relatively small fleet of 10 to 15 vessels. The strong cranes are required to lift the heavy cargoes during loading and discharging the vessel. The POL or POD are often on exotic locations (sometimes even not ports) where an infrastructure such as cranes to handle these cargoes is not available, for example small ports or offshore locations. Especially the deck of these vessels is utilized by the super heavy cargoes, because these cargoes are often too oversized to fit in the holds. This means that the hold space of these vessels are infrequently utilized to their full potential.

The shipowners from this category provide a tramp service and not a liner service, because of the of low freight volumes in this market segment, the reason why these vessels have a low deadweight capacity. In a tramp service, the vessel has no fixed sailing schedule or routing, but the vessel is positioned for the super heavy cargoes. The vessels in this category frequently sail empty legs or ballast legs to position the vessel for a cargo from the special segment, because the high rates that are paid for the transportation of these cargoes justify the cost of a ballast leg. When a vessel is shipping a cargo from the special segment, the deck and hold space of these vessels are often underutilized. To increase the utilization of their fleets, the High-end Tramp Operators fix commodity cargoes on the spot market as fillers of under-utilized cargo space to improve their utilization. On low volume trade routes it is much more difficult for a shipowner to find profitable cargoes on the spot market compared to high volume trade routes. Depending on the freight that is

paid for these filler cargoes, the shipowner's sailing schedule and the extra cost that have to be incurred to ship and handle the cargo, the shipowner can decide whether to fix or not to fix a filler cargo. Charterers from the special segment sometimes even pay extra to a shipowner in order to have a dedicated vessel for their cargo, for these voyages the shipowner does not have to consider to fix filler cargoes.

The relatively small deadweight capacity and strong cranes make these vessels suitable for lifting and shipping the super heavy cargoes in the special segment. The strong cranes on the vessels enable these shipowner to deliver an integrated shipping and lifting service. The combination of large required capital investment in these vessels and a large amount of man-hours to operate the vessel and a large amount of man-hours for transport engineering makes it very expensive to operate and charter these vessels. The day rate for the vessels in this category varies from $ 12,000 to $ 40,000, depending on crane capability, age of the vessel and market conditions. The High-end Tramp Operators achieve competitive advantage over the deck carriers in terms of shorter loading and discharging times. They achieve competitive advantage over the Low-end Operators for heavy cargoes that can not be handled by Low-end Operators. The High-end Tramp Operators achieve their competitive advantages in the market segment in which the Deck Carriers are too expensive and in which the Low-end Tramp and Liner operators lack the lifting capability to lift and ship these cargoes. In this niche market, the super heavy special segment, the charterers are willing to pay a high price for transportation when there is no alternative available for lower costs.

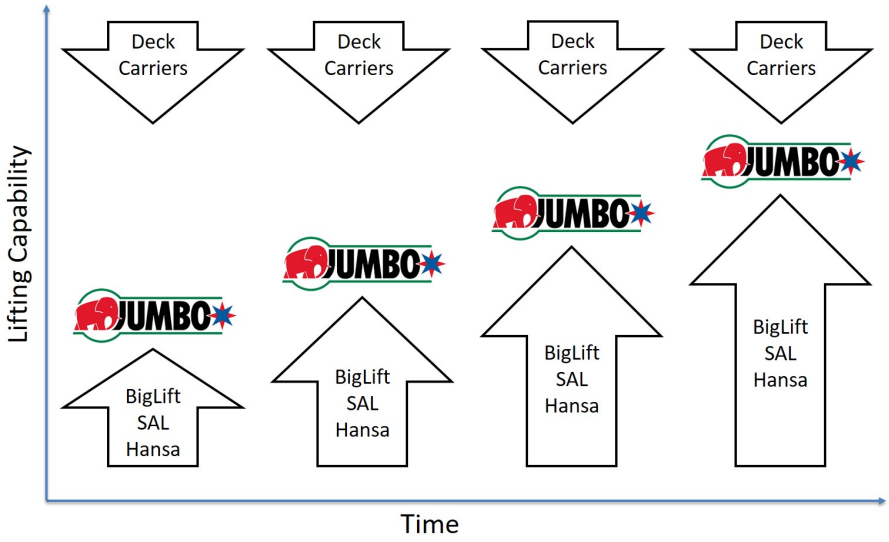
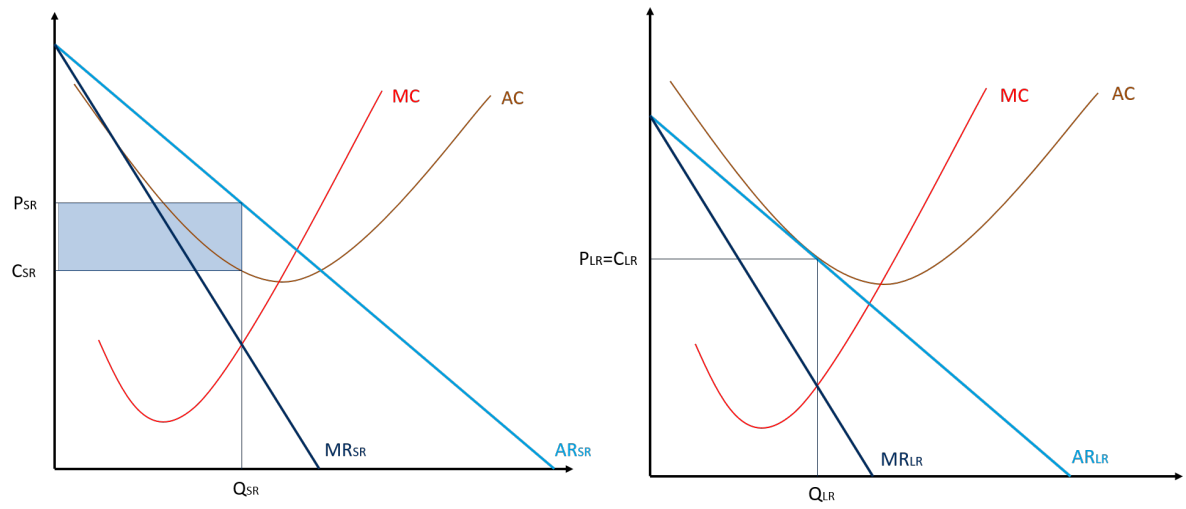


Figure 3.14: Development of Competition in the Super Heavy Segment

The profitability of the niche market in which the High-end Tramp Operators are active has been attracting other and more shipowners, that started to build vessels with stronger cranes. This development shows the characteristics of monopolistic competition, in which firms are able to earn super-normal profits in the short run, while the absence of barriers to entry ensures the firms are only able to earn a normal profit in the long run [Lipczynski et al., 2017], as shown in figure 3.15. Jumbo, but also SAL and Biglift, have been pioneering new niche market segments, by investing in vessels fitted with higher crane capabilities. This development is illustrated in figure 3.14. Jumbo has been developing and investing in vessels with stronger cranes (see annex A.1), in order to stay ahead of the competition from SAL, BigLift and Hansa, which were also following this trend.



(a) Short Run

(b) Long Run

Figure 3.15: The Equilibria of Monopolistic Competition [Lipczynski et al., 2017]

Jumbo's strategy of pioneering a new niche-market has been working out for decades. When Jumbo introduced a new class of vessels, they enjoyed a period of being a monopolist in the top segment, because they were the only shipowner in this new created top segment. In this period of being a monopolist, Jumbo was able to set prices higher than marginal costs, extracting super-normal profits (see the short run equilibrium in figure 3.15a). Note that figure 3.15 represents a standard text book model of monopolistic competition, meaning that this figure does not represent the heavy lifts shipping market. However, the size of the niche market was decreasing, because the gap between the shipowners of deck carriers and HLCV's became smaller. In 2015, Jumbo attempted to pioneer a new market segment by introducing two K-3000 class vessels. These are fitted with a crane capability of 3000 tons, which is 1000 tons more than the 2000 tons crane capability of SAL's vessels. At the time as these vessels were introduced into the market, the oil price decreased in 2015 as discussed in 3.1.4, causing projects in the oil and gas industry to be cancelled. In this situation, no other High-end Tramp Operator tried to enter the niche of Jumbo, because there has not been enough space in the market for such vessels. The lack of market space in this niche is caused by a combination of more competition from deck carriers and a lack of demand in this segment. A lack of demand in this market segment does not permit super-normal profits in this top segment, as shown in figure 3.15b, due to the stagnating investment in capital projects as discussed in section 3.1.4. Jumbo and the other High-end Tramp Operators are facing challenging times that are characterized by an oversupply of tonnage an a lack of demand, this means that they have to fix more profitable filler cargo to increase their utilization on ballast legs and legs that want completion. However, an even more severe oversupply of tonnage among Low-end Tramp and Liner Operators, which implies strong competition, makes penetration into the commodity segment very challenging. The strategies of the Low-end Operators rely more on economies of scope and scale, which will be explained first for the Low-end Tramp Operators.

Figure 3.16: Low-end Tramp Operator: BBC

The Low-end Tramp operators in general have larger fleets than the High-end Tramp Operators. The vessels that are operated in this category have the same range of deadweight capacity as the High-end Tramp Operators, but are fitted with cranes that have lower lifting capabilities. The shipowners in this category are only capable to ship and lift the cargoes from the commodity segment. The relatively small deadweight capacity of their vessels, compared to the vessels of the Low-end Liner Operators, enables Low-end Tramp Operators to provide service in and between exotic POLs and PODs. The lower crane capability of these vessels and the less complex transport engineering result in low costs to operate and to invest in these vessels, compared to the vessels from the High-end Tramp Operators. information from Jumbo indicates that the day rate for the vessels in this category varies from $ 4,000 to $ 12,000, depending on the lift capability, the age of the vessel and market conditions.

Most of the shipowners in this category provide a tramp service and some provide a liner service or even a combination of both. The shipowners from this category do not try to achieve competitive advantage by differentiating themselves from competition through high capability cranes. These shipowners achieve economies of scale because of their large number of vessels in their fleets, which enables them to operate at low average costs. The large fleets enable these shipowners to provide flexibility to customers and themselves. The charterers benefit from the flexibility that can be provided by the shipowners in terms of frequent sailings and a high availability of vessels. The shipowners themselves from this category are able to change their sailing schedules and shift cargoes from vessel A to vessel B, which helps to increase their utilization levels, achieving economies of scope. The largest operator from this category, BBC, operates 80 vessels that are fitted with cranes capable to lift more than 250 tons, and even 170 vessels in total.

Figure 3.17: Low-end Liner Operator: Rickmers-Line

The Low-end Liner Operators in general have the same fleet size as the Low-end Tramp Operators, moreover the crane capabilities are more or less the same for these Low-end Operators. The size of the vessels in terms of length and deadweight capacity of the vessels in category makes this category different from the other two categories. The large cargo hold volume and large deck space of these vessels enable the shipowners from this category to combine multiple shipments of multiple charterers on the same vessel. Most shipowners in this category operate a liner service. In a liner service, the vessel is operated according a schedule with a fixed port rotation and published dates of port calls. The liner service is performed between major ports and on high volume trade routes. On these routes, the shipowners try to utilize the hold and deck space of their vessels. The port infrastructure is often well developed at the POLs and PODs, the reason why super strong cranes are not very cost effective for shipowners in this category. These shipowners show their sailing schedule online and charterers can approach these shipowners to request for a price and availability.

The Low-end Liner Operators achieve competitive advantage through economies of scope and through economies of scale. Economies of scale are achieved when the average costs are decreased (economies of scale) or increased (dis-economies of scale) as a firm alters its scale of production. Economies of scope are cost savings that arise when a firm produces two or more outputs using the same set of resources [Lipczynski et al., 2017]. The economies of scope are achieved by combining multiple shipments from different charterers in the large cargo space of their vessels on the fixed routes of their liner services. The economies of scale are achieved by operating a fleet of large vessels. The economies of scales due to the large fleet are the equal to the economies of scale as discussed for Low-end Tramp Operators, while the economies of scale due to large vessels are unique for the Low-end Liner Operators. Consider two options for shipping a batch of 40 wind turbine blades: option 1 is to ship these blades on 1 vessel that is able to ship all 40 blades, while option 2 is to ship the blades on 2 vessels that each are able to ship only 20. Option 1 will be the most efficient option, because of lower costs because only 1 crew is required for one vessel instead of two vessels and because fuel and port costs are lower.

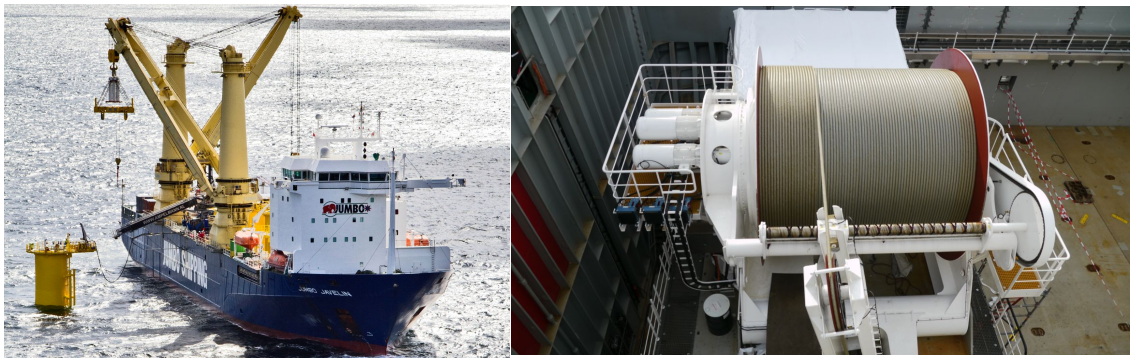
Besides the previously described fleet and vessel characteristics that have implications on competitive advantage, there are other vessel characteristics that are used by shipowners to differentiate themselves from competitors. During the determination of the deck and hold specifications of a HLCV, the strength and size of the tanktop, the tween-decks, the hatches and deck are key to determination for which types of cargo the vessel is fit.

Figure 3.18: The Flyjib

In addition to the lifting capability of the cranes, the hoisting height and the outreach of the crane also have implications to competitive advantage. Some shipowners, for example Jumbo and BigLift, have fly-jibs to increase the hoisting height of their cranes. The fly-jib temporarily increases hoisting height at the expense of the crane capacity. The fly-jib is used for cargoes that require a large hoisting height and or outreach during loading and discharging operations. An example of a fly-jib is shown in figure 3.18.

Figure 3.19: The Combination of Lifting, Rolling and Docking

Some shipowners gain competitive advantage by having alternatives for loading and discharging cargoes by cranes. RollDock for example operates vessels that are able to roll the cargo over a ramp in order to load or discharge a cargo (figure 3.19), as they also have the alternative to submerge the vessels, so the cargo can be floated into the cargo hold.



(a) Dynamic Postitioning (b) Deepwater Deployment

Figure 3.20: Diversification to Offshore Installation Services

In the category of the High-End Tramp Operators, some vessels are fitted with Dynamic Positioning (DP) systems (figure 3.20a) and/or Deepwater Deployment (DD) systems (figure 3.20a), which enable the shipowner to increase the vessel capabilities so the vessel can be employed to offshore installation contracts in addition to the shipping contracts. Jumbo and SAL have fitted some of their vessels with DP and or DD systems to diversify their activities from shipping to shipping and offshore installation activities, which enables them to serve a wider market. By diversification, Jumbo and SAL benefit from economies of scope, because these vessels can flexibly be deployed for shipping and offshore activities. When there are no offshore contracts, the DP and or DD fitted vessels can be employed to shipping contracts, discussed more elaborately in chapter 4.

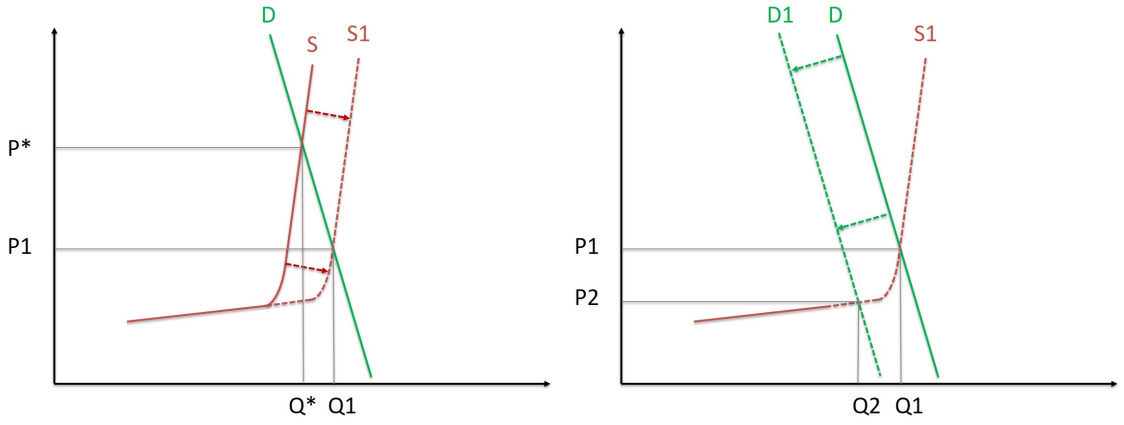
Figure 3.21: Ice-Class notation for a HLCV

In order to win more contracts for shipments from and to northern regions during winter, some shipowners choose to Ice strengthen their vessels' hull. A large part of the BigLift and Spliethoff fleets and Jumbo's K-class vessels comply with the Finnish Iceclass A1 notation, which enables them to achieve competitive advantage in winning contracts for heavy lift shipping through icy regions. An example of a HLCV that has Ice-Class notation is shown in figure 3.21.

3.2.5 Development of the Heavy Lift Fleet

The heavy lift fleet has grown in size, as the number of vessels capable to lift more than 750 tons has grown from a dozen to 71 vessels. As discussed in section 3.2.4, the super-normal

profits in the special segment attracted more and new operators, the lack of barriers to entry made it possible to enter this market segment, which has led to more supply in this market.



(a) Increase of Supply (b) Decrease of Demand

Figure 3.22: Freight Rate Mechanism

The freight rate has strong influence on the supply of sea transport. The supply curve for shipping is shown in figure 3.22. This curve shows the quantity of shipping services supplied by shipowners in response to freight changes [Lun et al., 2010], which is a J-shaped curve. When the freight rate falls below operating costs, ships will be laid up and supply is consequently reduced. The supply during a boom is very in-elastic because a large amount of the fleet is in service. During a recession, the supply of sea-transport is very elastic, because vessels are laid up. In figure 3.22a, the fleet growth is represented by the shift of S to S1, leading to a decrease of the freight rate from P* to P1. Moreover, because investment in offshore oil and gas projects plummeted since 2015, demand decreased represented by the shift of D to D1 in figure 3.22b, leading to a reduction of freight rates, represented by the shift from P1 to P2. Currently the combination of a lack of demand and a severe oversupply of tonnage results in low freight rates in the heavy lift shipping industry.

Growth of demand would drive the freight rate up, scrapping of heavy lift tonnage could also drive the freight rates to increase. The (expected) development of the heavy lift fleet according to Drewry is shown in figure 3.23, from 2015 to 2019. From this figure can be concluded that scrapping activity is expected especially in the fleets of the Low-end Tramp and Liner Operators. In contrary, newbuilding activity is expected in the fleet of High-end Tramp Operators. The scrapping activity of the Low-end fleet can be declared by recent environmental regulatory rules that have been established by the International Maritime Organization (IMO). The regulations that have an impact on the development of the heavy lift fleet are the regulations regarding Ballast Water Management Convention (BWMC) and the Sulphur Emission Control Area (SECA). Operators of vessels that do not yet comply to these regulation have to invest in expensive technologies to comply to the IMO regulations. Especially operators of old vessels have to consider if scrapping is commercially more attractive than investing in expensive technologies and re-fitting their vessels [Drewry, 2017].

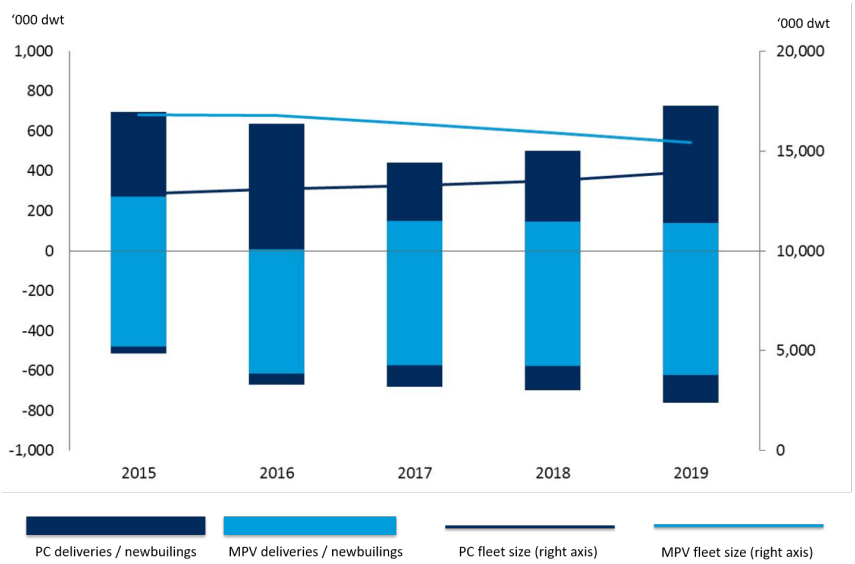


Figure 3.23: Fleet Development [Drewry, 2017]

3.2.6 Intermediate Conclusions

The supply side of the commodity segment is fragmented, as there are more than 267 vessels operated by more than 15 operators. In the special segment, the supply side is more concentrated as up to 71 vessels are operated by only 8 operators and only 3 operators in the super heavy segment. The supply side can be considered differentiated as the vessels of the heavy lift fleet have many different characteristics. Based on crane capabilities, the High-end Tramp Operators can be distinguished from the Low-end Operators, which on their turn are distinguished into Low-end Tramp Operators and Low-end Liner Operators, based on the deadweight capacity of their vessels. The High-end Tramp Operators serve a niche market, the special segment, by filling the gap between the Low-End Operators and the (Semi-submersible) Deck Carriers. The High-end Tramp Operators position their vessels for cargoes from the special segment and try to fix spot cargoes from the commodity segment in order to maximize their yield. The Low-end Operators achieve competitive advantage through economies of scale in their fleet size. The flexibility of the service from the Low-end Tramp Operators and the economies of scale of large vessels from the Low-end Liner Operators are sources of competitive advantage of the shipowners in the commodity segment. The shipowners are facing challenging times, characterized by low freight rates, due to severe overcapacity of tonnage in combination with stagnating demand. The market outlook is positive for the shipowners as, besides the growth of demand, scrapping activity is expected to decrease supply and drive freight rates up.

3.3 The Coordination of the Freight Market in the Heavy Lift Shipping Industry

This sections discusses the coordination of transactions between charterers and shipowners and the role of intermediaries in this coordination. The exchange in the heavy lift shipping industry is discussed in section 3.3.1. The role of brokers and forwarders is discussed in section 3.3.2. The current way of matching charterers and shipowners is discussed in 3.3.3. The current facilitation of transactions in the heavy lift shipping industry is discussed in section 3.3.4. The current institutional infrastructure in the heavy lift shipping industry is discussed in section 3.3.5. Finally, the findings of this section are discussed in section 3.3.6.

3.3.1 The Exchange of Information the Heavy Lift Shipping Industry

The coordination of transactions between charterers and shipowners is quite complex. Charterers send inquiries that contain cargo and route data to shipowners, which share their vessel positions, availability of cargo space and price information to charterers. If a charterer finds a convenient vessel for a decent price that is quoted by the shipowner, these parties close a contract which is called a fix, in which the terms are defined. After the fix has been made, the shipowner executes the shipping, lifting or installation service according the contractual terms. After the service has been completed, the charterers provides an evaluation of the service and pays the freight to the shipowner, sometimes in- or excluding penalties when the charterer or shipowner does not meet the contractual obligations. Especially if the charterer or shipowner is a large company, in-house agents are deployed to coordinate these transactions, as these interaction can be very complex.

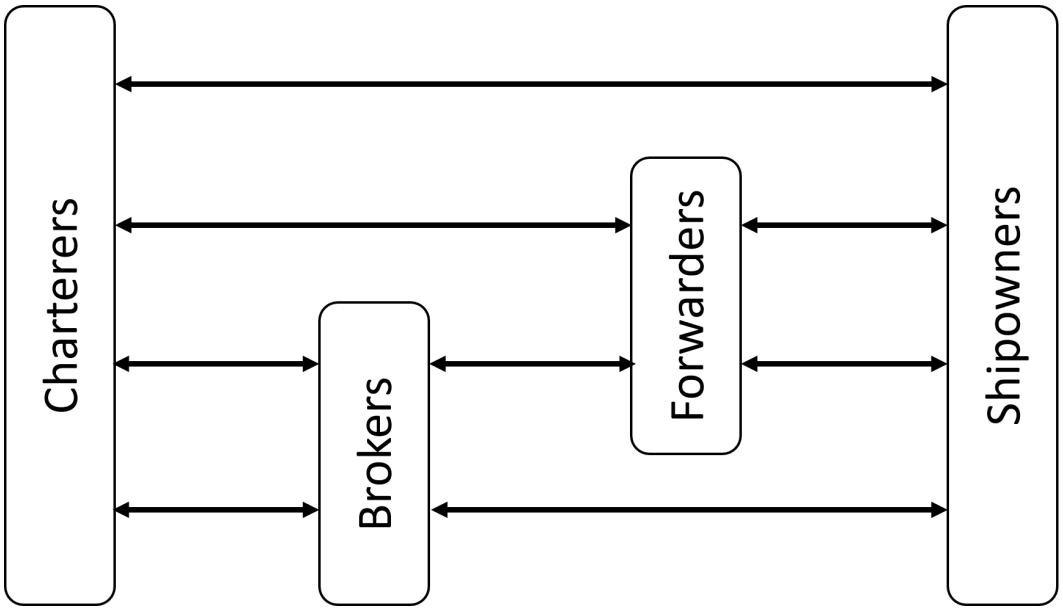


Figure 3.24: Intermediation of Charterers and Shipowners

Intermediaries are involved in the majority of transactions in the heavy lift shipping industry, who's role is to contribute to market efficiency: the ship brokers and the freight forwarders. A schematic representation of the involvement of brokers and forwarders is shown in figure 3.24 and their role in the industry is discussed in 3.3.2.

3.3.2 The Ship Brokers and Freight Forwarders

The ship brokers and freight forwarders contribute to market efficiency in exchange for a fee or a commission that is paid by charterers and shipowners. The brokers act as matchmakers [Strandenes, 2000], while the freight forwarders act as marketmakers in the heavy lift shipping industry. Marketmakers set an ask price and a bid price at which he sells and buys on his own account, while matchmakers do not sell or buy, but simply match two parties [Yavas, 1992]. Shipbrokers match cargo owners to ship owners and forwarders buy in (multi-level) transportation services from shipowners, combine them and sell integrated transportation services to charterers.

Table 3.3: Shipbrokers' contribution to market efficiency [Strandenes, 2000]

Activity	**Function**	**Resources**
Searching	Brief search period	(1) Extensive network (2) Market Research
Matching	Choose probable matches	Knowledge of agents' operations
Bargaining	Relevant initial price suggestion	(1) Knowledge of agents' cost structure (2) Knowledge of market situation
Risk Reduction	(1) Increase chance of contractual fulfillment (2) Neutral expert in case of asymmetric information	(1) Knowledge of international law (2) Experience from earlier contractual agreements (3) Knowledge of vessel quality from former deals

According to Strandenes, ship brokers contribute to the efficiency of the shipping market in different ways as summarized in table 3.3 [Strandenes, 2000]. The contribution of brokers to market efficiency has the same characteristics as the value adding processes of digital platforms in the form of marketplaces as discussed in chapter 2. The differences are the resources of a broker's contribution to market efficiency compared to the valued adding processes of digital platforms. The resources of a broker are his personal network, industry knowledge and expertise, while the resources of marketplaces are a digital infrastructure and network of users. Brokers have two types of information: market information on supply and demand 1) and assessment of market developments and quality of vessels and sellers 2). Type 1 is replaceable by the internet, but type 2 reflects brokers expertise and is thus not easily replaceable by the internet [Strandenes, 2000]. Technical knowledge of ship brokers in heavy lift shipping industry is required to ensure technical tasks provided by others such as stowage plans, lift studies, stability calculations and safety procedure studies before passing them to a charterer or owners [Polson, 2016]. Shipowners may not always publish the positions of their whole fleet, some may be sailing with part cargoes and they may only disclose her position and space availability to trusted parties. The brokers are paid commission by charterers and shipowners as transaction costs for finding convenient vessels, negotiations on terms and rates, pre-fixture information and advise, post fixture evaluation, paperwork and insurance. This commission is about 1.25 percent of the freight, sometimes a sequence of up to 4 brokers is involved in the chartering process, which means that the total commission can be equal to 1.25 to 5 percent of the freight. Brokers increase the price until the probability of a successful sale falls low enough to counteract the rise in commission from a slightly higher price.

The freight forwarders arrange the transportation for charterers, serve as a one-stop-shop for transportation, insurance and other paperwork and arrange port calls, stevedoring and warehousing. Charterers only need to have one single point of contact if they approach a forwarder for arranging their shipment. Forwarders leverage their network of charterers and shipowners by combining several shipments from different companies to form one large shipment. Economies of scope are achieved by combining multiple shipments on one vessel, that leads to a higher utilization of such a shipment. Forwarders do not earn a similar commission as brokers do, because they are marketmakers and make money by selling transportation services to charterers for a higher price than they buy these services from shipowners, at their own risk. The role of forwarders is more or less the same as the role of travel agents: bundling several services into one total service to add value for buyers and bundling buyers' demand to services to achieve cost reduction. Brokers are active in both commodity segment and the special segment. Especially in the commodity segment, forwarders have a large market share, because of their added value by combining several small shipments into one large shipment, leading to cost reductions following economies of scope. Kuehne + Nagel, DHL, Bluewater Shipping and Deugro are examples of forwarders that are regularly active in the commodity segment, according to Jumbo.

Table 3.4: Overview of Transaction Costs to Brokers and Forwarders

	Turnover [$]	Commission [%]	Commission [$]
Specials	500,000,000	5.0	25,000,000
Commodity	1,500,000,000	2.5	37,500,000

The transaction costs due to intermediation of brokers forwarders are significant. Table 3.4 summarizes the transaction costs to these intermediaries, based on the estimated turnover and transaction cost percentages in both the commodity and special segment. The transaction cost percentages of brokers and forwarders are a rough estimate by the CFO by Jumbo, just as the yearly turnover in this industry. The transaction costs paid to brokers and forwarders account $ 37.5 million in the commodity segment and $ 25.0 million in the special segment. These significant transaction costs are a source of incentives for charterers and shipowners to transact direct without forwarders and brokers. However until now, these intermediaries are still dominant and seem to be indispensable. The impact of information technology and digital platforms on the intermediaries and their changing roles are discussed more elaborately in chapter 5.

3.3.3 Matching charterers and shipowners

Shipowners have different methods for determination of product offering in the market. The determination of product offering may be the characteristics of their fleets, or the positions of their fleet. To determine their characteristics of their fleets, shipowners have market intelligence managers who follow the industry trends. For the determination of their fleet positions, shipowners have a commercial team deployed, and or brokers, in order to follows the trends of market.

Charterers can find information about the characteristics of the shipowners' vessels and positions on their websites. Especially the shipowners that provide a liner service show their liner schedules on their websites to provide transparency to their prospective clients in their schedules. For example BBC Chartering has a daily update of their sailing schedule (not detailed) and Rickmers-Line show their liner schedule on their website

[Rickmers-Line, 2018]. The tramp operators send their vessel positions to their exclusive brokers, which attempt to find profitable cargoes for them, without disclosure of this commercial sensitive information. Jumbo has an interactive website that enables prospective clients to view their open positions and to submit inquiries through a fixed format, this system will be discussed in chapter 4.

Table 3.5: Matching charterers and shipowners in the Heavy Lift Shipping Industry

Sub-function	Current Coordination
Determination of Product Offerings	• Market Analysts • Information from Brokers / Agents • Surveys from Clients
Search	• E-mail Circulations • Phone Calls • Company Websites • Brokers & Forwarders
Price Discovery	• Request for Quotation → Quote • Invitation to Tender → Tender • Negotiation

Charterers can choose to approach a shipowner directly by searching on company websites for vessel characteristics or open positions, by sending an inquiry through email or by calling a representative of the shipowner. They can also contact a broker or forwarder to search for and arrange the transportation service. Shipowners receive inquiries mainly through email or phone contact, directly from charterers or indirectly from brokers or forwarders. In most cases, the commercial team of a shipowner take care of these inquiries and attempt to find cargoes that lead to profitable contracts. If they find commercially attractive inquiries, they respond by providing quotes to the charterer or intermediary associated to this inquiry. The price quote can be a fixed tariff (in case of a liner service) or based on the cost of a voyage (in case of a tramp service). The charterer receives a single or multiple quotes for his inquiry, and responds to the quote by indicating: 1) to be prepared to fix the contract for the price that is quoted, 2) to want a negotiation on the price or terms or 3) the disqualification of the shipowner for this contract. The fixture of contracts and the included negotiations are often executed on the phone, in which personal and negotiation skills are very important. When a charterer has multiple options for a shipment, a reverse auction through email or phone contact is executed, without any strict rules or protocols. During negotiations between charterers and shipowners, charterers provide (fake) information about quoted prices from other shipowners to improve their bargaining position. The price setting mechanism is a mix of reverse auctioning and personal negotiation, which is facilitated by the infrastructure of email, phone calls and personal contact.

3.3.4 Facilitation of Transactions

As discussed in chapter 2, the maritime services are delivered physically and coordinated by email and phone contact of charterers, shipowners and intermediaries. The coordination of the operations is supported by the exchange of information and documentation through email and phone contact. After a shipping contract is fixed, the charterer pays the charterer in advance, in most cases an amount equal to 10% of the freight. When the shipment is completed successfully, the other part of the freight sum is paid. There are multiple sources of trust: through strong and long relationships, through the reputation of a shipowner, through the neutral expertise of the broker or forwarder or through the contractual terms that prevent parties from opportunistic behaviour.

Table 3.6: Facilitation of Transactions in the Heavy Lift Shipping Industry

Sub-function	Current Coordination
Logistics	• Status Updates • Documentation
Settlement	• Payment through Banking
Trust	• Brands of Shipowners • Relationships • Brokers and Agents • Forwarders

3.3.5 Institutional Infrastructure

To create an atmosphere of trust, BIMCO is an institution that provides a legal infrastructure for stakeholders in any shipping industry in terms of standard contractual formats. In heavy lift shipping, the tramp service can be under several contractual agreements [Stopford, 2009]. The voyage charter and the contract of affreightment (CoA) are the most common charter parties in the heavy lift shipping. They provide transportation services for one or multiple voyages from a POL to a POD, in a certain time period for a fixed price, where capital, operating and voyage costs are paid for by the ship owner. The whole vessel can be hired in this way, or only a part for small cargoes. The charterer can choose to pay or not to pay extra for a dedicated vessel, speed, reliability and security are of importance. For the heavy lift shipping industry, the HEAVYLIFTVOY format is frequently used. The time charter is a contract for services to be rendered to the charterer by the ship owner through the use of the vessel by the shipowner's own servants. The voyage costs are paid by the charterer and the capital and operating costs are paid by the ship owner. The bare-boat charter is a contract for the long time lease of a ship, often for one or more years. The operating and voyage costs are paid by the charterer and the capital costs are paid by the ship owner. The charterer has full control of the ship and can choose the crew and master of the ship.

Table 3.7: Institutional Infrastructure in the Heavy Lift Shipping Industry

Sub-function	Current Coordination
Legal	• BIMCO Contracts • Customized Contractss
Regulatory	• IMO • Lloyds Register

Besides legal bodies, regulatory bodies control the market that guard the conduct of stakeholders in the industry. IMO sets regulations regarding the environment and safety such as the BWM convention and the SECA. Lloyds Register assesses the quality and safety of the vessels.

3.3.6 Intermediate Conclusions

Market coordination in the heavy lift shipping industry is quite complex, because the cargo specification, route and time span of every inquiry is different and the extent of differentiation among the fleets and vessels of shipowners is high. The transaction between charterers and shipowners can be coordinated either direct or via intermediaries: brokers and forwarders. The brokers and forwarders leverage their networks of charterers and shipowners to efficiently match these parties. These intermediaries serve as neutral experts, assist in the bargaining process and establish the required level of trust that is needed to make transactions possible in the presence of high information asymmetries and confidential information. The intermediaries in this industry have market power, because charterers and shipowners are willing to pay for their services: the costs of brokers and forwarders is estimated at $ 62.5 million for the whole heavy lift shipping industry, of which $ 25 million comes from the special segment and $ 37.5 million comes from the commodity segment. The role of matching of buyers and sellers might be threatened by digital technology, while people skills are present in arranging trust and assistance in negotiations, which might not be susceptible to digital technology.

3.4 Competition in the Heavy Lift Shipping Industry

In this section, the findings of previous sections are used to determine the competition model of the heavy lift shipping industry, which is different in the special segment and the commodity segment of this industry. The typology of market structures is discussed in section 3.4.1 The current competition model of the special segment is determined in section 3.4.2 and in section 3.4.3 for the commodity segment. After the current competition models have been determined, scenario's for future competition models are discussed in section 3.4.4. Finally, the finding of this section are concluded in 3.4.5.

3.4.1 The Typology of Market Structure

Market structure refers to those characteristics of a market, such as the number of firms, the extend of barriers to entry and the degree of product differentiation, that influence the nature of competition within the market [Lipczynski et al., 2017].

Figure 3.25: Porter's five forces model [Porter, 2008]

Porter's five forces model can be used to address the competition models of the market segments in the heavy lift shipping industry. The five forces include the extent and intensity of competition, the threat of entrants, the threat of substitutes, the power of buyer and the power of suppliers as shown in figure 3.25 [Lipczynski et al., 2017].

Table 3.8: Neoclassical Theory of the Firm: Typology of Market Structures [Lipczynski et al., 2017]

	Perfect	**Monopolistic**	**Oligopoly**	**Monopoly**
# Sellers	Large	Large	Few	One
# Buyers	Large	Large	Large	Large
Influence on price	Negligible	Some	Some	Complete
Entry or exit	Free	Free	Negligible	None
Differentiation	Homogeneous	Similar	Similar	Unique
Information	Perfect	(Im)perfect	(Im)perfect	(Im)perfect
Transaction costs	None	Some	Some	Some
Interdependence	Negligible	Negligible	Significant	None

The models of competition and main characteristics are summarized in table 3.8. The most extreme cases are perfect competition and monopoly. In perfect competition, buyers and sellers are not powerful enough to influence prices and information is perfect. In a monopoly, the seller is able to set prices. Imperfect competition describes the ground between perfect competition and monopoly and has two sub-types. Monopolistic competition is a competitive variant of imperfect competition, where product differentiation enables firms to influence the price. Oligopoly is the less competitive variant of imperfect competition, characterized by interdependence among firms [Lipczynski et al., 2017]. Based on the characteristics of the special segment and the commodity segment, the competition model of these segments can be determined.

3.4.2 Competition in the Special Segment

The number of sellers in the special segment is only 8 and for some projects even less shipowners are qualified to win the contract, due to the position of the fleet or required vessel capabilities for the transportation demand. The various vessel characteristics ensure significant product differentiation. The barriers to entry significant due to large required capital investment in high end heavy lift tonnage, but not insurmountable. Substitution is possible especially in the top segment, where deck shipowners who also suffer from low rates in their market, consider to fix contracts from the special segment. Data about the number and size distribution of charterers is not available, however it can be concluded that the number of charterers is much higher that the number of shipowners, based on information from Jumbo. The preferences of charterers are diverse, depending on their perception of value per type of charterer. Stagnating demand and an oversupply of tonnage result in low rates, as this segment is a buyers' market. Shipowners have the ability to set prices in the special segment, especially in the super heavy segment or for contracts for which few or only a single supplier is qualified. The special segment is characterized by interdependence of players, as the shipowners are conscious of each others actions in bidding on contracts or providing tenders, however there is no pure collusion among shipowners. Information is far from perfect, but the internet provides tools such as Marine Traffic that enable transparency of competitors' positions and asymmetric information is reduced by intermediaries such as brokers and forwarders. Based on these characteristics of the special segment, this segment can be characterized as an oligopoly and in some cases as a monopoly, especially in the super heavy segment or for contracts in which a shipowner can be a (temporary) monopolist due to vessel characteristics or the positions.

3.4.3 Competition in the Commodity Segment

The number of sellers in the commodity segment is large, from 15 operators in the segment with a crane capability of more than 250 tons to dozens of operators in the total commodity segment. The vessels characteristics are extremely differentiated, as shown in figure 3.9. The barriers to entry are less significant compared to the special segment, but still a significant of capital investment is necessary to enter the market. Substitution is possible if the High-end Tramp Operators attempt to fix filler cargoes from the commodity segment to increase their utilization, or from operators of Ro-Ro or Container tonnage, at times these operators suffer from low rates in their market. The number of (end) buyers is extremely large in the commodity segment, and their size distribution is even more fragmented. Freight forwarders, intermediaries in this market, can also be considered as buyers in this market and have large market shares and power in the commodity segment. The preferences of charterers are diverse, however the charterers in the commodity segment focus more on low prices than values such as reliability, safety or speed, as their cargoes

have a lower value than the cargoes in the special segment. The oversupply of tonnage is even more extreme than the oversupply in the special segment, resulting in more (price) competition than in the special segment. In the commodity segment, shipowners behave as price takers rather than price setters. The large number of operators means that interdependence of shipowners can be neglected. Shipowners do have some market power, not because of insurmountable barriers to entry, but due to the differentiation of their vessels and fleets. Information is not perfect, but the shipowners, especially the liner, provide more information about their sailing schedule and forwarders and brokers reduce information asymmetries. Based on these characteristics of the commodity segment, this segment can be characterized as monopolistic competition.

3.4.4 Future Competition

In addition to the current models of competition in this industry, the future models of competition have to be discussed as well, because the impact of digital platforms in this industry will occur, if this impact occurs, in 5 years of later. However the outlook of the heavy lift shipping in both market segments is very hard to predict. According to Stopford, maritime forecasting has a poor track reputation, because too many unpredictable variables have to be considered for a forecast. However Stopford assumes that rational forecasting is possible to reduce uncertainty, without exactly predicting what will happen, for example using scenarios [Stopford, 2009]. This research proposes to utilize the information about development of the demand in section 3.1.4 and supply side in section 3.2.5 to discuss the future competition in the heavy lift shipping industry.

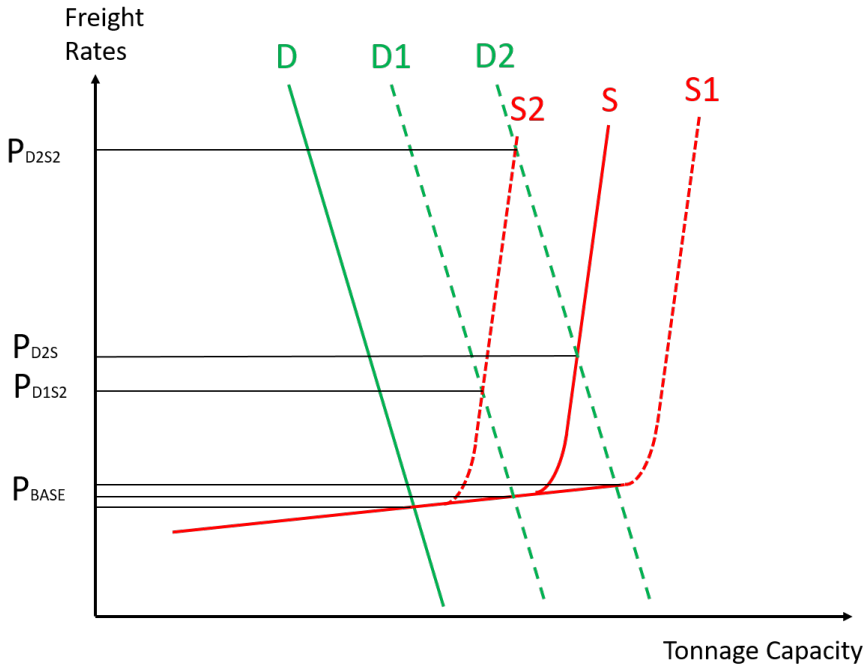


Figure 3.26: Scenarios for future competition

A schematic model for scenarios for future demand and supply is shown in figure 3.26. Scenarios for the development of demand are ongoing stagnation (D), slight growth (D1) and significant growth (D2), as the growth of demand is mainly driven by the oil price and the growth of the renewable energy sector. Scenarios for the growth of supply are the base case scenario (S), positive growth of tonnage (S1) and negative growth of tonnage (S2), which are based on scrapping or new-building activities of operators. In the

commodity segment the fleet size is likely to decrease, as the lower freight rates do not attract operators to build new vessels and IMO regulations drive scrapping activity. In the special segment, slight new-building activity is expected and scrapping activity is not likely as most vessels in this segment are build in the last 10-20 years. The freight rates are more likely to be increased in the commodity segment than in the special segment, based on developments in the heavy lift fleet. However, the development of demand can be different in both segments. Overall the competition model will not be entirely different in 5 years or later, however the power of buyers will be reduced as demand is expected to grow and supply is not expected to grow significantly in the special segment and is even expected to decrease in the commodity segment

3.4.5 Intermediate Conclusions

The market structure of the special segment and commodity segment are different, which means that the impact of digital platforms, especially of marketplaces, is expected to be different in both market segment. The special segment is typed as oligopoly and the commodity segment is typed as monopolistic competition. The current market structures of both market segments can be a base for the discussion of the effects of digital platforms on the heavy lift shipping industry, because the type of market structure of both the special segment and the commodity segment are not expected to change in the next years. Only an incremental increase of transportation demand is expected. The supply side is expected to grow slightly in the special segment and to decrease in the commodity segment.

3.5 Conclusions

This chapter is aimed to address the characteristics of the heavy lift shipping industry in order to provide a context for the company analysis in chapter 4 and to be able to analyze the impact of digital platforms on this industry in chapter 5 by the application for the framework that has been developed in chapter 2.

The demand side of the industry is highly fragmented in the commodity segment. There are numerous different charterers in the special segment, however the fragmentation of buyers in this segment is less fragmented as found in the commodity segment. The preferences of charterers are heterogeneous. The PED is assumed very low in both segments, modelled as a near vertical demand curve, which indicates that a reduction of search costs is expected to lead to only an extremely small increase of demand for heavy lift shipping. The most dominant driver of demand for heavy lift shipping is the oil price. The growth of renewable energy might be a driver of future demand for heavy lift shipping.

The supply side of the commodity segment is fragmented and differentiated, because more than 267 vessels are owned by more than 15 shipowners in this segment. The supply side in the special segment is characterized by fewer players and a higher concentration, as there are only 8 shipowners in this segment, but for some contracts only one shipowner is qualified because of their vessel's capabilities or positions. The shipowners can be distinguished in three categories: the High-End Tramp Operators that serve the special segment and the Low-End Tramp and Liner Operators that serve the commodity segment. The shipowners, especially the High-end Tramp Operators, often sail with idle cargo space in their hold or on their decks, particularly on legs in ballast condition in order to position a vessel for a cargo. The size heavy lift fleet is expected to increase in the special segment and the number of vessels in the commodity segment is expected to decrease.

The transactions between charterers and ship-owners are mainly coordinated through personal, phone and e-mail contact. Charterers and shipowners have opportunities to transact directly, but most transactions are intermediated by brokers and forwarders that are characterized as matchmakers and marketmakers respectively. Both forwarders and brokers are active in the commodity segment and brokers are the most dominant intermediaries in the special segment. These intermediaries account for $ 25.0 million transaction costs in the special segment and $ 37.5 million in the commodity segment.

The special segment can be considered as an oligopoly because the number of shipowners is only 8 in this segment. The monopoly is the market structure for the market contracts in the super heavy segment, for which only one ship-owner is qualified because of capabilities and positions of the vessels. The commodity segment can be considered as monopolistic competition, as there are dozens of differentiated operators of hundreds of differentiated vessels active in this segment.

The market structure of the heavy lift shipping industry has been addressed and can be used in next chapters. First, chapter 4 provides a company analysis of Jumbo that includes their market position and power in this industry, their strategic conduct, business procedures and their performance. This company analysis is performed to address Jumbo's strengths and weaknesses, distinguished for the commodity segment and the special segment. Subsequently, the impact of digital platforms on the heavy lift shipping industry is addressed in chapter 5, by the application of the framework from chapter 2 to the characteristics of the two separate market segments the heavy lift shipping industry.

Chapter 4

Company Analysis: Strategic Conduct and Performance of Jumbo Maritime

This chapter provides a company analysis of Jumbo and focuses on their current strategy, the procedures of Commerce Shipping and the yield of their fleet. The goal of this chapter is to address the strengths and weaknesses of Jumbo's current strategy, business processes and exchange of information and to address the potential to increase the yield of their fleet. These aspects of Jumbo can be used in chapter 6 to address the opportunities and threats of digital platforms to Jumbo and in chapter 7 to develop potential digital strategies. The current strategy of Jumbo in their industry is discussed in section 4.1, considering their product design, organization, value chain, market position and power and cooperation with other parties. This section addresses the strengths and weaknesses of Jumbo's current strategy and emphasizes why Jumbo's financial results have decreased. The business procedures of Commerce Shipping are analyzed in section 4.2, focusing on the composition of Commerce Shipping, their marketing and customer acquisitions activities and the procedures from receiving inquiries to fixing contracts including the involved flow of information. The aim of this section is to address the strengths and weaknesses of the current procedures and exchange of information of Commerce Shipping in this section. The yield of Jumbo's fleet is analyzed in section 4.3 to address the potential for a higher yield of their fleet, which have implications for the meaning of digital platforms to Jumbo. Finally, the findings of this chapter are concluded in section 4.4. The conclusions from this chapter provide the foundation of the meaning of digital platforms to Jumbo in chapter 6 and the strengths and weaknesses that can be used for the SWOT analyses in order to formulate strategic options in chapter 7.

4.1 Jumbo's Current Strategy and Profitability

Jumbo's strategy has already been discussed briefly during the market analysis in chapter 3. The characteristics and strategies of the High-end Tramp Operators have been analyzed, which is the category of shipowners to which Jumbo belongs. This section provides a more specific discussion of Jumbo's strategy, considering their product design in section 4.1.1, organization and value chain in section 4.1.2, their market position and market power in section 4.1.3 and the cooperation with other parties in section 4.1.4. The strengths and weaknesses of Jumbo's current strategy are concluded in section 4.1.5.

4.1.1 Jumbo's Product Design

Jumbo is a maritime transportation, installation and engineering company, as they provide these services to their customers. In order to provide these services, Jumbo operates a fleet of ten HLCV's, of which an an overview is given in Annex A.2. The fleet currently can be distinguished in 4 classes: the E-650 class, the H-800 class, the J-1800 class and the K-3000 class. The fleet of Jumbo is characterized by high capability cranes, from a minimum of 650 tons for the E-650 class and a maximum of 3000 tons for the K-3000 class. Jumbo's fleet has been developed over the years from a single vessel in 1956 to the current fleet of 10 vessels, as shown in annex A.1. Jumbo has been increasing the crane capabilities of their vessels over the years, which are their main determinant of competitive advantage in the heavy lift shipping industry, as discussed in chapter 3.

Two J-class vessels, the Fairplayer and the Jumbo Javelin, are fitted with DP systems and DD systems to be deployed to offshore installation contracts. The rest of Jumbo's tonnage is currently only deployed to shipping contracts. When the Fairplayer and the Jumbo Javelin are not assigned to offshore projects, these vessels can be assigned to shipping contracts. This can be viewed as product extension, a type of diversification of the firm by supplying new products that is closely related to its existing products [Lipczynski et al., 2017]. A diversified firm is a multi-product firm as Jumbo Maritime providing shipping and offshore services. Jumbo has been both a heavy lift shipping contractor and an offshore transportation and installation contractor since 2003, as Jumbo Maritime has established two business units: Jumbo Shipping and Jumbo Offshore. These business units each have their own activity and are complementary to each other. Jumbo Shipping is focused on heavy lift shipping in the top segment. The activities of Jumbo Offshore are offshore heavy lifting, subsea lifting operations and floater & mooring installations. The main incentives for Jumbo's diversification are cost savings in terms of economies of scope, reduction of risk and uncertainty and the reduction of tax exposure [Lipczynski et al., 2017]. The flexible deployment of the two J-class offshore vessels realizes economies of scope, as the Jumbo's long run average cost savings are achieved, by spreading the costs of these vessels over offshore and shipping services. Risk and uncertainty about the fluctuations in demand in the shipping and offshore sector are reduced, because these vessels can be deployed to shipping contracts during a lack of offshore projects. Finally, Jumbo is able to reduce tax exposure because profits for Jumbo Offshore can be offset against losses for Jumbo Shipping and vice versa. To achieve the benefits of diversification, Jumbo's organization has to be flexible in order to support their activities of both Jumbo Shipping and Jumbo Offshore, as discussed in section 4.1.2.

4.1.2 Jumbo's Organization and Value Chain

Jumbo's organization currently consist of 350 employees, 100 of them work in the offices and 250 of them are seamen on the fleet. The complete organizational structure is included in Annex A and is quite complex due to the two business units with multi-deployable personnel and different challenges in both sectors. The shipping branch and the offshore branch each consist of a separate commerce and engineering department, while the shipping department includes the operations department. Next to the shipping and offshore branches the other departments include Finance and Control, Legal, Innovation, Market Intelligence, Quality Health Safety Environment (QHSE), Human Resources and finally the Crew. Jumbo's organization is managed by the board of directors, as indicated in Annex A. Cooperation between departments, fleet and the foreign offices is a matter of the utmost importance, to support Jumbo's activities in Shipping and Offshore, with the focus on quality and safety. The cooperation intended for shipping activity is appointed to as the Jumbo Chain by Twynstra Gudde [Twynsta Gudde, 2011], the value chain of Jumbo. The value chain is the set of a firms activities, which can be dis-aggregated in primary activities that are associated with the physical creation of the product or service and support activities that support primary activities and each other [Porter, 1979].

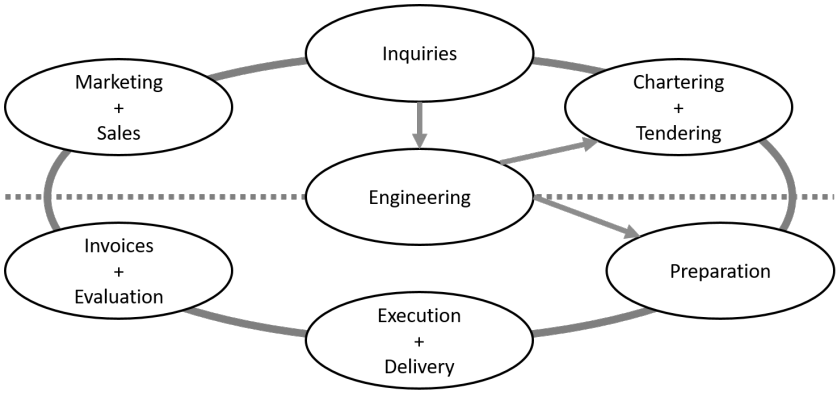


Figure 4.1: The Value Chain of Jumbo

The value chain of Jumbo, as indicated in figure 4.1, is built up from two main parts: 1) getting the business and 2) doing the business. The shipping activities are primary activities, executed the crew on the fleet. The seamen on the fleet operate vessels, as instructed by the operations department. The operations department is responsible for the supporting the execution chain: scheduling, preparing, executing and evaluating voyages and projects. The other supporting activities are marketing, sales, chartering and engineering. The Commerce department is responsible for the commerce chain: getting the work proactively (Marketing & Sales) and re-actively (Chartering). The engineering department is responsible for supporting the Commerce and Operations chains by checking technical feasibility before a contract is fixed and preparing voyages and projects after a contract is fixed. The operations department supports Commerce, by providing the sailing schedule that is used by the Commerce to find and fix commercial and technical feasible contracts. The commerce department are on their turn supportive to the operations department by handing over fixed contracts to the operations department, which determine the sailing schedule. The business procedures of Commerce Shipping are explained in more detail in section 4.2.

4.1.3 Jumbo's Market Position and Power

As already discussed in chapter 3, Jumbo belongs the High-end Tramp Operators and is most active in the special segment of the heavy lift shipping industry. Within this category, Jumbo currently operates the fleet with the highest average crane capability and the vessels with the highest crane capability.

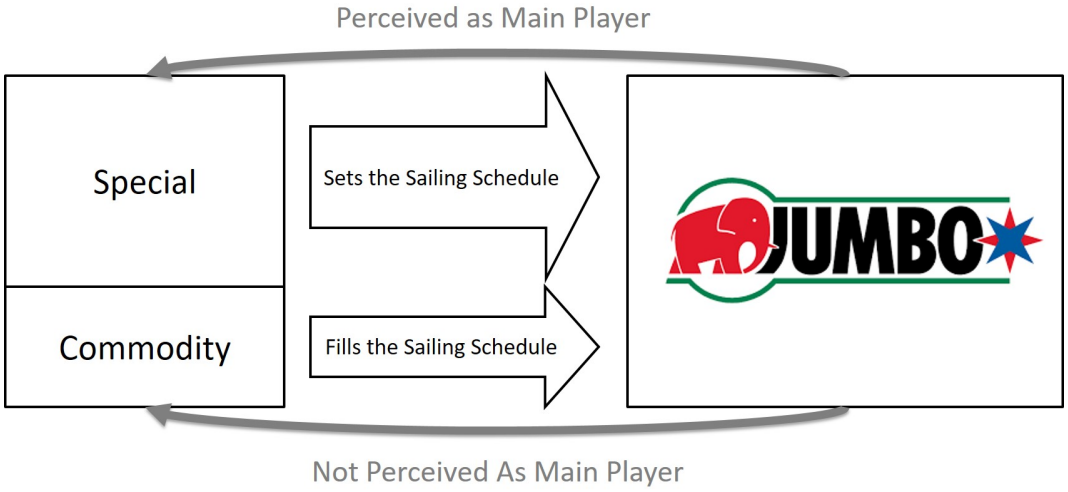


Figure 4.2: The Role of Jumbo in the Heavy Lift Shipping Industry

The vessel characteristics of Jumbo mean that they are a main player in the special segment. In the commodity segment, Jumbo is not perceived as main player, because chartering a Jumbo vessel is considered too expensive compared to Low-end Tramp and Liner Operators that achieve economies scale and scope. Jumbo's role in the market is presented by figure 4.2, as well as the meaning of the market for Jumbo. Inquiries from the special segment set the sailing schedule, because large sums of $ 1.0 million (2016 average) are paid for these contracts. The cost positioning of a vessel for the cargo is worth the large amount of freight that is paid by the charterer. The transportation demands from the commodity segment fill the gaps in the sailing schedule and stowage plans. In this segment the average revenue from a contract is $ 0.4 million (2016 average).

Jumbo has been increasing the crane capability of their vessels, in order to stay ahead of the competition and sustain market power in the special segment of the heavy lift shipping industry. High profit margins attracted other and new operators that followed Jumbo's strategy, made possible by a lack of insurmountable barriers to entry the newly created niche market by Jumbo. For decades Jumbo succeeded to remain profitable, being a temporary monopolist and creating new niche segments by introducing vessels with higher capability cranes than their competitors. Jumbo's current fleet of 10 vessels is only small and results in relatively high average costs. If Jumbo would have invested in a larger fleet, they would benefited from economies of scale and raise their barriers to entry in two ways: 1) they would occupy a larger amount of the special segment and leave less space for competitors or entrants and 2) they could reduce their average costs and have advantage over competitors or potential entrants. Jumbo could still expand their fleet by either acquisition of another shipowner or by newbuilding activity. In the case of acquisition, they would only grow their market share but not the supply side of the market. In the case of newbuilding, they would expand the supply side of the market, which may lead to depressed prices. The change of Jumbo's marketshare has been analyzed and the results are shown in Annex B.2.1 for diverse newbuilding scenarios and in Annex B.2.2 for diverse

acquisition scenarios. Next to the cost advantage of both cases, Jumbo would benefit from a wider coverage of the world with their fleet and a higher flexibility of interchanging cargoes on their vessels.

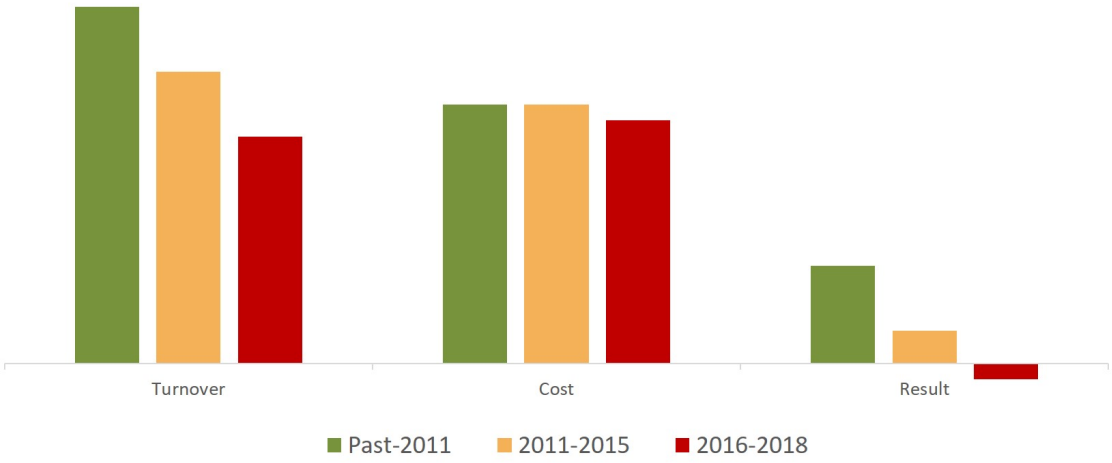


Figure 4.3: Financial Results of Jumbo

The financial results presented in figure 4.3, which have to be considered as operating results and not as their accounting results. Only a qualitative indication of the financial results in this figure are shown, because Jumbo is not a quoted company and absolute yearly revenue and cost data are not available of this company. Jumbo's was a (temporary) monopolist, being able to only fix the most profitable contracts and to set high prices for their shipping services up until 2011, generating large profits, as shown in figure 4.3. In these times, Jumbo did not need to fix much commodity cargoes to raise more revenue by increasing the occupancy of their vessels on ballast legs or legs that want completion. The risk of delay for a cargo from the special segment was not worth the extra revenue from shipping a filler cargo fixed on the spot market.

In 2011, when contracts which were already signed before the financial crisis in 2008, had been completed, Jumbo faced stagnation of demand for heavy lift shipping, as projects in the offshore oil and gas industry were cancelled or delayed. At the same time, the heavy lift fleet had grown resulting in an oversupply of tonnage and a buyers' market. In the buyers' market, Jumbo only made small or zero profits from 2011 to 2015, as shown in figure 4.3. When the oil price decreased from $ 110 to $30 per barrel in 2015, even more projects got cancelled or delayed, resulting in even lower demand and freight rates in the heavy lift shipping industry. From 2016 to 2018, Jumbo has generated a small loss, as shown in figure 4.3. In these market conditions, Jumbo needs to fix more profitable filler cargoes from the commodity segment to increase their yield, as there is a lack of profitable contracts in the super heavy segment.

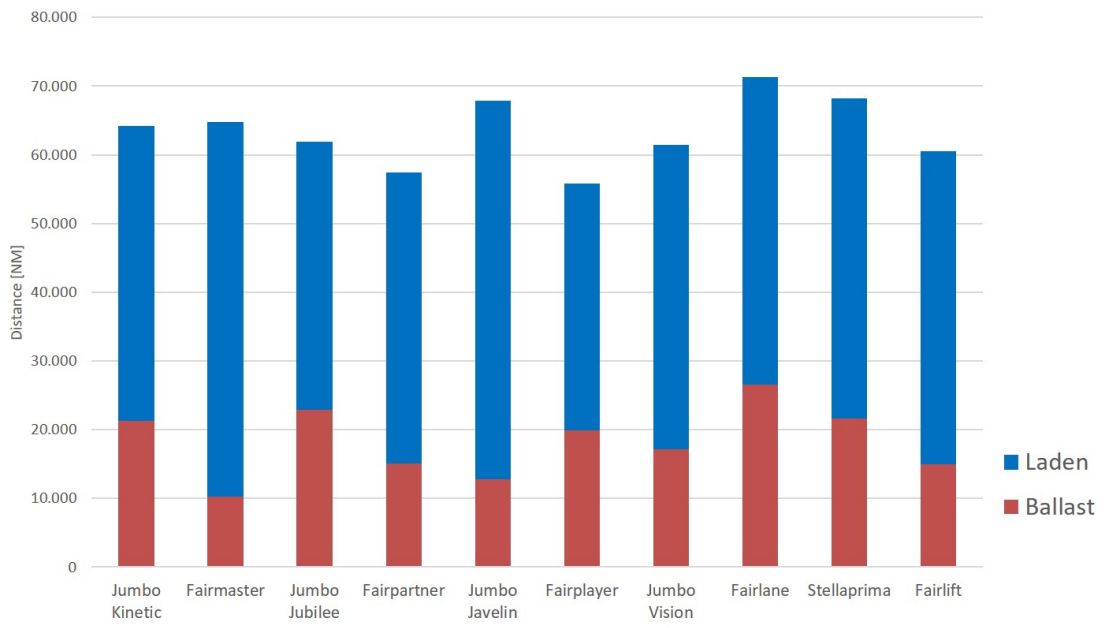


Figure 4.4: Overview of the distance sailed in ballast and laden condition (2016)

An overview of the utilization of sailed distance is shown in figure 4.4 for the whole Jumbo fleet. The fleet was sailed 29 percent of their voyages in ballast condition on average in 2016. This information is based on data from Shipnet [Jumbo, 2017d], an Enterprise Resource Planning (ERP) system for shipping that is used by Jumbo since 2004 for the operational and financial administration of their fleet's voyages. This information of sailed ballast legs is not a very accurate indicator of idle capacity, because a vessel may be chartered as a dedicated vessel or a vessel frequently sails with under-utilized cargo space. Moreover, not all unused capacity has potential to be utilized due to a lack of demand for shipping profitable cargoes on the routes of these ballast legs and the specific time frames these legs are sailed, or extra ports that have to be called to load these cargoes, increasing the voyage costs. Despite these challenges, the information from figure 4.4 does represent the potential of achieving a higher utilization of the fleet, which will be discussed more elaborately in section 4.3.

The need of a higher utilization is stated in Jumbo's objective for 2017 considering their shipping branch [Jumbo, 2017a]. In Jumbo's objective is stated that they want to be the market leader in the top segment of the heavy lift shipping industry, but that they need market access to the commodity segment in order to generate sufficient revenue for survival. Jumbo has already been looking for opportunities to improve their access to the commodity segment. Jumbo has already tried to time charter several vessels of the operator Arkon [Jumbo, 2015], to achieve a higher level of flexibility in terms interchanging cargoes from the commodity segment among their vessels. Chartering these vessels did not prove to be a successful strategy, as Jumbo was challenged to find profitable cargoes in the challenging market conditions. Cooperation is mentioned as another opportunity to improve Jumbo's access to the commodity segment, as will be discussed in section 4.1.4.

4.1.4 Cooperation of Jumbo with other parties

Jumbo is an independent shipowner, but they cooperate with other parties in order to find more business opportunities and to win more contracts. The joint venture with Biglift has helped Jumbo to win a contract for a large project in the special segment and the recent alliance with BBC provides opportunities to improve access to the commodity segment.

Jumbo and Biglift are competitors, as discussed in chapter 3. They compete for winning similar projects and both receive the same inquiries on a regular basis. In 2015, both parties received an inquiry to ship 88 modules for a Sasol project from Asia to Lake Charles that form part of a chemical plant in Lake Charles. The joint venture Jumbo Biglift Projects was established, because both parties did not have the capacity to perform the project by themselves, due to the number and size of modules and the tight schedule. Together, Jumbo and Biglift won the contract and reduced the number of shipments from 20 to 14 shipments. Jumbo Biglift Projects emerged as successful partnership by complementing capabilities and capacity of both parties [Biglift, 2017]. This means that competitors are not always rivals but can also partner in order to seize business opportunities. If Jumbo and BigLift maintain their relationship by working in joint ventures on large projects, an information system provides the opportunity to stream line information flow and processes, or this relationship can be viewed as willingness to cooperate in the development of a strategic information system.

Jumbo and BBC agreed in October 2017 to an exclusive strategic cooperation being the Global Project Alliance. The alliance aims to provide a complete solution for EPC companies, by optimizing cargo volumes from both the commodity and special segment. Both parties complement each other, Jumbo is the main player in the special segment, while BBC is the main player in the commodity segment. The market position of both parties are indicated in figure 3.10 and their market shares in figure 3.12. Through the Global Projects Alliance (GPA), Jumbo and BBC together form one point of contact for clients that need transportation for their projects, by complementing each other in their network in the commodity and special segment. An EPC company or a project company that needs transportation for a project usually approaches High-end Tramp Operators for the super heavy cargoes and Low-end Tramp or Liner Operators for the smaller cargoes. Frequently, Jumbo has been in the situation that they shipped a cargo for such project, not utilizing their cargo space to its full potential, while other parties were contracted to ship the commodity cargoes of such project. Moreover, the GPA provides opportunities for both parties to relet cargoes to one and each other, if one of these parties is not able to fit a fixed cargo in their own sailing schedule. The GPA benefits Jumbo, because it enables them to increase the utilization of their fleet by shipping commodity cargoes from customers from the network of BBC. The GPA benefits BBC because they leverage Jumbo's network in the special segment. In November 2017, the Jumbo Vision completed the first shipment under the Jumbo BBC Alliance. A shipment containing 500 tons of pipes have been shipped from Antwerp to Umm Qasr. This is a good example of a completion cargo where Jumbo can capitalize on the relationship with BBC. This alliance actually has potential for an information system, as will be discussed in chapter 7. Jumbo and BBC together have large market share in both the special as well as the commodity segment, characterized as a condition for successful investment in an online marketplace.

4.1.5 Intermediate Conclusions

Jumbo has always been the market leader in the top segment of the heavy lift shipping industry and currently still is, operating a fleet of 10 high-end HLCV's, sailed by a highly skilled crew and supported by in-house engineering, operations and commercial teams onshore. Their diversified services, position and reputation in the special segment of the industry are their strengths. Their objective is to maintain this leading position in their industry. Because of a severe oversupply of tonnage and stagnating demand for overseas transportation of project cargo, positive results before 2011 became negative results in 2017. Jumbo needs to meet more and new customers from the commodity segment, to increase the utilization of their fleet. There is potential to increase the yield, as 29 percent of the sailed distance by their vessels is in ballast condition. A lack of market access to the commodity segment prevents them to fix more profitable cargoes on the spot market, because Jumbo is not perceived as a main player in this segment, as their tonnage is not fit and considered too expensive. Jumbo's operates a small fleet, which is associated with high average costs and low potential for flexibly of interchanging cargoes on their vessels, is their weakness. However, a recent alliance with BBC potentially helps Jumbo to increase their utilization, but Jumbo is looking for more opportunities to increase access to the commodity segment of the heavy lift shipping industry. The organization and procedures of Commerce Shipping are discussed in section 4.2, to understand the current sales channel of Jumbo. The composition of Commerce Shipping, their procedures and internal and external information exchange will be discussed, in order to address their strengths and problems of their business procedures.

4.2 The Business Procedures of Commerce Shipping

The organization of Commerce Shipping and their business procedures are discussed in this section, in order to address the strengths and weaknesses of their current procedures and flow of information. The role and organization of Commerce Shipping is discussed in section 4.2.1. The marketing and customer acquisition activities are discussed in 4.2.2. The information exchange with prospective clients is discussed in section 4.2.3. The exchange of information between Jumbo and their clients is discussed in section 4.2.4. The processing of inquiries is discussed in section 4.2.5. The feasibility study of inquiries is discussed in section 4.2.6. The price setting procedure is discussed in section 4.2.7. The correspondence and the negotiation with the client is discussed in section 4.2.8. The post-fix procedures are discussed in section 4.2.9, such as the preparation and the execution of the contract, the invoice and the evaluation of the client. Finally, the strengths and weaknesses of the current business procedures and flow of information are concluded in section 4.2.10.

4.2.1 The Role and Organization of Commerce Shipping

Commerce Shipping is responsible for getting the business in two ways: 1) Marketing and Sales and 2) Chartering. Marketing and Sales are carried out by the promotion of Jumbo's shipping activities through several channels to attract prospective clients. Chartering is carried out by providing response to pre-qualifications, invitations to tender and inquiries, in order to fix profitable shipping contracts. 5000 inquiries for shipping contracts are received every year by Jumbo. From 1000 inquiries in the special segment, 50 inquiries have been fixed in 2016. The average revenue from a fixed contract in the special segment is $ 1.0 million, assuming that the revenue from this segment is equal to $ 50 million. From the commodity segment, about 4000 inquiries are received each year and only 100 of these inquiries have been fixed in 2016. The average revenue of a fixture in the commodity segment is estimated at $ 0.4 million, based on the assumption that the revenue from this segment is equal to $ 40 million.

Commerce Shipping consists of a team of Regional Sales Managers in their headquarters in Schiedam and in overseas Jumbo offices, managed by the Manager Commerce Shipping which reports to the Board of Directors. Jumbo has a worldwide network of external agents, to get in contact with local forwarders, brokers and customers.

Figure 4.5: Representative Offices of Jumbo [Jumbo, 2017b]

The Regional Sales managers are responsible for designated regions, which contain Northern Europe, Southern Europe, the Americas, Middle East, Far East and Australia. The red dots in figure 4.5 represent offices of Jumbo and offices from exclusive agents. Next to Sales Managers. Jumbo has a Communications Advisor who ensures marketing contact is distributed through diverse media and a Marketing Intelligence Manager who keeps track of market information and reports this information to the Board of Directors and the Sales Managers. The main procedures of Commerce Shipping can be found in Annex C.1 and these procedures are discussed in the sections 4.2.2 to 4.2.9.

4.2.2 Marketing and Customer Acquisition

Jumbo's Market Intelligence Manager identifies new prospects after analyzing potential project origins and potential prospects are listed in the Customer Relationship Management (CRM) system. This CRM system is updated by the commerce departed when new prospects are endorsed. In this way, the CRM system is kept up to date. Prospects are ranked and selected to create a budget and outlook for the shipping branch of Jumbo. From a market analysis follows a volume/revenue estimation, a trend analysis, client information and historical data per segment, industry and per region.

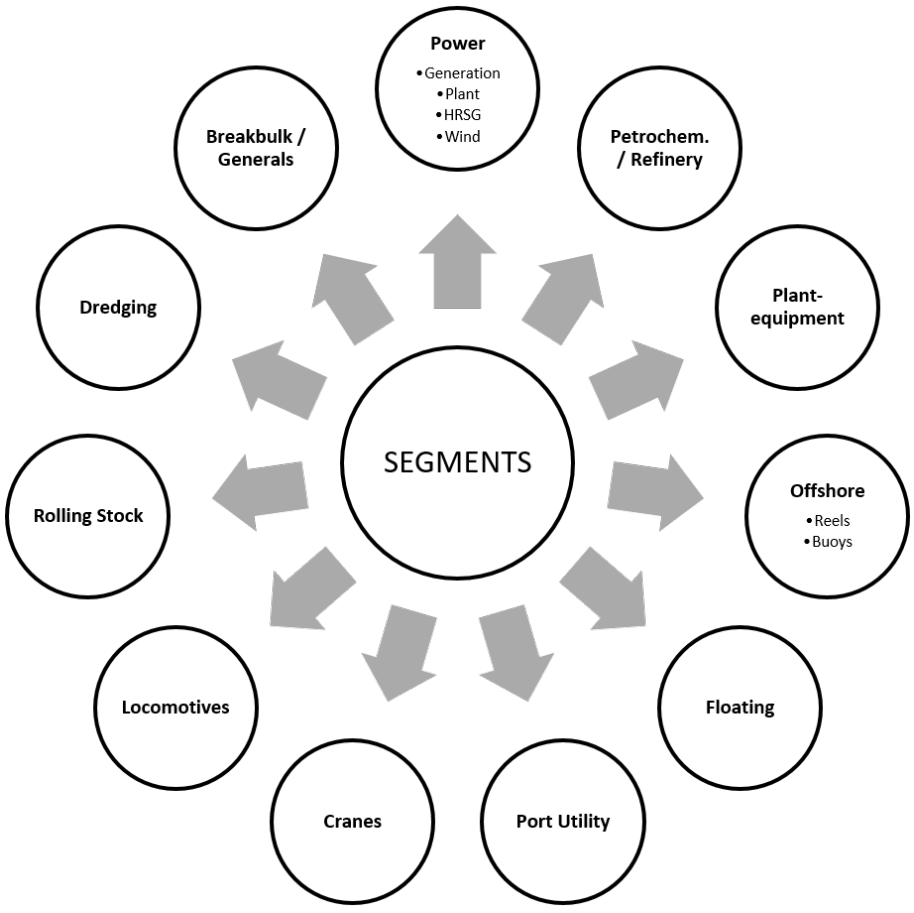


Figure 4.6: Segmentation in Jumbo's CRM system [Jumbo, 2017d]

An overview of the segments and industries from the CRM is shown in table 4.6. Target prospects are selected, and these targets are listed and offered to the Commerce Shipping. Commerce Shipping endorses target prospects, lists these and provides a financial forecast. The Finance and Control department translates this financial forecast into a yearly budget and outlook. Based on the list of prospects and their future projects in the CRM system,

the status of Jumbo is bench-marked against that of competitors. A partner plan is generated if required. For tenders only, a pre-qualification is made with the client and interaction is required with project stakeholders. In this case the Regional Commercial Managers make a pre-qualification with clients and interact with project stakeholders, through e-mail, phone calls, visits at clients or industry related conferences. The Corporate Communications Advisor ensures the distribution of of Jumbo's marketing content, for example on social media such as Facebook and LinkedIn.

4.2.3 Sharing Information to Prospective Clients

Every week, Commerce Shipping shares the open vessel positions to Regional Sales Managers in overseas offices and exclusive agents, so they can share this information to prospective customers from their regional networks. This information is currently shared by sending emails. In this way, these Regional Sales Managers and exclusive agents can search for cargoes that fit the sailing schedule and are commercially viable for Jumbo. For contracts from the special segment, the vessel is positioned for the cargo and the lead times are months to even years, making the sharing of positions most relevant for the commodity segment. Jumbo faces the consideration of the advantages and disadvantages of sharing information about vessel positions and availability of cargo space on their vessels. Openly sharing this information brings the advantage that clients are able to check availability of the fleet, while it brings the disadvantage that competitors are able to locate the positions of Jumbo tonnage. Keeping this kind of information restrained, competitors are in less extend able to locate the positions of Jumbo tonnage, which is an advantage for Jumbo, while clients are also less able to check availability of Jumbo vessels, which would be a disadvantage of not sharing this kind of information openly. These days, the actual vessel positions of any operator are already made transparent on website such as MarineTraffic, which published the positions according to Automatic Identification System AIS data, including the port of departure and arrival. These tools can be used by Commerce Shipping and other operators to analyze the positions of competitors. The long term sailing schedules contains all matter of competitive-sensitive information and greatest caution is essential when sharing this information.

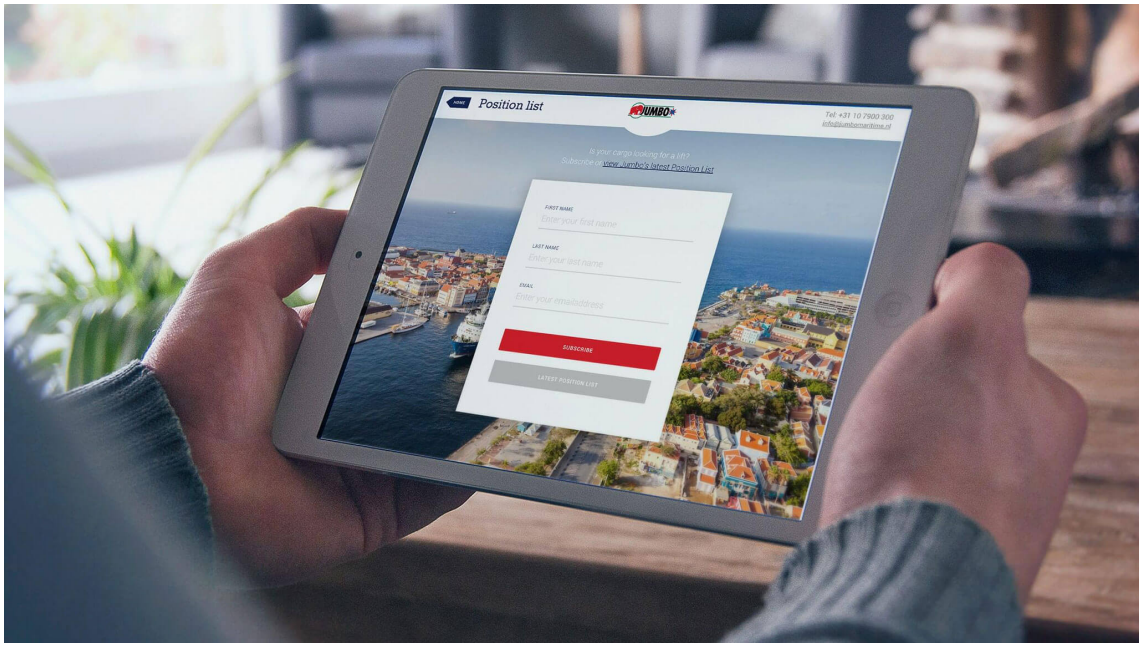


Figure 4.7: Jumbo Position List on a tablet [Jumbo, 2017c]

In 2012, Jumbo announced to establish an interactive website to enable their clients to search for open positions of Jumbo tonnage [BreakbulkEventsandMedia, 2012]. One of the objectives was to develop an online tracking system so clients can monitor the location of their cargo, which has never been realized. In 2016, Jumbo established a website that enables clients to view the positions and direction of Jumbo tonnage, the Jumbo Position List [Jumbo, 2017c]. The Jumbo Position List is available on the website of Jumbo, as indicated in figure 4.7. Existing and new clients of Jumbo are able to see the positions and directions of the Jumbo fleet, as indicated in Annex C.5. In addition to sharing the positions and directions of Jumbo tonnage, the Jumbo Position List enables clients to submit inquiries through a fixed format. The channels and media of receiving and sharing information from clients are discussed in section 4.2.4.

4.2.4 The Exchange of Information between Jumbo and Customers

Commerce Shipping receives information from customers such as pre-qualifications, invitations to tender and inquiries. The pre-qualification and invitations to tender are most common in the special segment, as these contracts are very complex and include very complex requirements. The simple inquiries are most common in the commodity segment.

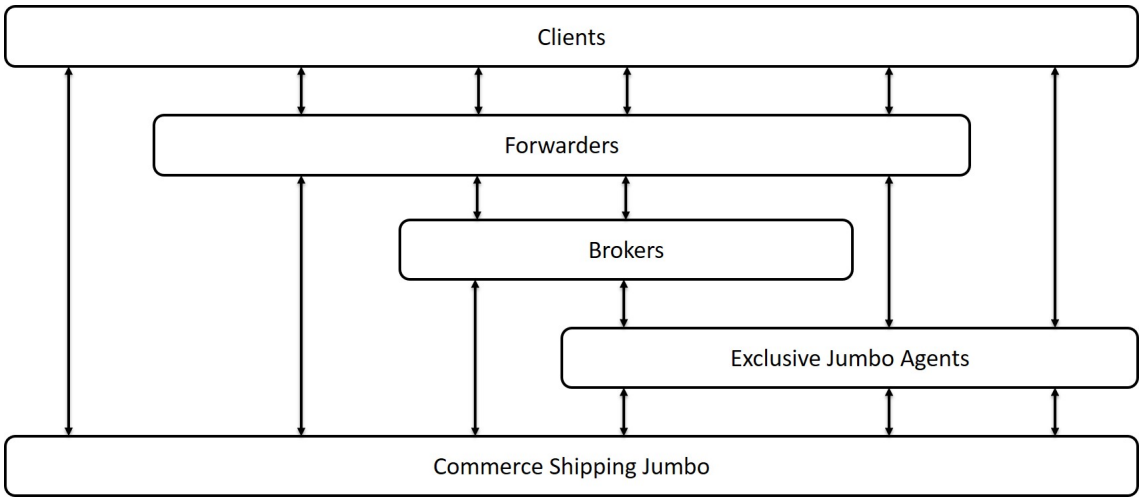


Figure 4.8: The Channels of Information Exchange

The channels of the exchange of information between Commerce Shipping and clients is shown in figure 4.8. Requests from clients are received direct or via intermediaries such as forwarders, brokers, of Jumbo's exclusive agents. In some cases, an inquiry is even sent through a chain of multiple intermediaries.

Table 4.1: Estimation of Cost of Forwarders and Brokers incurred by Jumbo

Market Segment	Turnover [$]	Commission [%]	Commission [$]
Special	50,000,000	5.0	2,500,000
Commodity	40,000,000	2.5	1,000,000

An estimation of the cost of brokers and forwarders as a distribution channel for Jumbo is shown in table 4.1. Assuming an average commission of 5.0 percent of the freight, the commission costs to external intermediaries are estimated $ 2.5 million yearly in the special segment. Assuming an average commission of 2.5 percent of the freight, the commission costs to external intermediaries is estimated $ 1.0 million yearly in the commodity segment.

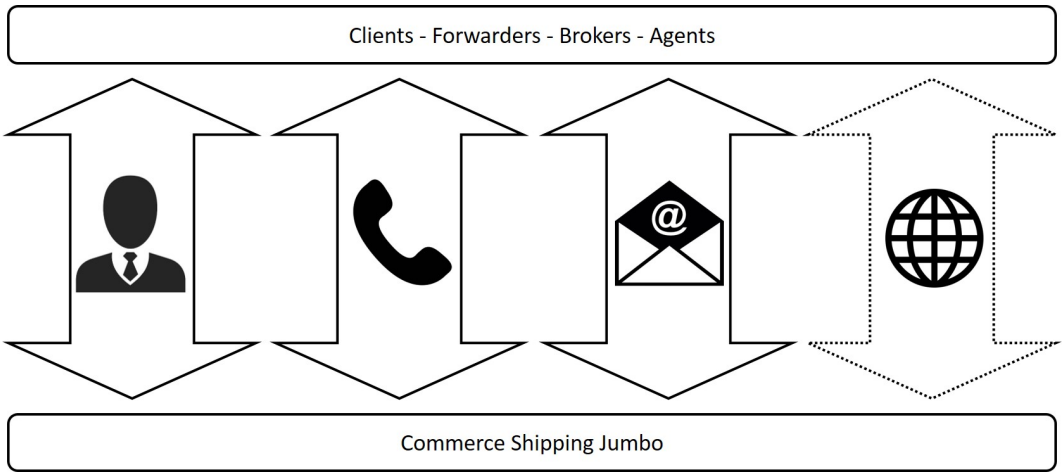


Figure 4.9: The Media of Information Exchange

The information exchange between Jumbo and client, and so are their requests, is currently facilitated by four different media, through personal contact, phone calls, email and Jumbo's interactive website, as schematically shown in figure 4.9. About 5000 inquiries are received by Commerce Shipping through diverse channels and media as indicated in figures 4.8 and 4.9. The complexity of the 1000 inquiries from the special segment is higher than the complexity of the 4000 inquiries from the commodity segment. This means that the feasibility studies of inquiries is also different for both market segments, as discussed in section 4.2.5.

4.2.5 Processing Inquiries

For transportation demands, an inquiry is received at Commerce Shipping, stating info such as merchant, POL, POD, time of shipment, brief description of the cargo booking terms and other specific requirements. The inquiries are not received in a fixed format, of which the main reasons are the diverse preferences of charterers and the complexity of cargo and route specifications, especially in the special segment. The Regional Sales Managers have to query a large amount of email for profitable cargoes. Based on the first received information, the Regional Sales Manager checks the sailing schedule (see Annex C.2) for positions and availability of vessels in the fleet. This sailing schedule is kept up to date in a spreadsheet in Excel by Operations and printed by Commerce Shipping in order to check the schedule when assessing their incoming inquiries on feasibility and commercial viability. Information about clients and their cargoes is stored in the CRM system for marketing and market intelligence purposes.

When a cargo is about to be booked, the schedule is updated manually in cooperation with Operations. In most cases, the cargo is scheduled on a vessel, but in some cases the cargo is just booked and not directly scheduled. In the first case, the vessel is either positioned for the cargo or the cargo is included in the stowage plan of a yet scheduled voyage. In the latter case, the booked cargo is included in the list of not yet scheduled cargoes in the sailing schedule (Annex C.2). When a cargo that is included in the sailing schedule and Jumbo is not able to ship this cargo with their own vessels, another shipowner is requested to ship this cargo, known as reletting. Just as Jumbo relets cargoes to other shipowners, other shipowners relet cargoes to Jumbo, meaning that a shipowner can be a charterer and vice versa. Reletting cargoes in the cooperation of Jumbo and BBC provides less friction than reletting cargoes to competitors.

Manually scheduling makes it very difficult to optimize the sailing schedule. Jumbo made several attempts to automate the scheduling of the fleet, without success because of the large number of constraints that have to be taken into account [Lanphen, 2015]. When a received inquiry is considered as feasible and commercial viable, the technical feasibility of a shipment has to be checked, before deciding to respond to an inquiry. Before this feasibility study can be executed, more detailed information about the cargo and the client has to be gathered, currently through phone and email contact. This information includes information about the locations of loading and discharging, the equipment that is required for the shipment and the papers and procedures that cover the specifications of the cargo and the handling of this cargo.

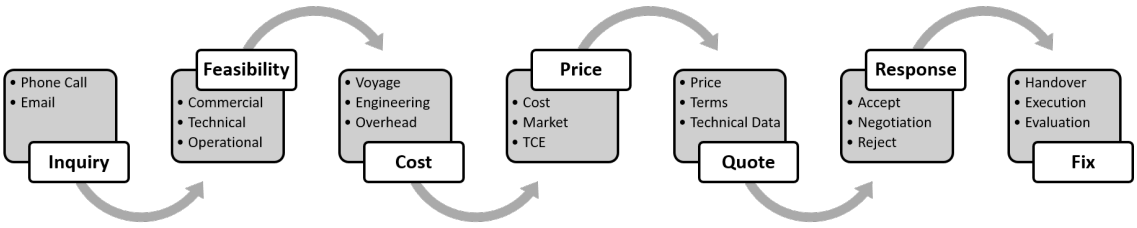


Figure 4.10: The Chartering Procedure from Inquiry to Fixture

Receiving inquiries is yet discussed, being only the beginning of the chartering chain as shown in figure 4.10. Based on the information of an inquiry, a feasibility study is performed, costs are estimated, a price is established and quoted to the client including terms, a negotiating process follows which could lead to a fix. The feasibility check is first discussed in section 4.2.6.

4.2.6 Feasibility Study

When sufficient information is gathered from the client, the commercial viability and technical feasibility can be checked, as shown in figure 4.11. The technical feasibility study is performed by Operations that check the schedule and ports and Engineering that check the technical feasibility of shipping and lifting. The Regional Sales Manager asks the Engineering department for a feasibility study to figure out which vessel type can load the cargo, including lifting and stowage studies.

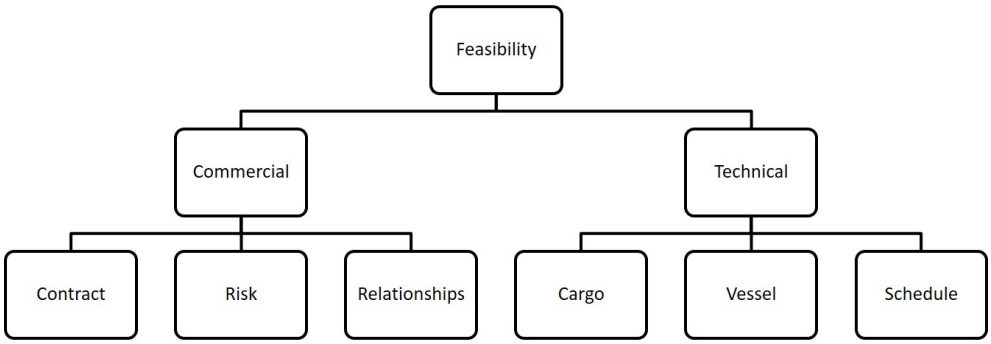


Figure 4.11: Commercial Viability and Technical Feasibility

This feasibility study can be very complex, because of the presence of many specifications that have to be considered of the cargo and the capabilities of the vessels (see Annex C.6). An inquiry sheet, which contains all available information from the client (see Annex C.3),

is send to the Engineering department that performs the feasibility study. The Regional Sales Manager asks the Operations department for port information and discusses the implications of booking the cargo on the sailing schedule. For inquiries from the commodity segment, which are called shipments, these studies are more complex than for inquiries from the special segment, known as projects, as shown in table 4.2. The feasibility study takes about 1 day for a shipment and 4 days for a project.

Table 4.2: Shipment vs Project

	Shipment	**Project**
Segment	Commodity	Special
Study time	1 day	4 days
Lead Time	$<$ 1 Month	$>$ 1 Month
Engineering hours	$<$ 150	$>$ 150

The outcome of the feasibility study contains the result if the inquiry is feasible and the estimated costs of the contract. When an inquiry is considered technically feasible and the costs of executing the shipment are estimated, the price that is quoted to the client can be determined by Commerce Shipping.

4.2.7 Determination of Prices

When the sailing schedule, the feasibility study and the port restrictions will cause no barriers, a freight rate is established and the terms and conditions will be determined. If the transport cannot be performed as requested, alternatives will be proposed and if these are declined by the client, the process will be stopped. The Regional Commercial Manager established the freight rate based on the estimated costs, the market conditions, the commercial risk and the importance of maintaining the relationship with the client (see figure C.6 in Annex C.7). The price is set using the voyage estimator tool in Shipnet software (see figure C.7 in Annex C.7). The entry data consist of vessel information, cargo information, the itinerary, several cost items and finally the gross freight. The Regional Sales Manager can vary the freight, the price that is quoted to the client, until a desired Time Charter Equivalent (TCE) or voyage result is achieved. A TCE equals the dayrate that would have been quoted if the vessel would have been hired on a time charter basis. In other words: the TCE is equal to the voyage result per day of the voyage. In the special segment, Commerce Shipping aims to maximize prices, taking competition and the client's willingness to pay into account. The potential competition is assessed, based on knowledge of the capabilities and positions of competitors. For contracts in the commodity segment, the price is established according to market rates, because a premium price will not result in winning the contract. Commerce Shipping may consult the CRM system to view historic prices of similar contracts and set a decent price. A Lumpsum price is quoted to the client for the shipment or project. The terms of the shipment are established, using BIMCO contracts as discussed in chapter 3, most frequently on the basis of a Voyage Charter and sometimes a Contract of Affreightment for large projects. Frequently, other operators are responding to the inquiry to, also providing proposals to the same client. This leads to a reverse auction through phone and email contact and the client is able the choose the preferred operator, based on information about the price and terms. The freight proposal is sent to the client for their review or acceptance, as will be discussed in section 4.2.8.

4.2.8 Correspondence with the Client

The client receives the freight proposal through email and considers the price and terms. Three options of the client's reaction are possible: no further reply/correspondence 1) request to draft a firm offer with amendments and/or adjustments 2) request for further details with regard to stowage, lifting and transit time 3). When the client decides to continue the booking process and asks for a firm offer, this offer is with engagement, because the booking is a fact when accepted by the client. When the client accepts the offer, a negotiation process follows, often by phone contact. The negotiation process end with an agreement, which leads to a fix, or no deal is made. In this negotiation process, the importance of the negotiation skills of the Regional Commercial Manager of Manager Commerce are significant. When a booking is fixed, a fix number is assigned and a booking note is drafted, all documentation of booking is stored under a fix number. The booking is handed over to the Operations and Engineering Department, who are responsible for the preparation and executing phase of the shipment or project, as will be discussed in section 4.2.9.

4.2.9 Execution of the Contract and Evaluation

The Engineering and Operations department receive a booking note and start to prepare the shipment or project. For projects (cargoes from the special segment), a project team is established, managed by a project manager. No project team is established for shipments (cargoes from the commodity segment). The Engineering department prepares the stowage, lifting and sea-fastening plans. In a stowage plan, as shown in Annex C.4, the position of the cargo on the deck or in the hold of the vessel is drawn. Especially for super heavy cargoes for the special segment, deck or tank-top strength calculations have to be performed and stability calculations for sailing and lifting conditions. In a lifting plan the procedures for lifting operations during the loading and or discharging phase are analyzed, sometimes a customized lifting frame has to be designed and constructed. For the preparation of securing cargoes to the vessel during overseas shipping, sea-fastening plans have to be made, in which is decided how cargoes have to be secured. When all plans are established, the Operations department ensures these plans are followed by the crew by providing them with instructions. The Operations department communicates with all other parties such as port agents, stevedores and customs that are stakeholders in the shipping activities and keeps the clients update about the state of the shipment. Finally, after a contract is executed, the client is sent an invoice and is asked to evaluate Jumbo's service in a client survey form, which is send through email.

4.2.10 Intermediate Conclusions

Jumbo is challenged to shift their sales organization to an organization that efficiently fixes profitable cargoes on the spot market in the commodity segment, to which Jumbo's dependence has increased during the current market conditions. Jumbo's channels for receiving inquiries and for sharing information about availability and positions email and phone contact and most inquiries come from brokers and forwarders. The costs of these intermediaries are estimated $ 2.5 million in the special segment and $ 1.0 million in the commodity segment. Most of the 4000 inquiries that are received by Jumbo do not fit the sailing schedule or are not commercially viable, as only 100 of these inquiries have been fixed in 2016. These inquiries have to be processed by the Regional Commercial Managers, which is time consuming. Positions and availability of the vessels are shared through email circulations on a weekly basis, but little response is the result. The time from receiving an inquiry to the time of quoting a price for this inquiry varies from 1 day for inquiries from the commodity segment to 4 days for inquiries from the special segment. For inquiries from the special segment, the complexity of the cargo specifications and requirements of the charterer requires technical expertise from Jumbo's inquiry engineering department. Correspondence with a client after a contract is fixed occurs through email and phone contact, even for routine tasks such as updates about the ETA at the POL or POD, which could be incorporated in an information system in order to reduce the time spent to these routine tasks.

4.3 The Yield of Jumbo's Fleet

This section focuses on the potential of a higher yield of Jumbo's fleet. Section 4.3.1 describes how the yield of can be determined in shipping and discusses the difficulty of the determination the potential increase of the yield of Jumbo's fleet. An analysis of the number sailed days and and the distance that is sailed by Jumbo's fleet is discussed in section 4.3.2. An analysis of stowage plans from voyages that have been sailed by Jumbo's fleet during the third and fourth quarter of 2016 is discussed in section 4.3.3. A first estimation of potential to increase the revenue of Jumbo's fleet is provided in section 4.3.4. Finally, the conclusions about the potential to increase the yield of Jumbo's fleet are provided in section 4.3.5.

4.3.1 The Analysis of the Potential to Increase the Yield

The TCE is used by Jumbo as an indicator for the yield of their vessels and fleet. The TCE can not be used as an indicator for the potential to increase the yield of Jumbo's fleet, because this indicator only accounts for the voyage income and the voyage costs of Jumbo's fleet. The indicator of the potential to increase the utilization of Jumbo's fleet should contain the following aspects: 1) the quantity of available/idle cargo space of Jumbo's fleet, 2) the quantity of transportation demanded from charterers that fits the sailing schedule and stowage plans of the fleet and is commercially viable for Jumbo, 3) the marginal revenue from the freight that would be paid by charterers to Jumbo for shipping these cargoes and 4) the marginal cost that have to be incurred by Jumbo to ship these cargoes. This section provides a discussions which of these aspects can be determined an which of these aspects cannot be determined.

Stopford mentions that the revenue calculation of a vessel involves 1) determining how much cargo the vessel can carry in a financial period t, in whatever units are appropriate (for example ton miles) and 2) establishing what price or freight rate the shipowner will receive per unit of transported cargo [Stopford, 2002].

$$P_{tm} = 24 * S * LD * DWU_{tm} \tag{4.1}$$

The productivity of a fleet of ships is measured in Stopford's revenue calculation in terms of ton miles of cargo transported in year t [Stopford, 2009], which is determined by the distance sailed by the vessel in 24 hours, the number of loaded days in motion in a year and the extent to which it sails at full deadweight capacity, as shown in equation 4.1.

$$LD = 365 - OH - DP - BAL \tag{4.2}$$

The number of loaded sailing days that is expressed in equation 4.2 can be determined for Jumbo's fleet. An analysis of the days in port and days in motion of Jumbo's fleet is provided in section 4.3.2.

$$DWU_{tm} = \frac{DWcargo_{tm}}{DWvessel} \tag{4.3}$$

Stopford uses the deadweight utilization for the determination of productivity, as shown in equation 4.3. The determination of the deadweight utilization is convenient indicator of the occupancy rate of a dry bulk carrier or a tanker, because the deadweight capacity of these vessels is determinant for the occupancy rate of these vessels. The deadweight capacity is not determinant for the occupancy rate of a MPV or a HLCV, because the cargo carrying capacity of these vessels is in most cases not constrained by the deadweight

capacity, but constrained by the dimensions and strength of the deck and hold and the stability requirements of the vessel and, as shown in Annex C.6. An approximation of the occupancy rate of Jumbo's fleet is discussed in section 4.3.3.

Even if the unused cargo capacity of Jumbo's fleet can be quantified, the quantity of transportation demanded from charterers should be known in order to investigate the marginal revenue that Jumbo can obtain and the marginal cost that has be to incurred and eventually to address the potential of a higher yield quantitatively. Information about cargo volumes including freight rates that charterers are willing to pay are not available, which makes it challenging to quantify the marginal cost and revenue of shipping more cargoes.

4.3.2 The Analysis of Days in Motion and Distance of Jumbo's Fleet

Voyage data from 2016 of Jumbo's ten vessels has been gathered from Shipnet, including voyages that have been completed partially in 2015 and 2017. These data have been collected for each voyage of each vessel and include: the port calls, the date and time of arrival and departure of each port call, the days spent in each port and the days in motion and distance between each set of ports. These data from Shipnet are shown in Annex C.9 for Jumbo's vessel the Stellaprima.

Table 4.3: The Number Days in Port and in Motion of the Stellaprima in 2016

	# Days		Fraction [%]	
Condition	Actual	Normalized	Total	In Motion
In Port	135	111	30%	
In Motion	310	254	70%	
• Ballast	134	110	30%	43%
• Loaded	175	144	39%	57%
Total	445	365		

For each leg, the fix number of the cargo has been assigned to the table in Annex C.9, in order to determine whether a cargo is loaded on the vessel during each leg. Each leg to which no fix number is assigned is assumed to be sailed in ballast condition, in other words: these legs are sailed without a cargo on board of the vessel. For each vessel, the number of days in port, number of days in motion and sailed distance have been determined, as shown in table 4.3 for the Stellaprima. The number of days in motion has been distinguished in sailing days in ballast and loaded condition for each vessel. These numbers have been normalized for each vessel, so the total number of days for each vessel is equal to 365 days. From the overview of days of the Stellaprima can be concluded that this vessel has been in motion for 70 percent of the days during 2016, of which 43 percent has been sailed without a cargo on board, suggesting that there is potential to increase the yield of this vessel.

Table 4.4: The Number Days in Port and in Motion of Jumbo's Fleet in 2016

		# Days				Condition [%]		
Class	Vessel	Port	Ballast	Loaded	Total	Steaming	Ballast	Loaded
K	Jumbo Kinetic	178	73	114	365	51%	39%	61%
K	Fairmaster	179	39	147	365	51%	21%	79%
J	Jumbo Jubilee	176	78	111	365	52%	41%	59%
J	Fairpartner	189	50	126	365	48%	28%	72%
J offshore	Jumbo Javelin	164	39	162	365	55%	19%	81%
J offshore	Fairplayer	209	62	94	365	43%	40%	60%
H	Jumbo Vision	180	53	132	365	51%	29%	71%
H	Fairlane	135	95	135	365	63%	41%	59%
E	Stellaprima	111	110	144	365	70%	43%	57%
E	Fairlift	147	64	154	365	60%	29%	71%
	Average	167	66	132	365	54%	33%	67%

The results of the number of days in port and in motion of the whole fleet of Jumbo are shown in table 4.4, which have been obtained using the same method as explained for the Stellaprima. The average number of days in motion for Jumbo's fleet in 2016 is equal to 198, which is 54 percent of the time of the year. From these 198 days Jumbo's fleet has been in motion on average in 2016, the fleet has been in motion for 66 days without a cargo on board, which is 33 percent of the days in motion, suggesting a potential for to increase the yield of Jumbo's fleet.

Table 4.5: The Sailed Distance of the Stellaprima during 2016

Condition	Actual Distance [NM]	Normalized Distance [NM]	Fraction [%]
Ballast	26,345	21,627	32%
Loaded	56,782	46,613	68%
Total	83,127	68,240	100%

The data from Shipnet that contain the sailed distance has also been analyzed. The total distance that has been sailed by each vessel from Jumbo has been calculated for each voyage these vessels have sailed in 2016. The total sailed distance of each vessel has been normalized to 365 sailing days and has been distinguished in the distance sailed in ballast and loaded condition. The distance sailed by Jumbo's vessel the Stellaprima is shown in table 4.5.

Table 4.6: The Sailed Distance of Jumbo's Fleet

		Distance [NM]			Condition [%]	
Class	Vessel	Total	Ballast	Laden	Ballast	Loaded
K	Jumbo Kinetic	64,190	21,286	42,904	33%	67%
K	Fairmaster	64,761	10,316	54,445	16%	84%
J	Jumbo Jubilee	61,954	22,845	39,110	37%	63%
J	Fairpartner	57,471	15,132	42,338	26%	74%
J offshore	Jumbo Javelin	67,836	12,791	55,045	19%	81%
J offshore	Fairplayer	55,765	19,890	35,874	36%	64%
H	Jumbo Vision	61,386	17,119	44,266	28%	72%
H	Fairlane	71,282	26,514	44,768	37%	63%
E	Stellaprima	68,240	21,627	46,613	32%	68%
E	Fairlift	60,502	14,938	45,564	25%	75%
	Average	63,339	18,246	45,093	29%	71%

The results of sailed distance of the whole fleet of Jumbo are shown in table 4.6, including the percentages in ballast and loaded distance. On average, Jumbo's fleet sailed 29% of the total distance sailed in ballast condition, based on voyage data from 2016. The percentage of the total distance sailed in ballast condition is lower than the percentage of the days in motion in ballast. This could be explained by the fact that ballast legs are often sailed at relatively low speed because otherwise the vessel would arrive too early at the POL.

Some ballast legs are sailed in order to position a vessel for a contract of a charterer that booked a dedicated vessel. For these legs, Jumbo is not allowed to fix spot cargoes in order to increase their utilization. Moreover, not on all routes that are sailed by ballast legs, profitable spot cargoes can be found, certainly not om the specific routes and in the specific time frames that are dependent on the routes and in the time frames of the fixed main cargoes from the special segment. However, on legs on which one or multiple cargoes are booked, not all hold or deck space has been utilized, which means that there is also potential for a higher utilization of Jumbo's fleet, as will be discussed in section 4.3.3.

4.3.3 The Analysis of the Stowage Plans of Jumbo's Fleet

Lanphen and Smits both faced the difficulty to deal with the vessels capacity and capability constraints when they tried to determine the occupancy of HLCV's [Lanphen, 2015] [Smits, 2016]. Smits defined the utilization of a HLCV as the length of the cargo divided by the deck length of the vessel, because his research focused on the shipping costs of floating cargoes. Lanphen developed a scheduling tool that included constraints to determine feasible sailing schedules and Smits used the occupancy rate in order to estimate the shipping costs of HLCV's. Lanphen assumed that the constraints include that the deadweight capacity, deck space and hold volume have to be large enough to carry a cargo, but did not include the stability or strength criteria or stowage and sea-fastening complications which are off-course very difficult to model. Lanphen did also include the constraint that some cargoes can only be stowed under deck, if requested by the client. In Lanphen's determination of occupancy rate, the occupancy rate is equal to the average occupancy rate of the deck and the occupancy rate of the hold. Based on the difficulty and the large number of constraints that are based on the cargo and vessel specifications, it can be concluded that there is no comprehensive method to determine the occupancy of a MPV

or HLCV. However, a thoughtful approximation of the occupancy rate of these vessels is possible. In order to estimate the occupancy rate of Jumbo's fleet (O_{fleet}), the stowage plans from voyages of the last 10 weeks of 2016 have been studied (see Annex C.4 for an example of a stowage plan). The average occupancy rate of each Jumbo vessel i (O_{vessel_i}) has to be determined, based on the average occupancy rate of each Jumbo vessel i on leg j ($O_{vessel_{ij}}$), which is based on the estimated occupied deadweight capacity ($O_{deadweight_{ij}}$), deck area ($O_{deck_{ij}}$), hold area ($O_{holdarea_{ij}}$) and hold volume ($O_{holdvolume_{ij}}$). If vessel i sails leg j in ballast condition, $O_{vessel_{ij}}$ is set to zero. If vessel i sails leg j as a dedicated vessel, $O_{vessel_{ij}}$ is set to 100 %. When vessel i sails leg j as a want completion leg, the occupied deadweight ($W_{cargo_{ij}}$), deck area ($A_{cargo,deck_{ij}}$), hold volume ($V_{cargo,hold_{ij}}$) and hold area ($A_{cargo,hold_{ij}}$) are determined from the stowage plan and used to calculate $O_{vessel_{ij}}$ for vessel i on leg j.

$$O_{deadweight_{ij}} \approx \frac{W_{cargo_{ij}} + W_{stores_{ij}} + W_{fuel_{ij}} + W_{ballast_{ij}}}{D_{vessel_{ij}}} \tag{4.4}$$

The occupancy of the deadweight capacity is calculated using equation 4.4. The weight of the stores, fuel and ballast water also occupy the deadweight capacity of the vessel, but for simplicity these are neglected. The weight of the cargo ($W_{cargo_{ij}}$) is obtained from the packing-lists associated to the sailed leg j on vessel i. From the results in Annex C.10 can be concluded that the deadweight capacity of Jumbo's vessels is hardly ever occupied.

$$O_{deck_{ij}} \approx \frac{A_{cargo,deck_{ij}}}{A_{deck_{ij}}} \tag{4.5}$$

The occupancy of the deck area is calculated as expressed by equation 4.5, dividing the occupied cargo area ($A_{cargo,deck_{ij}}$) by the total usable deck area ($A_{deck_{ij}}$). Not for every voyage the whole deck area can be used to stow a cargo, because the vessels can be sailed without the deck hatches. The stability criteria and loss of available deck space for sea-fastening have not been included in the analysis of the stowage, for simplicity.

$$O_{holdarea_{ij}} \approx \frac{A_{cargo,hold_{ij}}}{A_{tanktop_{ij}} + A_{tweendecks_{ij}}} \tag{4.6}$$

The occupancy rate of the hold area, expressed by equation 4.6, is more difficult to determine, as this area consists of the tanktop area ($A_{tanktop_{ij}}$) and the total area of the tweendecks ($A_{tweendecks_{ij}}$). The tweendecks can be placed in various configurations, depending on the characteristics of the cargo, resulting in a variable $A_{tweendecks_{ij}}$. When a very large and high cargo is stowed on the tanktop, the tweendecks cannot be placed anymore halfway the height of the hold, resulting in a lower $A_{tweendecks_{ij}}$ than in the case only parcels e.g. containers are loaded in the holds. The cargo in the hold on the stowage-plan in Annex C.4 is so large that most of the tweendecks are positioned on the tanktop. In this case, $A_{tweendecks_{ij}}$ is very small.

$$O_{holdvolume_{ij}} \approx \frac{V_{cargo,hold_{ij}}}{V_{hold_{ij}}} \tag{4.7}$$

The occupancy of the hold volume is calculated by dividing the volume of the loaded cargoes in the hold by the total volume of the cargo hold, as expressed in equation 4.7.

$$O_{hold_{ij}} \approx max(O_{hold,volume_{ij}}; O_{hold,area_{ij}}) \tag{4.8}$$

The occupancy of the hold is obtained by taking the maximum of $O_{hold,volume_{ij}}$ and $O_{hold,area_{ij}}$, as expressed by equation 4.8 In most cases, $O_{hold_{ij}}$ equals $O_{hold,area_{ij}}$ as shown in Annex C.10.

$$O_{vessel_{ij}} \approx max(O_{deadweight_{ij}}; \frac{O_{hold_{ij}} + O_{deck_{ij}}}{2}) \approx \frac{O_{hold_{ij}} + O_{deck_{ij}}}{2} \tag{4.9}$$

The average occupancy rate of a vessel i on leg j is obtained by taking the maximum of $O_{deadweight_{ij}}$ and the average of $O_{hold_{ij}}$ and $O_{deck_{ij}}$. For all studied voyages, the average occupancy of the deck and hold is larger than the occupancy rate of the deadweight capacity, expressed by equation 4.9.

$$O_{vessel_i} \approx \frac{\sum_{j=1}^{n} (O_{vessel_{ij}} * D_{ij})}{\sum_{j=1}^{n} D_{ij}} \tag{4.10}$$

From the average occupancy of each leg j sailed by vessel i, the average occupancy rate for each vessel i can be determined for legs 1 to n, expressed by equation 4.10. O_{vessel_i} is expressed as the weighted average of $O_{vessel_{ij}}$ over the total distance sailed by vessel i. The results of O_{vessel_i} can be found in the total column in table 4.7.

Table 4.7: Overview Calculation Occupancy Rate

Class	**Vessel**	$O_{deadweight_i}$ [%]	A_{deck_i} [%]	O_{hold_i} [%]	O_{vessel_i} [%]
K	Jumbo Kinetic	8	80	68	76
K	Fairmaster	95	95	95	95
J	Fairpartner	61	73	76	74
J	Jumbo Jubilee	28	69	33	51
J	Jumbo Javelin	20	77	77	77
J	Fairplayer	1	8	0	4
H	Jumbo Vision	27	53	60	57
H	Fairlane	13	43	44	43
E	Stellaprima	15	19	42	32
E	Fairlift	29	50	68	66

The occupancy rate of most Jumbo vessels is around 50 percent, following the in this section described methodology. The occupancy rate of the studied voyages of Jumbo's vessels range from 4 percent for the Fairplayer to 95 percent for the Jumbo Kinetic. In the case of the Fairplayer, the extremely low occupancy rate is due to the fact that the Fairplayer sailed very long ballast legs during the studied time frame, in order to position for an offshore service contract. The very high result for the Jumbo Kinetic is due to the fact that this vessel was chartered as a dedicated vessel during the studied time frame. As already discussed, the occupancy rates have not been calculated accurately because of the difficulties one faces during the determination of the occupancy rate of a HLCV. For simplicity, some assumptions and grove estimates have been used, because determining the occupancy is very difficult, certainly from 2D stowage plans.

$$O_{fleet} \approx \frac{\sum_{i=1}^{10} O_{vessel_i} * D_{ij})}{\sum_{j=1}^{10} D_i} \tag{4.11}$$

The average occupancy rate for Jumbo's fleet as a whole could be calculated as expressed by equation 4.11. However this would not lead to a very useful result, because not enough voyages have been studied. Table 4.7 already provides insight into the existence of unused cargo space on Jumbo's vessels and the potential to increase the yield of their fleet by

fixing more spot cargoes. However, the yield of Jumbo's fleet can only be increased if Jumbo is able to locate transportation demands from charterers that have to transport their cargoes that 1) fit the sailing schedule, 2) fit the stowage plans and 3) which provide a marginal revenue to Jumbo that exceeds the marginal cost of shipping the cargo. The marginal revenue of these cargoes would be the freight that is paid for these cargoes by the charterer. The marginal cost would be the extra costs of shipping these cargoes, such as extra cargo handling, port, insurance and fuel costs. Further research is required to address the cargo volumes that match Jumbo's sailing schedule and stowage plans and to quantify the potential increase of the yield of Jumbo's fleet. However, a first estimation to increase Jumbo's yield is provided in section 4.3.4.

4.3.4 First Estimation of the Potential to Increase Jumbo's Yield

A first estimate of the potential to increase the yield of Jumbo's fleet is still possible, despite the lack of data from global cargo volumes in the heavy lift shipping industry and the problems encountered when determining the amount of unused capacity. This research proposes to estimate the potential to increase the yield based on the number of days in motion without a cargo on board. The average number of days in motion of Jumbo's fleet is equal to 198 days and 66 of these days are sailed in ballast condition, as discussed in section 4.3.2. The days that Jumbo's fleet has been in motion without a cargo on board cannot be considered as 'free' days. Jumbo's vessels are mobilized or demobilized for main cargoes from the special segment for a part of these 66 days. The mobilization days cannot be considered as free days for two reasons. First, the clients from the special segment frequently pay for a dedicated vessel. Secondly, Jumbo absolutely wants to minimize the costly risk of delay or not arriving at all for a main cargo from the special segment. This means that the extra activity of shipping a spot cargo during mobilization days is usually considered too risky by Jumbo. The extra activity of shipping spot cargoes is considered as less risky during demobilization days compared to mobilization days. However, the client that has chartered Jumbo for the transportation of the main cargo pays (in)directly for the (de)mobilization of the vessel and is expected to be dissatisfied if another client from the commodity segment takes advantage of the voyage that has already been paid for. For simplicity, 44 days are assumed as mobilization and demobilization days that prevent or discourage Jumbo from shipping extra spot cargoes and 22 days are assumed as free days that offer the possibility for Jumbo to ship spot cargoes.

Table 4.8: Overview of Dayrates and Voyage Result / Gross Freight Ratios

Class	Dayrate [$]	Result / GF	Result / GF'
K	$ 30,000	0.7	0.5
J	$ 20,000	0.5	0.4
H	$ 10,000	0.5	0.3
E	$ 8,000	0.3	0.2

The revenue that can potentially be obtained by utilizing the 22 free days, is estimated and based on the dayrates of Jumbo's vessels. The dayrates of each class of Jumbo's vessels that are shown in table 4.8, which estimates based on data from Shipnet. Note that only Jumbo's shipping vessels have been taken into account, meaning that the Jumbo Javelin and Fairplayer, which are offshore vessels, are excluded from this estimation.

In addition to an estimation of the potential revenue from the free days, the potential results are also estimated. The yearly voyage result and yearly income in terms of Gross Freight (GF) have been obtained from Shipnet as an average for each class of shipping vessels. The ratios of voyage result over GF are shown in table 4.8 for each class of Jumbo's vessels. The ratios can be used to calculate the results of utilizing the free days, based on the dayrates. However, these ratios are based on a mix of contracts from the special segment and the commodity segment. The ratios are assumed to be too optimistic to calculate the results from utilizing the free days by shipping cargoes from the commodity segment. For example, the ratio of a K-class vessel equals 0.7 and this is not a realistic voyage result margin for commodity cargoes on the spot market. In addition, most transportation demands that may fit the schedule will require a deviation from the route that lead to extra voyage costs, for example port costs. However, some transportation demands that may coincide with the ballast legs on the sailing schedule can be served by Jumbo at extremely low marginal costs. For example, no or very little extra bunker costs have to be incurred by Jumbo when they ship a commodity cargo in the hold of their vessel, because the weight of this cargo would also be displaced by the vessel as ballast water in order to meet draft and stability criteria. Taking these reasons into account, the ratios from Shipnet have been corrected, resulting in more realistic ratios for the estimation of the results of utilizing free days, as shown in table 4.8.

Table 4.9: The Dayrates for 10 Scenarios

	Dayrate [$]									
Class	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
K	$ 3,000	$ 6,000	$ 9,000	$ 12,000	$ 15,000	$ 18,000	$ 21,000	$ 24,000	$ 27,000	$ 30,000
J	$ 2,000	$ 4,000	$ 6,000	$ 8,000	$ 10,000	$ 12,000	$ 14,000	$ 16,000	$ 18,000	$ 20,000
H	$ 1,000	$ 2,000	$ 3,000	$ 4,000	$ 5,000	$ 6,000	$ 7,000	$ 8,000	$ 9,000	$ 10,000
E	$ 800	$ 1,600	$ 2,400	$ 3,200	$ 4,000	$ 4,800	$ 5,600	$ 6,400	$ 7,200	$ 8,000
Total Dayrate	**$ 13,600**	**$ 27,200**	**$ 40,800**	**$ 54,400**	**$ 68,000**	**$ 81,600**	**$ 95,200**	**$ 108,800**	**$ 122,400**	**$ 136,000**

The dayrates that potentially are received by Jumbo for each free day have been calculated for 10 scenarios. The scenarios are based on the extent to which the full dayrate of each vessel type (from table 4.8) could be obtained during free days. First of all, transportation demands are not expected to be located by Jumbo on every route and in every time frame of the free days. Secondly, high prices are not expected to be paid for the spot cargoes that may be coincide with Jumbo's sailing schedule. For example, a K-class vessel is not expected to generate the dayrate of $ 30.000 when a spot cargo is shipped, nor is a E-class vessel expected to generate the dayrate of $ 8.000 during free days, even if convenient spot cargoes are located and fixed by Jumbo. For these reasons, the scenarios are set at 10 to 100 percent of the nominal dayrate of each class of Jumbo's vessels. The total dayrate of the 8 studied vessels equals twice the sum of the dayrate of each class of vessels, as shown in table 4.9, which varies from $ 13,600 in a worst case scenario to $ 136,000 in a (unrealistic) best case scenario.

Table 4.10: The Daily Results for 10 Scenarios

	Daily Result [$]									
Class	*10%*	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
K	$ 1,500	$ 3,000	$ 4,500	$ 6,000	$ 7,500	$ 9,000	$ 10,500	$ 12,000	$ 13,500	$ 15,000
J	$ 800	$ 1,600	$ 2,400	$ 3,200	$ 4,000	$ 4,800	$ 5,600	$ 6,400	$ 7,200	$ 8,000
H	$ 300	$ 600	$ 900	$ 1,200	$ 1,500	$ 1,800	$ 2,100	$ 2,400	$ 2,700	$ 3,000
E	$ 160	$ 320	$ 480	$ 640	$ 800	$ 960	$ 1,120	$ 1,280	$ 1,440	$ 1,600
Total Result	**$ 5,520**	**$ 11,040**	**$ 16,560**	**$ 22,080**	**$ 27,600**	**$ 33,120**	**$ 38,640**	**$ 44,160**	**$ 49,680**	**$ 55,200**

The daily results from the utilization of the free days have been calculated by multiplying the dayrates of each class of vessels from table 4.9 by the corrected ratios of each class of vessels from table 4.8. The daily result from the utilization of the free days of the 8 studied vessels is estimated $ 5,520 to $55,200.

Table 4.11: The Yearly Results from 22 Free Days for 10 Scenarios

	Yearly 22 Free Days [$]									
	10%	*20%*	*30%*	*40%*	*50%*	*60%*	*70%*	*80%*	*90%*	*100%*
Revenue	$ 299,200	$ 598,400	$ 897,600	$ 1,196,800	$ 1,496,000	$ 1,795,200	$ 2,094,400	$ 2,393,600	$ 2,692,800	$ 2,992,000
Result	$ 121,440	$ 242,880	$ 364,320	$ 485,760	$ 607,200	$ 728,640	$ 850,080	$ 971,520	$ 1,092,960	$ 1,214,400

The total revenue and result that may be obtained from the utilization of the 22 free days has been calculated for each scenario and are shown in figure 4.11. The revenue obtained from the utilization of the free days is estimated from $ 299,200 to $ 2,992,000 and the estimated result from utilizing the free days varies from $ 121,440 to $ 1,214,400 on a yearly basis. The scenarios 30 percent to 70 percent are assumed to be realistic for the extent to which the nominal dayrates are obtained when utilizing the free days. For the average of these scenarios, the revenue is estimated at $ 1.5 million and the result at $ 0.6 million. The potential revenue of $ 1.5 million from the utilization of the free days is only marginal to the $ 40 million revenue from the commodity segment in 2016. If Jumbo would have utilized the free days as estimated in 2016, their revenue from the commodity would have been increased by 3.75 percent. The number of free days, the setting of the scenarios for the obtainable dayrate and the result over GF ratio may be adjusted, if this leads to achieve a more accurate estimate. There is even a possibility that the extent to which the nominal dayrate is obtained during free days is different for each class of vessels.

The estimation is only based on the free days and excludes the potential to generate revenue from shipping contracts during voyages that have been made with a cargo on board. On these voyages with a cargo on board, idle cargo carrying capacity may also be utilized, as discussed during the analysis of the stowage plans in section 4.3.3. In addition, the Jumbo Javelin and the Fairplayer have not been taken into account for the estimation. From these perspectives, the potential to increase the yield of Jumbo's fleet may be underestimated.

4.3.5 Intermediate Conclusions

The idle capacity of Jumbo's fleet has been analyzed from two perspectives. First, the number of days in motion of Jumbo's vessels during 2016 have been analyzed and secondly the occupancy of the deck and hold space of Jumbo's fleet for voyages during Q3 and Q4 of 2016 have been analyzed. The vessels of Jumbo's fleet have been in motion 54 percent of the days of the year 2016 in motion on average, of which 33 percent have been sailed empty. From the days in motion, 22 days are assumed to be free. The distance sailed by Jumbo's fleet has been for 29 percent in ballast condition. The analysis of the occupancy of Jumbo's fleet, which has its limitations, suggests that the occupancy rate of Jumbo's vessels based on the deck and hold space of these vessels is more or less 50 percent. The results of these analyzes suggest that the yield of Jumbo's fleet has potential to be increased. A first estimation of the potential to utilize the 22 free days results in a potential revenue of $ 1.5 million and a potential result of $ 0.6 million on a yearly basis. Further research is required in order to monetize the potential to increase the yield of Jumbo's fleet, taking into account the global cargo volumes including willingness to pay and the extent to which these volumes match Jumbo's sailing schedule and stowage plans.

4.4 Conclusions

This chapter is aimed to address strengths and weaknesses of Jumbo's strategy and business procedures. Secondly this chapter aims to address the potential to increase the yield of Jumbo's fleet. Jumbo is a main player in the special segment, but currently they suffer from stagnating demand for heavy lift shipping and oversupply of tonnage in the special segment, which increases their dependence on transportation demands in the commodity segment as a source of revenue.

Distinction is made in Jumbo's strengths and weaknesses in general, in the special segment and in the commodity segment. Jumbo's main strength is their reputation in the heavy lift shipping industry. Their weakness is a low level of flexibility due to their small fleet of only 10 vessels and the current implementation of the sailing schedule. Jumbo's strengths are their attention level to projects, their diversification of Shipping and Offshore, their Joint Venture with Biglift in the special segment and their Alliance with BBC in the commodity segment. Jumbo's weaknesses are mainly located in the commodity segment, in which an inefficient way of handling inquiries, an inefficient way of sharing information about their positions and availability provide friction to improve their market access to the commodity segment, in which Jumbo's expenses to brokers and forwarders are estimated at $ 1.0 million. The strengths and weaknesses that have been addressed in this chapter can be used as inputs of the SWOT analyses in chapter 7, separately for the special segment and commodity segment.

The potential to increase the yield of Jumbo's fleet has been analyzed by addressing the number of days in motion and distance sailed by Jumbo's vessels, without a cargo on board and by analyzing stowage plans from voyages of Jumbo's vessels. From the analysis of Jumbo's voyages in 2016 can be concluded that Jumbo's vessels have been in motion for 54 percent of the days of the year and 33 percent of these days in motion have been sailed without a cargo on board. Jumbo's vessels have sailed 29 percent of the distance sailed in 2016 without a cargo on board. From the analysis of Jumbo's stowage plans from Q3 and Q4 of 2016 can be concluded that the deck and hold space of Jumbo's vessels are the determinant capacity constraints for most voyages. The unused cargo carrying capacity of Jumbo's fleet is around 50 percent, based on this analysis. From these two analyses of idle cargo carrying capacity of Jumbo's fleet can be concluded that there is potential to increase their yield, but only if they are able to locate transportation demands that fit their sailing schedule and stowage plans and from which Jumbo is able to generate a marginal revenue that exceeds the marginal cost. A first estimate of the yearly revenue that may be made if Jumbo is enabled to utilize the 22 free days of their 8 shipping vessels equals $ 1.5 million, while the yearly result is estimated at $ 0.6 million. The opportunities brought by digital platforms to gain market access are discussed in chapter 5 on an industry level and in chapter 6 on a company level.

Chapter 5

The Impact of Digital Platforms on the Heavy Lift Shipping Industry

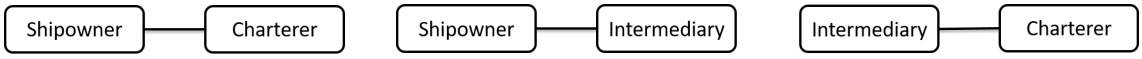
The goal of this chapter is to address the impact of digital platforms on the heavy lift shipping industry, by the application of the framework from chapter 2 to the market characteristics that have been addressed in chapter 3 of the special and the commodity segment of the heavy lift shipping industry. The potential functional structures of digital platforms in the heavy lift shipping industry are discussed in section 5.1. The potential value adding processes of digital platforms are discussed in section 5.2. The value adding processes of digital platforms are addressed that are effective in the heavy lift shipping industry, distinguishing in their applicability and effects in the commodity and the special segment. The effects of the by digital platforms improved coordination of transactions in the heavy lift shipping industry are discussed in section 5.3. These effects are discussed for information links and marketplaces separately. The strategic implications of digital platforms in the heavy lift shipping industry are discussed in section 5.4. The potential initiators of information links and marketplaces are discussed, based on their incentives, resources and their ability to attract participants. The impact of digital platforms to the market structure of the heavy lift shipping industry is viewed as the result of the (timing of) actions from shipowners, charterers and intermediaries in terms of investing in and participating to digital platforms. Finally, the findings of this chapter are concluded in section 5.5, from which the meaning of digital platforms to Jumbo can be deduced in chapter 6.

5.1 Digital Platforms in the Heavy Lift Shipping Industry

Information links and marketplaces are digital platform types that are or can be initiated in the heavy lift shipping industry. Diverse functional structures of digital platforms are possible in this industry and will be discussed for information links 5.1.1 and in 5.1.2 for marketplaces. The conclusions of this section are provided in section 5.1.3.

5.1.1 Information Links in the Heavy Lift Shipping Industry

Information links are expected to be established between a buyer and seller in the heavy lift shipping industry. These information links are established to improve the exchange of information and coordination of transactions between shipowners, charterers and intermediaries that are participating to such links.



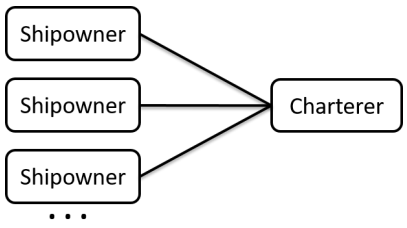
(a) (b) (c)

Figure 5.1: Functional Structures of Information Links

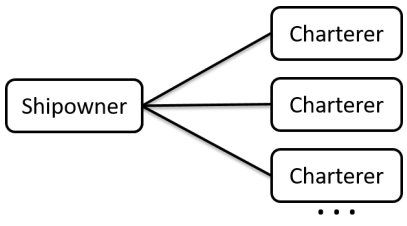
Three potential configurations of information links are shown in figure 5.1. Information links are expected in the following relations: shipowner to charterer (figure 5.1a), shipowner to intermediary (figure 5.1b) and intermediary to charterer (figure 5.1c). These information links can be established as a separate system or as part of a marketplace. For example, a forwarder that establishes information links to both charterers and shipowners forms the context of a marketplace of charterers and shipowners, coordinated by the forwarder. The functional structures of marketplaces are discussed in section 5.1.2.

5.1.2 Marketplaces in the Heavy Lift Shipping Industry

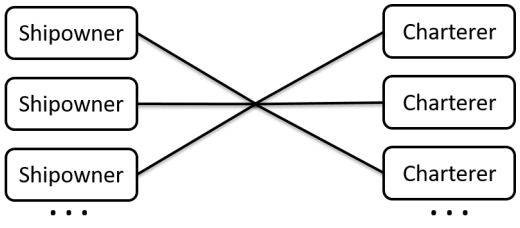
Marketplaces are expected to be established between (multiple) charterers and (multiple) shipowners and controlled by charterers, shipowners or intermediaries. Diverse configurations are discussed, that are distinguished from each other based on the number and types of participants and the type of controller of the marketplace.



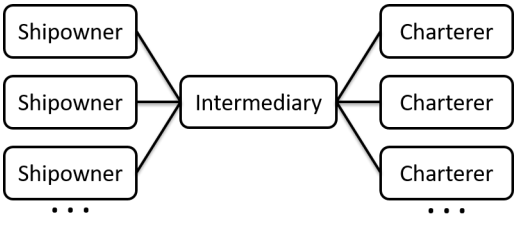
(a) Charterer's Marketplace



(b) Shipowner's Marketplace



(c) Consortium Marketplace



(d) Intermediary Marketplace

Figure 5.2: Functional Structures of Marketplaces

Figure 5.2 represents the configurations of marketplaces in the heavy lift shipping industry. The charterer's marketplace would be established and controlled by a charterer that connects to multiple shipowners, as shown in figure 5.2a.

The shipowner's marketplace is established and controlled by a single shipowner that connects to multiple charterers which can be seen as a booking portal, as shown in figure 5.2b. The Jumbo Position List can be viewed as this type of marketplace, in which Jumbo promotes the current and future positions of their fleet and in which their (prospective) clients can submit an RFQ.

Figure 5.2c represents a marketplace controlled by a group of charterers and or shipowners. The marketplace is controlled by a group of charterers, shipowners or both, as an investment in improving their coordination. The marketplaces as shown in figure 5.2a, 5.2b and 5.2c do not involve intermediaries and belong to the scenario of dis-intermediation as discussed in chapter 2.

Figure 5.2d represents the configuration of a marketplace controlled by an intermediary that can be a forwarder, broker or digital intermediary in the heavy lift shipping industry. Forwarders and brokers have opportunities to re-intermediate themselves by establishing information links to charterers and shipowners, which may actually lead to a marketplace. Digital entrants in the heavy lift shipping industry have the opportunity to compete to the traditional intermediaries. These digital intermediaries provide digital mechanisms that contribute to the coordination of transactions in this industry, in the cyber-mediation scenario as discussed in chapter 2.

5.1.3 Intermediate Conclusions

The possibilities of digital platforms have been discussed in this section concerning the functional structure of these systems. The owners and the participants of the diverse configurations of information links and marketplaces can be shipowners, charterers or intermediaries. The owners of the information link or marketplace have control and authority over the value adding processes incorporated in the system, that are determinant for the effects of these systems. The potential value adding processes of digital platforms in the heavy lift shipping industry are discussed in section 5.2.

5.2 The Value Adding Processes of Digital Platforms in the Heavy Lift Shipping Industry

This section addresses which value adding processes of digital platforms have potential in the heavy lift shipping industry to improve the coordination of transactions in the heavy lift shipping industry. The potential of these value adding processes is discussed separately for the commodity segment and the special segment, because market structure and the complexity of the shipping contracts is different in these market segments. The feasibility of the value adding processes is discussed according to the market functions of Bakos [Bakos, 1998], as discussed in chapter 2. The value adding processes in the heavy lift shipping industry are discussed in in section 5.2.1 for the matching functions, 5.2.2 for the sub-functions of the facilitation of transactions and in 5.2.3 for the institutional infrastructure. Finally, the potential of information links and marketplaces in the heavy lift shipping industry is concluded in section 5.2.4.

5.2.1 Value Adding Processes for Matching Charterers to Shipowners

The matching of charterers and shipowners can only be involved in marketplaces and not in information links. The digital mechanisms are discussed that support the market sub-functions: determination of product offerings, search and price discovery. The applicability of the digital mechanisms is indicated in table 5.1.

Table 5.1: Digital Mechanisms for Matching Charterers to Shipowners

Market Function	Value Adding Process	Commodity	Special
Determination Product Offerings	Cargo Volume Trends	✓	✗
	Vessel Position Trends	✓	✗
	Freight Rate Trends	~	✗
Search for Buyers and Sellers	Effective Search Tools for Shipowners	✓	~
	Effective Search Tools for Charterers	✓	~
Price Discovery	Fixed Tarrifs	✗	✗
	Dynamic Price Algorithm	~	✗
	Reverse Auction of Charterer's Inquiry	✓	~
	Auction of Shipowner's Availablity	~	✗
	Negotiation Messenger	✓	✗

The demand side, consisting of charterers, is fragmented in the commodity segment and to a lesser extent fragmented in the special segment, as discussed in chapter 3. The supply side, consisting of shipowners, is fragmented in the commodity segment and concentrated in the special segment. This means that the aggregation of inquiries from charterers may be effective in the special segment and the commodity segment. The aggregation of the shipowners' vessel positions and availability may be more effective in the commodity segment than in the special segment. Note that the potential of aggregation of inquiries and positions and availability of tonnage does not only depend on the fragmentation of the market, but also on the level of participation of each side of the market. Without the participation of charterers to the marketplace, no information about transportation demands can be gathered. Information of vessel positions and availability is not possible without the participation of shipowners.

The shipowners in the heavy lift shipping industry determine the characteristics of their vessels and fleet by interpreting market signals about the characteristics of the cargoes that have to be transported by the charterers. In addition, the shipowners determine the positions of their fleets based by interpreting market signals about cargo volumes in order

to maximize the utilization of their fleets. Monitoring mechanisms of marketplace can provide these market signals about demand from charterers to shipowners. Opensea.pro is an example of a marketplace in this industry that fulfills this function. The balance of cargo volumes and open tonnage are visualized on a world map that helps shipowners to monitor the market dynamics, as indicated in figure D.1 in Annex D. The mechanisms for the determination of fleet characteristics and positions are only expected in marketplaces in the commodity segment and not in the special segment, because market signals that are provided to shipowners are based on the aggregated inquiries from charterers and positions and availability of shipowners' tonnage.

The efficiency of the search process of charterers and shipowners can be improved by search tools in a marketplace, if the charterers' RFQs and the shipowners' positions and availability are aggregated on the marketplace. Effective search tools may improve the searching activity of charterers, that have differentiated preferences, for convenient vessels from shipowners for their cargoes and the searching activity of shipowners for RFQs from charterers. Only 8 operators of 71 vessels are (currently) active in the special segment, resulting in a small search scope in which search costs are not expected to be decreased significantly by search tools. Search tools are expected to reduce search related costs for charterers in the commodity segment, because the search scope of the supply side in the commodity segment consists of hundreds of differentiated vessels from dozens of shipowners, as discussed in chapter 3. The search costs that shipowners have to incur in order to locate transportation demand from charterers may be reduced by effective search tools, but the transportation demands from charterers from the special segment are assumed to be too complex for the aggregation and the search tools on a marketplace. The complexity of the transportation demands and services in the special segment, as discussed in the market analysis in chapter 3 and the company analysis in chapter 4, seem to be less susceptible for the effectivity of marketplaces in the special segment.

Shipnext and Opensea.pro are examples of marketplaces that aggregate information about inquiries and information about the availability of vessels from charterers, shipowners into their marketplace. These marketplaces visualize cargoes and vessel availability in lists or on maps. Filter and ordering tools help the participants of these marketplaces to search through these lists, as shown in Annex D. The search tools can be very effective if a critical mass of shipowners and charterers is active on the system. These digital intermediaries face the chicken-or-egg problem as discussed in chapter 2, because without the participation of shippers, they are challenged to attract charterers and vice versa. The strategic implications for these digital intermediaries are discussed more elaborately in section 5.4. Shipowners that initiate a marketplace do not have to attract shipowners as participants to aggregate information about vessel positions and availability, as they are able to provide the information of their own tonnage. However, shipowners may have the problem of attracting charterers to use their marketplace. The Jumbo Position List is an example of a marketplace initiated by a shipowner. This system provides customers an overview of the positions and directions of Jumbo fleet and enables charterers to send an RFQ. Because Jumbo's fleet of 10 vessels is only small, prospective customers have little options, which is the reason why this system is hardly ever used. The idea behind a system such as the Jumbo Position List is off course promising, as there is potential to effectively promote unused cargo space to charterers and to streamline the flow of RFQs to shipowners. This system may be effective if the positions and available cargo space of a very large number of vessels is aggregated, for example on a marketplace that is established by a shipowner with a large market share e.g. BBC that operates a fleet of 170 vessels.

Search tools are applicable in the commodity of the heavy lift shipping industry and can enable a reduction of search costs for charterers and shipowners to locate each other and to gather information about the counter-party. This information includes the characteristics of a transport inquiry or an available vessel for chartering. Instant information about prices is very difficult to realize in marketplaces in the heavy lift shipping industry. Instant prices are for example provided by hosts on Airbnb, by Airlines that list their seats including prices and by a price-setting algorithm of Uber. Instant price information for heavy lift shipping services are only possible, if a price algorithm can be developed that is based on marginal costs and or market dynamics. Cost plus pricing can be realized by adding a mark-up to the costs of the voyage. Price discrimination strategies can be realized that base the price on market dynamics or behaviour of charterers, as discussed in chapter 2 about the airline reservation systems. Dependent variables that influence the price include the specifications of the cargo, the route that has to be sailed, the price of port calls and the operational costs of the ship. Independent variables that influence the price include the capital costs and the overhead costs of the shipowner. The prices are currently calculated and quoted to charterers by the in-house brokers of shipowners in the same way as discussed in the case Jumbo in chapter 4. Automatic price algorithms are not yet expected in this industry, because of the high level of differentiation of cargoes that have to be transported on different routes and the high level of differentiation of vessels that are operated. However, instant price information can not be excluded, and these algortihms are at most expected in the case of the inquiries for which shipowners are qualified that operate a liner service. The cost structure of a liner service would be less complicated to implement in a price algorithm than the cost structure of a tramp service.

The digital price discovery mechanisms that can be applied in the heavy lift shipping industry are the auction, the reverse auction or the negotiation. The auction can be used as a digital price discovery mechanism in the case shipowners market information about the availability of their fleets, by auctioning the available days for hire or available cargo space of their vessels. Charterers would then search for available vessels and could decide to submit a bid. The reverse auction can be used as a digital price discovery mechanisms for charterers that have a transportation demand. The charterer defines and submits the information of an RFQ, that can be searched for by shipowners that can decide to bid on these RFQ's. Finally, the negotiation is a price discovery mechanism that can be realized by a messenger box through which charterers and shipowners can negotiate prices and terms. In addition to a messenger box, online contract editing tools can be included, which is also included in the marketplace Shipnext, which will be discussed in section 5.2.3. Note that the (reverse) auction mechanism can also be coupled to the negotiation mechanism. A charterer that receives a response from shipowners including price quotes can negotiate with these shipowners during the auction.

The price discovery mechanisms that are possible in this industry are the online (reverse) auction and negotiation or a combination of these. These digital price discovery mechanisms do not enable instant information about prices, which constrains charterers from instantly comparing multiple options for the transportation of their cargoes on information about tonnage and prices. Charterers will only be enabled to compare alternatives on information and price if a dynamic price algorithm can be created that provides instant information about prices to charterers, which suggests that price competition will not increase significantly and will be discussed later in section 5.3.

5.2.2 Value Adding Processes for the Facilitation of Transactions

The coordination of transactions between shipowners and charterers can be improved by value adding processes incorporated in information links that contribute to the logistics and settlement function of a market, after a bi-lateral relationship is established. These information links can also be part of marketplaces in which the functions for logistics, settlement and trust are supported. An overview of the applicability of the digital mechanisms to the market segments of the heavy lift shipping industry is shown in table 5.2.

Table 5.2: Digital Mechanisms for the Facilitation of Transactions

Market Function	Value Adding Process	Commodity	Special
Logistics	Monitoring and Coordination Tools	✓	✓
	Distribution of Documentation	✓	✓
Settlement	Payment Monitoring	✓	✓
Trust	Feedback Systems	~	✗

Value adding services and information during the execution of shipping contracts can be provided through information links. These value adding services and information can be for example: progress updates, real-time positions (track and trace), weather conditions, the ETA, live video footage of the charterers' cargo or even monitoring services of the cargo's motions. The latter are especially expected in the special segment, because some cargoes in this segment, for example harbour cranes, have a certain fatigue life that is negatively influenced by motions at sea. The exchange of documentation between charterers and shipowners such as the bills of lading, cargo drawings, packing lists, stowage plans and invoices can be exchanged through information links instead of emails. These logistics supporting functions are applicable in both the special and commodity segment in separate information links established by shipowners, as unique product offerings. Another application of the digital logistics mechanisms is to reduce friction in a marketplace that is established in the commodity segment.

Settlement in the heavy lift shipping industry is currently carried out by sending invoices to charterers after a shipment or project has been completed. The charterer pays the shipowner or forwarder the agreed freight. In a digital environment, these secured payments provided by banks could be incorporated in either information links or marketplaces. An alternative method for settlement is by using blockchain technology, as Shipnext is planning to do. Shipnext is planning to introduce freight coins that can be used in smart contracts, acting as an escrow service. Actually, very little is known yet about the adoption level of cryptocurrency and smart contracts in shipping. Recent pilots of blockchain technology have been runned in the container shipping business, but the actual deployment of this technology is rather uncertain [Knowler, 2017].

The protection against opportunistic behaviour of market stakeholders is important in marketplaces, but may be encountered by the functionality of an information link or a marketplace. Digital mechanisms exist for three types of trust: trust in the identity of a charterer or shipowner, trust in the successful and safe transportation of the cargo and trust in the fulfillment of contracts. Digital mechanisms can drive these types of trust, even in the heavy lift shipping industry. The trust in the identity of the counterpart, charterer or shipowner, is only required in marketplaces before establishing a bi-lateral relation. In a marketplace owned by an intermediary such as Shipnext or Opensea.pro, trust can be driven by feedback mechanisms or by certified entry that is controlled by the owner of the marketplace. In a marketplace operated by a shipowner, the brand of the

shipowner drives the charterer's trust in the identity of the shipowner. Transparency into the execution of the shipping service has to be realized in order to establish trust in the transaction of the shipping service. This type of trust may be realized by track and trace systems to record the time of arrival and departure at the POL and POD or to record motions of the vessel and cargo in order to check the damage of the cargo in real time. The trust in the contractual fulfillment is closely associated with the transparency into the execution of the shipping service. The records of the timing of arrival and departure or the records of the motions during a shipment may be used 1) to monitor the extent to which a party meets contractual obligations 2) as inputs of an automatic contract without the use of a third party. In the latter case, the possibilities of blockchain technology (in the combination with smart contracts) in the heavy lift shipping industry is an open area for further research.

5.2.3 Value Adding Processes for the Institutional Infrastructure

Several value adding processes do already or are expected to support the institutional infrastructure in the heavy lift shipping industry, in information links and in marketplaces. An overview of the applicability of digital mechanisms in the heavy lift shipping industry is shown in table 5.3

Table 5.3: Digital Mechanisms for the Institutional Infrastructure

Market Function	Value Adding Process	Commodity	Special
Legal	Contract Editing Tool Smart Contracts	✓ ~	✗ ✗
Regulatory	-	-	-

The BIMCO is an institution that promotes the standardization of charter parties For the (heavy lift) shipping industry, as discussed in chapter 3. The BIMCO introduced Internet Document Editing Application (IDEA) in 2000, that served as a digital platform for standard maritime contracts and clauses that handled about 40,000 contracts a year. Smartcon was introduced in January 2018, which enables editing the terms of a contract and these changes can be tracked by both parties in the contract [Ngai, 2018]. In the commodity segment, these online BIMCO contracts could be effective, but the contracts in the special segment are too complex to be covered by BIMCO contracts and often customized contracts are used that are established by shipowners. Shipnext is endorsed by BIMCO and this marketplace includes the editable BIMCO contracts that can be used by charterers and shipowners during their negotiation process [Shipnext, 2018].

The IMO is the intermediary that specifies and the laws, rules and regulations of the heavy lift shipping industry. Digital mechanisms are not expected to alter these functions of intermediation. Note that new suppliers that do not comply to the laws, rules and regulations of the heavy lift shipping industry are not expected to entry this industry driven by a digital platform, to which has been referred in chapter 2 in the case of Airbnb and Uber. The barriers to entry are not as low as the case for Uber or Airbnb, in which consumers that do not comply to the regulations of the incumbent industries, can compete to hotels or taxi companies.

5.2.4 Intermediate Conclusions

The value adding processes of information links are expected to improve the information exchange and coordination between charterers, shipowners and intermediaries in the special and the commodity segment. The most significant effects of information links are the improved exchange of information about progress and status updates. The value adding processes of marketplaces are expected to have potential to contribute to the coordination of transactions in multi-lateral relations, but especially in the commodity segment and to a lesser extent in the special segment. The most significant effects of marketplaces are expected to be reduced search costs for charterers gathering information about the positions and availability of the fleets of shipowners and for shipowners to gather information about the transportation demands from charterers. Providing instant prices to charterers may not be possible, unless an algorithm can be developed based on marginal costs and or market dynamics, suggesting that charterers will not have the ability to instantly compare the services of the shipowners on prices. A feedback system is a potential trust enabling mechanism in marketplaces, but only if a sufficient number of charterers and shipowners participates to this marketplace.

Table 5.4: Expected Digital Platforms in the Heavy Lift Shipping Industry

Market Function	Commodity	Special
Information Links	✓	✓
Marketplaces	✓	~

Information links are expected to be established in both market segments of the heavy lift shipping industry and marketplaces are especially expected to be initiated in the commodity segment, as shown in table 5.4. The theoretical effects of the improved coordination of transactions in bi-lateral and multi-lateral relations in the freight market of the heavy lift shipping industry are discussed in section 5.3. These effects have to be addressed before the strategic implications of digital platforms for shipowners, charterers, brokers, forwarders and digital entrants are discussed in section 5.4, because the effects may drive or discourage the digital initiatives of these parties.

5.3 The Effects of Digital Platforms in the Heavy Lift Shipping Industry

This section addresses the effects of information links and marketplaces in the heavy lift shipping industry. These effects are determinant for the digital initiatives of stakeholders in the heavy lift shipping industry in section 5.4. The effects of digital platforms are the improved exchange of information and coordination of charterers, shipowners and intermediaries, which will be discussed in section 5.3.1 for information links and in section 5.3.2 for marketplaces. The effects of the reduction of transaction costs that are incurred by charterers are discussed in section 5.3.3 and the effects of a reduction of transaction costs incurred by shipowners are discussed in section 5.3.4. The consequences of the reduced transaction costs incurred by shipowners and charterers for the role of brokers and forwarders in the heavy lift shipping industry are discussed in section 5.3.5. The conclusions are provided in section 5.3.6.

5.3.1 The Effects of Information Links

The effects of information links are the improved exchange of information and the improved coordination of transactions in a bi-lateral relation of: 1) a shipowner and a charterer, 2) a shipowner and forwarder or broker or 3) a broker or forwarder to a charterer. The effects of information links are expected to occur in the special segment and the commodity segment, as the mechanisms of these links have been concluded to be effective in both market segments in section 5.2.

Information links are expected to reduce the amount of time that is required for the communication between charterers, shipowners and intermediaries and to reduce the amount of errors that occur in this communication. The by information links improved exchange of information is expected to improve the coordination of shipowners and charterers or forwarders and charterers. The information links can include documentation or serve as a medium to share information about progress ETA's that otherwise have to be shared through email and phone contact. The reduction of time required to share the information and the reduction of errors are effects that may drive the investment of shipowners and forwarders in these information links. The strategic implications of information links for market stakeholders in this industry, for example for shipowners or forwarders that invest in information links to their clients in order to achieve or sustain competitive advantage, are discussed in section 5.4.

5.3.2 The Effects of Marketplaces

The value adding functions of marketplaces that support the matching function of a market are only expected to be effective in the commodity segment of the heavy lift shipping industry. Charterers have to incur market transaction costs when they have to search for shipowners and available and convenient vessels, negotiating costs and monitoring costs. Section 5.3.3 discusses the impact of the reduction of the reduction of search related cost incurred by charterers. Shipowners face market transaction cost for the dissemination of information about the specifications, availability and prices of their vessels, for their searching activity for cargoes from charterers and for gathering market information. Section 5.3.4 discusses the impact of 1) the reduction of search related costs that shipowners have to incur to gather information about charterers' transportation demands and 2) the reduction of costs associated with the dissemination of information about the positions and availability of their vessels. Brokers and forwarders assist charterers and shipowners in the coordination of transactions. Charterers and shipowners pay the forwarder and

broker a fee in exchange for the forwarder's or broker's service, as discussed in chapter 3. If a marketplace enables the reduction of transaction costs incurred by shipowners and charterers to the costs of the services of brokers and forwarders, or even below the costs of these intermediaries, the current role of the brokers and forwarders could be threatened. The consequences of marketplaces to the role of forwarders and brokers in the heavy lift shipping industry is discussed in section 5.3.5.

5.3.3 The Effects of a Reduction of Charterers' Transaction Costs

The impact of a reduction of buyers' search costs has already been discussed in chapter 2. The reduction of search costs reduces the monopolistic power of sellers that exploit the search related costs of buyers in a differentiated market. Buyers are better off when they can compare more offerings on product information and price and they enjoy the increased price competition in markets. This section discusses the impact of a reduction of search costs incurred the buyers in the freight market of the heavy lift industry: the charterers.

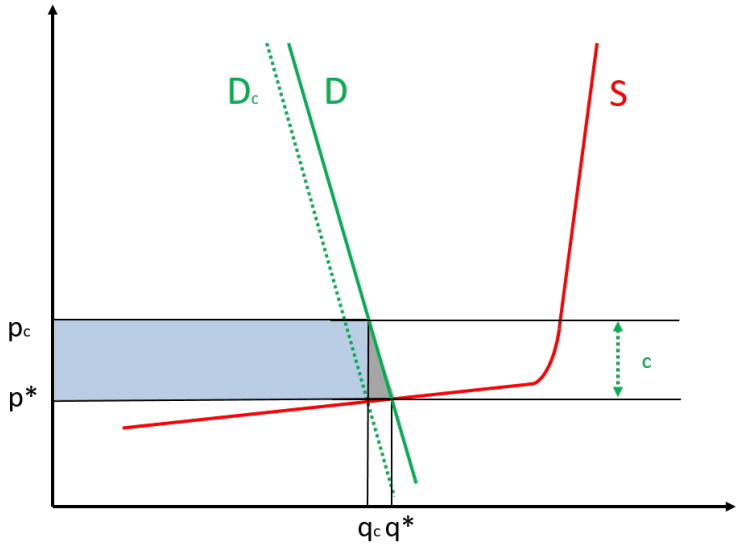


Figure 5.3: Transaction Costs Incurred by Charterers

Figure 5.3 shows a schematic model of the supply and demand curve of the commodity segment of the heavy lift shipping industry. The demand curve is extremely inelastic, because of the lack of a cheaper alternative transportation mode of breakbulk and project cargo, as discussed in chapter 3. The demand curve is represented in two scenarios. D represents the demand curve in a scenario when all search related costs of charterers are eliminated. D_c represents the demand curve in a scenario in which the charterer faces a fixed search cost c. In this schematic model, the elimination of all search related costs incurred by charterers leads to a reduction of the price from p_c to p* and the increase of demanded output from q_c to q*. The reduction of search related costs enables charterers only to gather more and better information about the availability of the vessels and not on price information, because the ability of charterers to gather instant information about prices is not expected. In the absence of instant price information, charterers are not able to compare the alternative shipowners and their heavy lift shipping services on product information and on price. The charterers' ability to compare more alternatives due to reduced search costs (without instant price quotes) is not expected to lead to a significant increase of price competition.

Even if all search related costs of the current charterers are reduced by a digital medium, this reduction of search costs is not expected to lead to a significant growth of quantity demanded in the commodity segment of the heavy lift shipping industry, because the PED in the freight market of the heavy lift shipping industry is very low, modelled by a very steep demand curve. The total disappearance of search related costs by the introduction of a marketplace is an illusion, meaning that the introduction of a marketplace does not lead to the significant growth of demand from the current charterers in the commodity segment of the heavy lift shipping industry.

If the level of accessibility of the commodity segment of the heavy lift shipping industry is driven by a digital medium, charterers that are currently active in other markets could be attracted to the commodity segment of the heavy lift shipping industry. Some manufacturers are examples of such charterers, as discussed in chapter 3. These manufacturers consider to deliver their products to their customers in disassembled condition or fully assembled condition, depending on the associated advantages and disadvantages. The transportation of the product as separated components that fit in standardized containers may be a cheaper option compared to the transportation of the product in assembled condition on a MPV or HLCV. Transportation of the product as separated components is associated with the costs and risks involved with the assembly of the components at the site of the customer. These costs and risks are in less extend involved with the transportation in fully assembled condition on a MPV or HLCV. In the case the customer site is a remote location or port without harbour facility such as cranes, the transportation of the product on a MPV or HLCV, which is equipped with cargo handling gear and is operated in a tramp service, might be of advantage over the transportation of the product on a container vessel that has no cargo handling gear and is operated in a liner service.

5.3.4 The Effects of a Reduction of Shipowners' Transaction Costs

The impact of the reduction of sellers' cost of search for buyer and cost of disseminating information about their products have been discussed in chapter 2. Sellers a worse off after the introduction of a marketplace that promotes price information, leading to increased competition. However, sellers can also benefit from the introduction of a marketplace if this reduces their costs of searching for prospective buyers and the cost of marketing their products. This section discusses the impact of a reduction of transaction costs incurred the sellers in the freight market of the heavy lift industry: the shipowners.

The exchange of information between shipowners and charterers is currently facilitated by email and phone contact directly or indirectly via brokers and forwarders. If search tools of a marketplace reduce the search cost that have to be incurred by shipowners in order to search for prospective clients, their search scope may be extended that enables shipowners to locate transportation demands that better fit their sailing schedule or stowage plans in order to increase their yield. If shipowners are able to improve the efficiency of sharing information about their availability on a marketplace, charterers would be able to locate the availability of shipowners that would not be located through email phone contact. If a digital medium provides charterers insight into the availability of shipowners, the charterers' ability to search for availability even reduces the need for shipowners to search for the transportation demands from charterers.

The shipowners in this industry frequently sail with idle cargo capacity, especially the of High-end Tramp Operators as discussed for Jumbo in chapter 4, meaning that there is potential to increase the utilization of these vessels when a medium is utilized to easily disseminate information about unused cargo space and at reduced costs relatively to

email circulations. A reduction of transaction costs for High-end Tramp Operators may increase their market access to the commodity segment and provide competition to the Low-end Operators, if they are enabled to locate charterers for their available cargo space or if charterers are enabled to locate their cargo space. The potential for these High-end Tramp Operators to increase their yield is not investigated, because a lack of data from the other High-end Tramp operators than Jumbo. A first estimate can be obtained, based on the estimate of the $ 1.5 million revenue that can potentially be gained by Jumbo if they increase their market access to the commodity segment, as discussed in chapter 4. The joint fleet of Jumbo, SAL, Biglift and Hansa counts 60 vessels. Assuming the same potential to increase the yield of these fleets as for Jumbo's fleet, the potential to increase the yield of the joint fleet is estimated at $ 11.3 million, which is only marginal to the total turnover of the commodity segment.

It is assumed that the size of the market is currently not known by shipowners, based on the fact that Jumbo has only little data about the size of the market, but only is able to provide the estimate as discussed in chapter 3. Shipowners can increase their insight into the market dynamics and size through a marketplace and improve their market intelligence by monitoring the revenue from different market segments and charterer types.

5.3.5 The Consequences for the Role of Brokers and Forwarders

The position of brokers and forwarders is threatened if marketplaces contribute to the coordination of transactions between charterers and shipowners at a higher efficiency than brokers and forwarders contribute to this coordination. The position of brokers and forwarders are only threatened when the transaction costs incurred by shipowners and charterers are lower in the case of dis-intermediation or cybermediation relatively to the case of (re-)intermediation. The current price paid for the services from brokers and forwarders in the commodity segment of the heavy lift shipping industry are estimated to be $ 37.5 million at a transaction cost percentage of 2.5 percent. These transaction costs to brokers in the special segment are estimated $ 25 million at percentage of 5.0 percent. Shipowners have the opportunity to bargain the market power of brokers and forwarders down by creating alternative sales channels, in the same way airlines have bypassed or integrated into the role of travel agents. Digital intermediaries that enter this market by deploying scalable intermediation services are expected to compete over the mentioned transaction costs of brokers and forwarders.

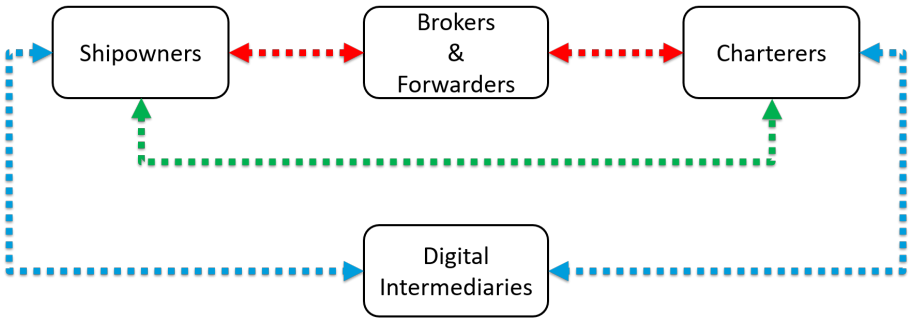


Figure 5.4: Three Scenario's of Intermediation in Heavy Lift Shipping

Figure 5.4 represent the scenarios for future intermediation in the heavy lift shipping industry. The search task of brokers and forwarders is obviously threatened, because shipowners and charterers have opportunities to locate each other directly through the internet. The technical expertise from brokers, that is required during the search for a vessel or a cargo, is not threatened by marketplaces, but the in-house agents of charterers and

shipowners may fulfill this function harnessed by the search tools that are incorporated in marketplaces. The providence of market information by brokers may be threatened, if information about market dynamics are provided on independent marketplaces. The trust that is arranged by brokers and forwarders might be threatened if a digital intermediary is able to establish a reputation system and able to attract a critical mass of users in a marketplace, or if shipowners can utilize their brands as a source of trust in marketplaces. Forwarders buy in and sell integrated end-to-end transportation services, including insurance, warehousing and customs clearance, which is challenging to realize in a marketplace. This would require the participation of other types of parties than only charterers and shipowners in a marketplace that would result in an ecosystem of various types of stakeholders in the industry. The possibilities of such an ecosystem facilitated on a digital platform are beyond the scope of this research and requires further research.

The future of intermediation in the commodity of the heavy lift shipping industry is not expected to be a pure scenario disintermediation, re-intermediation or cybermediation. A mix of marketplaces from shipowners, digital intermediaries and augmented services from brokers and forwarders is expected. The digital initiatives from the diverse market stakeholders are expected to influence the dominance of each of the scenarios for future intermediation in the commodity segment of the heavy lift shipping industry. The timing of the digital initiatives may be crucial for the eventual dominance over the coordination of the market.

5.3.6 Intermediate Conclusions

The effects of digital platforms in the heavy lift shipping industry have been discussed in this section. The effects of information links are expected in both the special segment and the commodity segment. Information links are expected to improve the information exchange and coordination in bi-lateral relations between shipowners, charterers, brokers and forwarders. The effects of marketplaces are expected in the commodity segment and to a lesser extent in the special segment. Marketplaces in the heavy lift shipping industry are expected to reduce costs for charterers and shipowners to gather information and for shipowners to disseminate information about the positions and availability of vessels. In addition, the role for brokers and forwarders in this industry may be threatened if shipowners and charterers get digital alternative for their intermediation services. The reduction of search costs for charterers is not expected to drive the increase of price competition significantly, because instant information about prices is not expected to be provided on a marketplace. The reduction of charterers' transaction costs is not expected to drive significant growth of demand from charterers in this industry, because the PED in this industry is near inelastic. The reduction of transaction costs of both charterers and shipowners through a marketplace may cause market exchanges to emerge in the commodity segment of the heavy lift shipping industry that would not have emerged in the current way of coordinating transactions through email and phone contact. Charterers that currently choose for transportation services from suppliers in other industries may be attracted to the heavy lift shipping industry. The High-end Tramp Operators might benefit from the reduction of transaction costs that may improve their market access to the commodity segment in order to increase their utilization, estimated at $ 11.3 million for the four major High-end Tramp Operators. The type of systems that are initiated and the type and number of participants may be driven or discouraged by the effects of digital platforms. The effects of digital platforms that have been discussed in this section can have strategic implications for shipowners, charterers, brokers, forwarders and digital entrants in the heavy lift shipping industry, as will be discussed in section 5.4.

5.4 The Strategic Implications of Digital Platforms in the Heavy Lift Shipping Industry

This section discusses strategic implications of digital platforms for the stakeholders in the heavy lift shipping industry by discussing the potential initiators and participants of information links and marketplaces in this industry. The strategic implications of digital platform are discussed in section 5.4.1 for shipowners, in section 5.4.2 for charterers, in section 5.4.3 for digital intermediaries and in section 5.4.4 for forwarders and brokers. Finally, section 5.4.5 provides the conclusions of this section.

5.4.1 Digital Initiatives from Shipowners

The potential initiatives from shipowners are discussed, first for information links and subsequently for marketplaces. Shipowners have the incentives to provide value adding services and information to their clients, in order to increase their comparative efficiency compared to other shipowners. The shipowners with the largest market share are assumed to be the parties to initiate these links, because these parties are expected to have the financial resources and the know how for the development of these links.

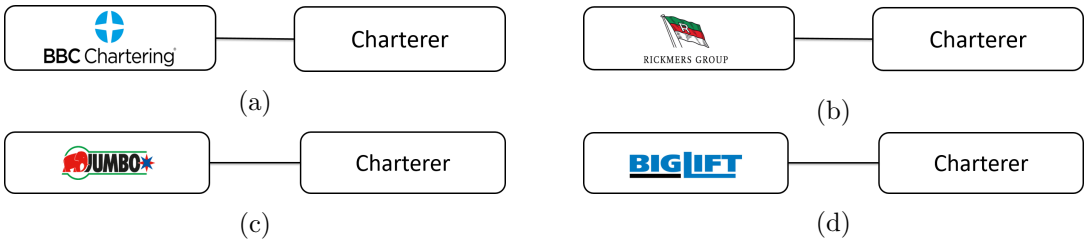


Figure 5.5: Potential Information Links initiated by Shipowners

Examples of potential initiators of information links are shown in 5.5. BBC and Rickmers Line are potential initiators of information links in the commodity segment, because these shipowners have to process information of a very large number of transactions with their customers, as main players in this market segment. Jumbo and Biglift are examples shipowners that can be considered as potential initiators of separate information links in the special segment, not because they have to process information of a very large number of transactions with their customers, but because value adding services may improve their customer service, for example the motion monitoring tools that can be incorporated in the information link.

The effects of marketplaces are partially in favour of shipowners and partially not in favour of shipowners. The effects of marketplaces that are aligned with the incentives of shipowners are: increase market access, to increase the utilization of the fleet and to reduce the dependence and expenses to the service from brokers and forwarders. The risk of sharing competitive information about positions and availability may discourage shipowners to establish marketplaces. If marketplaces are established by shipowners, these are not expected to include instant price discovery mechanisms for two reasons: 1) instant price discovery mechanisms are very difficult to be implemented as discussed in section 5.2 and 2) not including price discovery mechanisms in a marketplace prevents charterers from comparing alternatives on price. The marketplaces that are established by shipowners are expected to only include information about positions and availability of their tonnage. Not all shipowners in the heavy lift shipping industry are considered as a potential initiator of a marketplace. Only the shipowners that have a large market share (as a group) are expected to be capable of establishing a marketplace in the heavy lift shipping industry,

because of three reasons: 1) a marketplace is only effective if a significant amount of the supply side is offered and 2) shipowners with a large market share have a large customer base of charterers that may be attracted to the marketplace and 3) their reputation or brand can act as a source of trust.

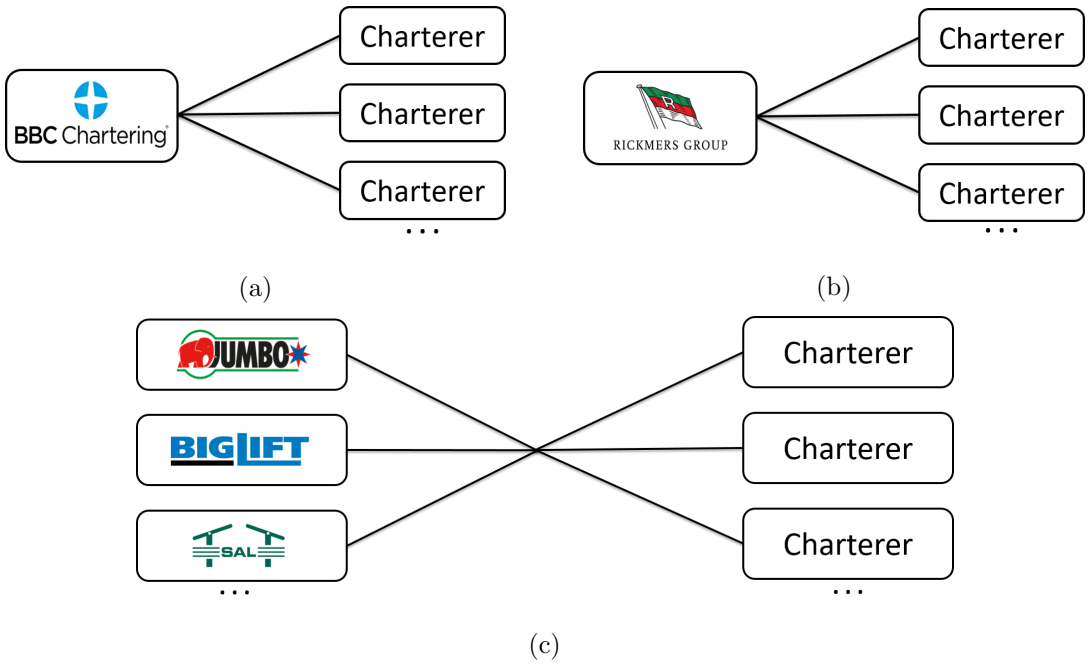


Figure 5.6: Potential Marketplaces initiated by Shipowners

Examples of shipowners as potential initiators of marketplaces are shown in figure 5.6. BBC and Rickmers-Line are potential initiators as shown in figure 5.6a and 5.6b, because these shipowners have a large market share in the commodity segment. The threshold for Rickmers-Line to disseminate information about their positions and availability on a marketplace because they operate a liner service and this information is currently already provided on their website [Rickmers-Line, 2018].

Despite marketplaces are only expected in the commodity segment, the High-end Tramp operators can be considered as potential initiators of a marketplace in the commodity segment, as shown in figure 5.6c. The High-end Tramp Operators may be willing to invest in a marketplace in order to increase their market access to the commodity segment. The High-end Tramp Operators could collude, because of the low number of shipowners in this category, and establish a marketplace that does not only focuses on vessel positions, but that focuses on effective promotion of idle cargo space. If the High-end Tramp Operators establish a marketplace that promotes the idle capacity of their joint fleets, they may be able to improve their market access to the commodity segment and provide competition to the Low-end Tramp and Liner Operators. For example, if Jumbo, Biglift, SAL and Hansa invest in a joint marketplace, they could list their joint fleet of 60 vessels on this marketplace, which may attract charterers to this marketplace, who's transportation demands coincide with the availability provided by the connected High-end Tramp Operators.

When shipowners invest in marketplaces and bypass the forwarders and brokers, these intermediaries could express their dissatisfaction by not approaching these shipowners anymore. Especially when a marketplace established by a shipowner fails, the shipowner may lose a significant source of inquiries for transportation services and revenue.

5.4.2 Digital Initiatives from Charterers

Charterers are assumed not being in the position to initiate information links and marketplaces, because charterers are involved in transactions in the heavy lift shipping industry at a lower frequency than shipowners brokers or forwarders. The demands of charterers for value adding services and information provided by their suppliers has not been investigated and requires further research.

Charterers have the incentive to reduce transaction costs in two ways: 1) the reduction of search costs enables them to increase the cost efficiency of their search process 2) the reduction of search costs allows charterers to search for a large number of alternatives of shipowners' services that may result in the selection of an alternative that better matches their needs. Charterers are better off by any marketplace that reduces their market transaction costs.

It is assumed that charterers do not have the sophistication and the financial resources if the charterer is only active in the heavy lift shipping industry on a sporadic basis. These charterers are expected to free-ride on the marketplaces that are initiated by shipowners, brokers, forwarders or digital intermediaries. Charterers that frequently need transportation of commodity cargoes in the heavy lift shipping industry may be potential initiators, in the same way as BHP Biliton has established an online reverse auction for their shipments in the dry bulk shipping industry [Chambers, 2017]. Further research is required to address the potential of charterers to initiate a marketplace in the heavy lift shipping industry.

5.4.3 Digital Initiatives from Digital Entrants

The incentives of a digital entrant in the heavy lift shipping industry is to earn from commission over transaction volumes, subscriptions or advertisement fees by deploying a marketplace that includes value adding processes supporting the market functions matching, facilitation of transactions and the institutional infrastructure at low marginal costs. The potential revenue that is earned by a digital intermediary has not been investigated, but the current $ 37.5 million estimate of transaction costs paid to brokers and forwarders in the commodity segment may limit the potential revenue to the digital intermediaries to or below this estimate of costs to intermediaries in the commodity segment.

Digital entrants may have the sophistication of developing and establishing the value adding processes of a marketplace that reduce the market friction for its participants. Search tools are expected to reduce search costs, because the search scope is large in this segment and the cargo, vessel, characteristics and contracts are not as complex as the contracts in the special segment. Price discovery is very difficult to be included in a marketplace of a digital intermediary. The shipowners are not expected to provide insight in their prices, because the ability of charterers to compare alternatives on price information and vessel characteristics may lead to increased price competition. Trust in the identity of counter-party can be realized by the digital intermediary, by limiting the entry of participants and by deployment of binary feedback systems. It is arguable whether the digital intermediaries have the sophistication to develop these value adding processes.

These value adding processes should have a distribution of payoffs that attracts both shipowners and charterers to the marketplace, that are both needed as providers of information input and users of information outputs in order to leverage network effects. This means that realizing value adding processes is not enough to attract a critical mass of users

to both sides of the marketplace. The digital intermediaries should also have the financial resources as well, in order to develop the marketplace and its value adding processes and in order to attract both sides of the market: the charterers and the shipowners.

The digital intermediary will have to promote the added value of their marketplace to both charterers and shipowners, by advertisement, by minimization of the barriers for participation or by even subsidizing participants to join the marketplace. After a critical mass has been attracted to the marketplace to leverage (positive) network effects, the digital entrant might not need to subsidize the participation of charterers and brokers anymore.

Digital intermediaries in the heavy lift shipping industry have to build globally in contrary to successful digital intermediaries in consumer markets, that have been able to build a mass locally and test their systems in a small scale, for example Uber and Airbnb both only covered San Fransisco in the early stage of the development of these marketplaces. The dis-ability of digital intermediaries in the heavy lift shipping industry to test their systems locally, limits the probability of developing a successful marketplace.

Even if the digital intermediary is able to generate a critical mass of users and to leverage network effects, the scenario of the gaining extreme monopolistic intermediary power, as discussed in chapter 2, is not expected. The intermediation services of brokers and forwarders provide an alternative to the intermediation services of the digital intermediary. In the case a digital intermediary in the heavy lift shipping industry increases their commission over transactions to a level, e.g. 15 percent, that is higher than the fees that are asked by brokers and forwarders, e.g. 5 percent, the shipowners and charterers will choose for the intermediation services of the brokers and forwarders. The probability of the threat of an extremely powerful intermediary is very low, but this threat to shipowners as suppliers and brokers and forwarders as intermediaries should not be excluded.

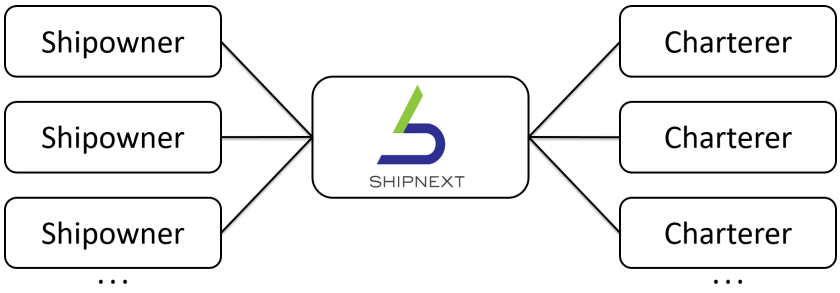


Figure 5.7: Example of a Marketplace initiated by a Digital Intermediary

Shipnext is an example of a digital intermediary that is currently entering the heavy lift shipping industry. The marketplace of Shipnext already involves the value adding processes as discussed in section 5.2, for example searching, auctioning and feedback systems. Shipnext has minimized the friction to entry of their marketplace for participants by offering free trial for a month, after which participants have to pay a monthly subscription of $ 250 [Shipnext, 2018]. Information about the size of the investment and current number of participants of Shipnext's marketplace is not available. It is arguable whether Shipnext is going to achieve to attract a critical mass and to establish the technology as promised. Only if they succeed to do so, Shipnext has potential to be a marketplace that competes to the services of brokers and forwarders in the commodity segment of the heavy lift shipping industry.

5.4.4 Digital Initiatives from Brokers and Forwarders

The incentives of forwarders and brokers are to differentiate themselves as intermediaries in the heavy lift shipping industry, to sustain competitive advantage over other intermediaries, may them be forwarders, brokers or digital intermediaries. The current intermediaries, especially the forwarders, may invest in information technology in order to re-intermediate themselves and to defend their role against the threats from shipowners that may try to dis-intermediate and new cyber-mediaries such as Shipnext. Several logistics start-ups are already threatening the role of forwarders in the container shipping industry [Knowler, 2018] and even the role of forwarders in the breakbulk logistics sector may be threatened [Strevens, 2017]

(a) (b)

Figure 5.8: Information Links potentially initiated by a Forwarder

Kuehne + Nagel, DHL, Bluewater Shipping and Deugro are currently among the dominant forwarders in the commodity segment of the heavy lift shipping industry, as discussed in chapter 3. Potential initiators among brokers and forwarders are not addressed, because of a lack of information about the digital initiatives from these parties. Kuehne + Nagel created a Joint Venture in 2018 with an investment company in order to invest in logistics start-ups and to drive their digital transformation as a forwarder [Kuehne + Nagel, 2018b]. The same forwarder established a digital platform in 2018 that provides their customers (shippers) the ability to compare availability and quotes from multiple alternatives suppliers for their transportation [Kuehne + Nagel, 2018a]. It has not been investigated whether these digital initiatives would apply to the heavy lift shipping industry. At least these digital initiatives from Kuehne + Nagel indicate that this forwarder aims to re-intermediate itself, by either establishing information links to suppliers and customers, as shown in figure 5.8 or by establishing a digital platform that involves both suppliers and customers as shown in figure 5.9.

Figure 5.9: Example of a Marketplace potentially initiated by a Forwarder

5.4.5 Intermediate Conclusions

Shipowners may initiate marketplaces in order to bypass brokers and forwarder or to improve their market access. Charterers are not expected (provisionally) to initiate such systems, because they lack the clout to induce the participation of shipowners and are usually not active as frequently in this industry as shipowners. Digital intermediaries are expected to initiate marketplaces and the first of such marketplaces have already been established. It may be challenging for these digital intermediaries to attract a critical mass of both shipowners and charterers as participants. The intermediaries in the heavy lift shipping industry are expected to re-intermediate themselves, in order to defend their position. Especially the dominant forwarders in the commodity segment are in the powerful position to express their dissatisfaction about the initiatives from shipowners by not approaching these shipowners anymore, known as the channel conflict. The long term impact of digital platforms on the heavy lift shipping industry is very difficult to address, because this impact will depend on the joint actions and timing of actions of industry stakeholders that have joint and opposite incentives. The uncertainty about the effects of digital initiatives creates hesitation among the players in the heavy lift shipping industry.

5.5 Conclusions

The impact of digital platforms on the heavy lift shipping industry has been discussed by the application of the framework that has been developed in chapter 2. The impact turns out to be different in the special segment and the commodity segment, because the characteristics of these market segments are different.

Information links are expected to be effective in both market segments of the heavy lift shipping industry as media to improve the exchange of information in bi-lateral relations between shipowner, charterers and forwarders. Shipowners are potential initiators of information links, as an investment in improved information exchange and improved coordination with their clients. Forwarders are potential initiators of information links as an investment in improved information exchange and improved coordination with their suppliers and customers in order to differentiate themselves as intermediaries and to defend their position against (potential) digital initiatives from shipowners, charterers or digital entrants.

Marketplaces are expected to be effective in the commodity segment of the heavy lift shipping industry, because the supply and demand side of this segment are fragmented and the coordination of transactions in this segment are much less complex compared to the special segment. The introduction of marketplaces in the special segment should not be excluded, but the complexity of the transportation demands and the small search scope in this market segment may limit the effects of marketplaces in the special segment. The introduction of marketplaces are expected to reduce search related costs but will not lead to extreme price competition, because instant price discovery mechanisms are provisionally not expected, which prevents charterers from comparing alternatives on price. The quantity demanded from the current charterers in the heavy lift shipping industry is not expected to grow significantly if the search related costs of these charterers are reduced, because the PED is extremely low in this industry. However, the attraction of companies that currently purchase transportation services from suppliers in alternative shipping industries may be driven by the digital media that reduce market friction in the commodity segment of the heavy lift shipping industry. The High-end Tramp Operators may benefit from the increased allocative efficiency that drives their market access to the commodity segment, providing more competition to the Low-end Tramp Operators and Low-end Liner Operators, which is only marginal based on the estimated revenue gain of $ 11.3 million by the High-end Tramp Operators from the commodity segment.

Shipowners may invest in marketplaces to improve their market access and to reduce the power of brokers and forwarders over their distribution channels. Digital intermediaries are expected to develop and establish digital mechanism that reduce search costs for shipowners and charterers to locate each other, however they will be challenged to develop digital mechanisms that realize trust and to attract a critical mass of users. The probability of the threat to shipowners of a dominant platform from an intermediary in the heavy lift shipping industry is low. Forwarders are expected to re-intermediate themselves by investing in digital technology as augmented services.

The types, value adding processes, effects and strategic implications of digital platforms that are expected in the special segment and commodity segment will, together with Jumbo's position in this space, be used in chapter 6 to address the meaning of digital platforms to Jumbo.

Chapter 6

The Meaning of Digital Platforms in the Heavy Lift Shipping Industry for Jumbo: Opportunities and Threats

The goal of this chapter is to address the meaning of digital platforms to Jumbo in terms of opportunities and threats, based on the effects of digital platforms to two distinctive market segments and Jumbo's position in this space. The opportunities and threats of digital platforms to Jumbo are addressed for the special segment and the commodity segment separately, because information links are expected to be effective in the special segment and the commodity segment and marketplace are expected to be more effective in the commodity segment than in the special segment. In addition to the impact of digital platforms, Jumbo's position and market power are different in the special and the commodity segment.

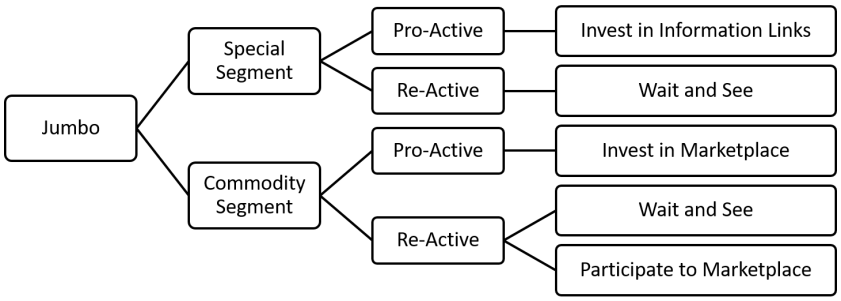


Figure 6.1: Potential Approaches by Jumbo in two Market Segments

The meaning of digital platforms to Jumbo depends on Jumbo's approach to the by digital platforms affected market space of the heavy lift shipping industry. A pro-active approach by Jumbo means establishing a digital platform that can be either an information link or a marketplace. A re-active approach by Jumbo means doing nothing or only participating to marketplaces that are initiated by other parties. An overview of the potential approaches by Jumbo is shown in figure 6.1. First, the opportunities and risks of information links to Jumbo in the special segment are discussed in section 6.1. Subsequently, the opportunities and risks of marketplaces to Jumbo in the commodity segment are discussed in section 6.2. Finally, the meaning of digital platforms to Jumbo is concluded in section 6.3.

6.1 Information Links in the Special Segment

Information links are expected to improve the coordination in bi-lateral relations in the special segment and the commodity segment, as discussed in chapter 5. The opportunities and risks involved with a pro-active approach are discussed in section 6.1.1. The opportunities and risks involved with a re-active approach are discussed in section 6.1.2. Finally, the opportunities and risks of information links for Jumbo are concluded in section 6.1.3.

6.1.1 A Pro-Active Approach to Information Links

A pro-active approach to information links by Jumbo means that they would invest in a system that enhances the exchange of information and the coordination with their customers, associated with two opportunities and risks as indicated in table 6.1.

Table 6.1: A Pro-Active Approach to Information Links

Opportunities	**Risks**

• Improve Customer Service
• Replace Routine Tasks
  • *Save Time*
  • *Reduce # Errors*
	• Risk of Investment
	• Copying from Jumbo
	  • *Success*
	  • *Failure*

By establishing information links, Jumbo can provide value adding services and information to their customers. These services could be delivered through a client portal that includes contract and operational documentation, progress of a shipment or project, monitoring of the conditions or the motions of the cargo, weather conditions, invoices and evaluations. These digital services could drive the attraction and retention of customers to Jumbo in the special segment of the heavy lift shipping industry. Technip FMC is an example of a recurrent client of Jumbo in the special segment that may be interested in the extra information and services that can be provided through a client portal. The desires of Jumbo's client have not been investigated and require further research, for example by completing a questionnaire among Jumbo's most recurrent clients.

If information is shared through a client portal, less labour time may be spent to the communication with clients and the distribution of documents compared to the current media of communication through email and phone contact. This can be viewed as a substitution effect, because the information links serve as a substitute for the labour that is currently needed for the communication with clients. The reduction of labour time that is spent on the communication with clients can also be seen as an income effect, because the costs of coordination with clients can be reduced by (partially) communicating with clients through information links. In addition, the time saved by the automation of routine communication with clients may drive the attention level to non-routine tasks. Next to time saving, the number of errors that is made can be reduced, for example during the communication of progress updates, that can be directly coupled to the sailing schedule, without a person that sends an email that may contain human errors. The number of errors and the type of errors have not been investigated and require further research, for example by completing a questionnaire among Jumbo's employees.

The investment of Jumbo in information links is not without risk, because the investment required for the development of information links is a sunk cost, which cannot be recovered when the system is not used or when the system does not lead to the attraction of

more customers to Jumbo. The required investment depends on the type of system that is implemented and the value adding services and information that are included. Large investment may be required for the development and the hardware of a client portal. Investment in a client portal may even require the development of a more sophisticated sailing schedule, that is currently maintained in Excel.

Even if Jumbo succeeds to establish information links to their customers, competitors can easily imitate these systems and invest in similar information links at low cost compared to Jumbo because these competitors would be able to piggyback on Jumbo's investment for the development of information links. Otherwise, when Jumbo's investment in information links does not result in the attraction of more customers, competitors can learn from the failure of Jumbo's information links. This risk can also be an opportunity for Jumbo, as will be discussed in section 6.1.2.

6.1.2 A Re-active Approach to Information Links

Jumbo can choose not to invest in information links, but to continue their current way of communicating with their customer through phone and email contact. The opportunity and risk associated with this approach are shown in table 6.2.

Table 6.2: A Re-active Approach to Information Links

Opportunities	**Risks**

• Copying from Competitors
  • *Success*
  • *Failure*
	• Become Obsolete

If Jumbo adopts this approach, they don't face the risk of investment and have the opportunity to learn from the successes and failures of digital initiatives from competitors, if any competitor invests in information links. Imitation of a system of a competitor can be seen as an opportunity, if this results in a cost effective way of developing and establishing information links, or even superior information links compared to those of the competitor.

If Jumbo adopts a re-active approach in the special segment, following a wait and see strategy in this segment, they face the risk of becoming obsolete if competitors are able to improve their customer service by establishing information links and may (temporary) have an advantage over Jumbo when competing for contracts in the special segment.

6.1.3 Intermediate Conclusions

The opportunities and risks involved with a pro-active and re-active approach to information links by Jumbo in the special segment are involved with a set of opportunities and risks, which have been discussed in this section. A pro-active approach provides the opportunity to replace routine tasks and to improve customer service by investing in an information link, associated with the risk of investment or copying from Jumbo. A re-active approach provides Jumbo to steal from the successes and failures from other parties, while facing the risk to become obsolete. The opportunities and risks have not been assessed yet on probability and impact, because the implementation of the approach by Jumbo would influence the probability and impact of the opportunities and risks associated with Jumbo's approach.

6.2 Marketplaces in the Commodity Segment

Information links and marketplaces are both expected in the commodity segment as concluded in chapter 5, but the focus of this section is on the meaning of marketplaces to Jumbo. The meaning of information links have already been discussed in section 6.1 for the special segment and the same applications of information links are assumed to be applicable in the commodity segment. The opportunities and risks involved with a pro-active approach to marketplaces by Jumbo is discussed in section 6.2.1. The opportunities and risks involved with a re-active approach to marketplaces by Jumbo is discussed in section 6.2.2. Finally, the conclusions of the opportunities and risks of marketplaces for Jumbo are concluded in section 6.2.3.

6.2.1 A Pro-Active Approach to Marketplaces

A pro-active approach by Jumbo to marketplaces means that Jumbo, or a coalition of Jumbo and other shipowners, would invest in a marketplace. The opportunities and risks associated with this approach are shown in table 6.3.

Table 6.3: A Pro-active Approach to Marketplaces

Opportunities	**Risks**

• Improve Market Access
  • *Searching for Cargoes*
  • *Sharing Availability*
  • *Increase the Yield*
  • *Reduce Dependence on Intermediaries*
	• Risk of Investment
	• Channel Conflicts
	• Exposure of Sensitive Information
	• Copying from Jumbo
	  • *Success*
	  • *Failure*

Investment in a marketplace provides Jumbo the opportunity to increase their market access to the commodity segment. The marketplace can serve as a medium to search for profitable spot cargoes and to improve the dissemination of information about the positions and availability of their fleet. If Jumbo would be able to increase their market access to the commodity segment by investing in a marketplace, they may be able to increase the yield of Jumbo's fleet and to reduce their dependence and expenses to brokers and forwarders in the commodity segment. The potential of increasing the yield of Jumbo's fleet has already been discussed in chapter 4. Jumbo's yearly revenue may be improved by $ 1.5 million if they establish a marketplace that provides them the required market access. Jumbo's current yearly expenses to intermediaries are $ 1.0 million and are not expected to be eliminated completely if Jumbo would establish a working marketplace. If demand grows for the transportation of cargoes in the special segment, access to the commodity segment, that may be driven by a marketplace, becomes less important for Jumbo to increase their market access to the commodity segment.

Establishing a marketplace in the commodity segment is not without risk, whether this investment is made by Jumbo or a coalition of Jumbo and other parties. The capital investment required to develop and establish a marketplace is a sunk cost. If Jumbo is not able to attract charterers to the marketplace and keep approaching Jumbo through email and phone contact, the sunk cost cannot be recovered anymore. This has been the case with the investment in the Jumbo Position List as well, the main reasons being 1) that Jumbo can only offer 10 vessels on this system 2) the system is only convenient for

inquiries from the commodity segment for which Jumbo's tonnage is not fit. The probability of failure of the marketplace can be reduced by establishing a marketplace as coalition with other shipowners, to be able to list the positions and availability of a large number of vessels.

Establishing a marketplace that excludes brokers and forwarders from Jumbo's transactions with charterers is associated with the risk of channel conflicts. The brokers and forwarders could express their dissatisfaction by choosing not to approach Jumbo (and the other shipowners) anymore as a supplier. If the marketplace is not fully rolled out successfully at once or even fails, forwarders and brokers may not approach Jumbo anymore for their transportation services. If the pro-active approach by Jumbo to marketplaces eventually leads to channel conflicts, the attempt to increase their market access to the commodity segment may even result in a decrease of market access.

If Jumbo exposes their positions and availability of their fleet with the purpose to reach potential charterers and to locate transportation demands from the commodity segment, this information can be used by shipowners from the category of High-end Tramp Operators. For example, information about the future positions of the K-class vessels can be utilized by direct competitors such as Biglift or SAL while bidding on contracts from the special segment for which Jumbo could be qualified. However, this risk may not be significant as nowadays websites do already provide AIS information, for example Marinetraffic.com.

Competing shipowners can imitate the marketplace of Jumbo, if Jumbo's marketplace is proven to be successful. Other shipowners can also learn lessons from failures of a marketplace, the same way as with information links. Investing in a marketplace as a coalition of shipowners may reduce this risk, because the joint marketplace is not as easily imitated by competing shipowners. Another possibility is that a digital intermediary copies the data from the by Jumbo established marketplace and incorporates the data from Jumbo's marketplace to a wider marketplace, as has been for airlines that prepared the marketplace of Skyscanner, as discussed in chapter 2.

6.2.2 A Re-Active Approach to Marketplaces

Jumbo can choose for a re-active approach in the commodity segment, by following a wait and see strategy or by the participation to marketplaces from third parties. This re-active approach makes the meaning of marketplaces to Jumbo fully dependent on the initiatives of other shipowners, forwarders, brokers, digital intermediaries or even charterers. The opportunities and risks are shown in table 6.4.

Table 6.4: A Re-Active Approach to Marketplaces

Opportunities	**Risks**

• Improve Market Access
  • *Searching for Cargoes*
  • *Sharing Availability*
  • *Increase the Yield*
• Copying from Competitors
  • *Success*
  • *Failure*
	• Exposure of Sensitive Information
	• Dependence on Dominant Intermediary

If a digital intermediary succeeds to build a critical mass of charterers and shipowners on a marketplace, Jumbo can start to participate to this marketplace by sharing information about the positions and availability on the marketplace and by searching for profitable commodity cargoes on the spot market, which may help Jumbo to increase their yield.

In the case other shipowners invest in marketplaces, Jumbo can learn from the failed and successful initiatives, in the same way as it has been discussed for the information links. Another opportunity is learning from the successful or failed participation of other shipowners to marketplaces from third parties.

The risk involved with the participation to marketplaces from third parties is the exposure of sensitive information that may be exploited by competitors, in the same way as for the risk of exposure of information in the case of a pro-active approach to marketplace. Even without participation to a marketplace, information that might be sensitive is exposed to marketplaces from third parties. Information Jumbo's tonnage has been exposed by Shipnext, as can be found in figure D.4 in Annex D.

If brokers, forwarders or digital intermediaries increase their power in the commodity segment, the risk of a re-active approach can be the increased dependence on these parties as a distribution channel. The probability is low that a dominant marketplace arises that charges extremely high commission percentages, because there are so many alternatives for intermediation provided by brokers and forwarders. However, the impact may be severe if a (digital) intermediary succeeds to take control over the market, as Jumbo's revenue from the commodity segment was nearly half of their total revenue in 2016.

6.2.3 Intermediate Conclusions

The opportunities and risks involved with a pro-active and re-active approach of marketplaces by Jumbo in the commodity segment have been addressed in this chapter. A pro-active approach allows Jumbo to improve their market access and to reduce their dependence on brokers and forwarders. The risk of investment, channel conflicts, exposure of information and copying by competitors may discourage Jumbo to adopt a pro-active approach. When Jumbo adopts a re-active approach by following a wait and see strategy, Jumbo may learn from successful or failed initiatives from other parties. Jumbo can also choose to participate to marketplaces from third parties, in order to increase their market access, but this is associated with the risk of exposing sensitive information or the risk of becoming dependent on a dominant intermediary. The opportunities and risks have not been assessed yet on probability and impact, because the formulation of this approach may influence this assessment.

6.3 Conclusions

The opportunities and risks have been addressed for a pro-active and a re-active approach by Jumbo to information links in the special segment and marketplaces in the commodity segment. The probability and impact of these opportunities and risks can not be assessed yet, because the formulation of strategic options for these approaches may affect the probability and impact of the opportunities and risks for Jumbo. By a strategic option is meant the implementation of the approach. A strategic option for each of the four potential approaches has to be formulated first, because every approach can be implemented in various ways. After the strategic options are formulated in chapter 7, the opportunities and risks of each strategic option will be assessed.

Chapter 7

The Formulation and Assessment of Strategic Options and a Strategic Advice for Jumbo

The goal of this chapter is providing a strategic advice for Jumbo by the formulation and assessment of strategic options for Jumbo's approach to digital platforms in the heavy lift shipping industry. The strengths and weaknesses as addressed in chapter 4 and the opportunities and risks addressed in chapter 6 are the inputs of the SWOT analyses that are performed in this chapter in order to generate strategic options. The probability and impact of the opportunities and risks of the strategic options are assessed. For both the special segment and the commodity segment, either a pro-active or a re-active approach is proposed, based on the opportunity and risk assessment of these strategic options.

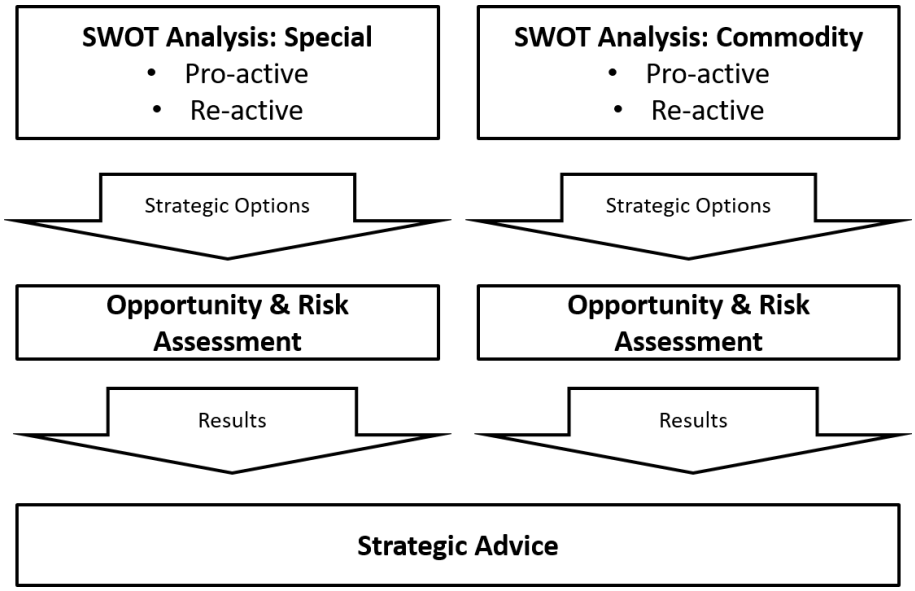


Figure 7.1: The Development of a Digital Strategy for Jumbo

Figure 7.1 presents the structure of this chapter. The methods for the formulation and assessment of strategic options are discussed in section 7.1. The strategic options for the special segment are formulated and assessed in 7.2. The strategic options for the commodity segment are formulated and assessed in 7.3. Finally, a strategic advice is provided to Jumbo in section 7.4.

7.1 The Formulation and Assessment of Strategic Options

This section discusses the method for the formulation and assessment of strategic options. The SWOT analysis as a method to formulate strategic options is discussed in section 7.1.1. The opportunity and risk assessment of the strategic options is discussed in section 7.1.2. Finally, the conclusions about these methods are provided in section 7.1.3.

7.1.1 The Formulation of Strategic Options

A SWOT analysis is proposed as a tool that is used to formulate strategic options for Jumbo. The strategic options are formulated for a pro-active approach and a re-approach by performing a SWOT analysis, resulting in two strategic options for two market segments. According to Chaffey, a SWOT analysis is a powerful tool that can help organizations analyze their internal resources and match them against the external environment [Chaffey, 2011]. A SWOT analysis suits this research, because the development of a digital strategy for Jumbo has to cover both their internal resources and external environment. The internal resources of Jumbo have been addressed in chapter 4, by addressing the strengths and weaknesses of Jumbo's strategy and business procedures, distinguished in the special and the commodity segment. The external environment of Jumbo includes the opportunities and risks for Jumbo that are associated with their approach in the special segment and the commodity segment from chapter 6. The strengths, weaknesses, opportunities and risks serve as inputs of the SWOT analysis. The SWOT format that has been used to formulate the strategic options can be found in Annex E.1. A separate SWOT analysis is performed for the pro-active and a re-active approach in the special segment and the commodity segment, resulting in four strategic options. The formulation of strategic options have been carried out with utmost care in agreement with the Chief Financial Officer (CFO) of Jumbo.

7.1.2 The Opportunity and Risk Assessment of Strategic Options

The probability and impact of the opportunities and risks associated with the strategic options are assessed, making use of the opportunity and risk matrices in Annex E.2. The probability and impact of the opportunities and risks of each strategic option are rated from 1 to 5 in order to determine the rate of opportunities and risks. The sum of the ratings of risks is subtracted from the sum of the ratings of opportunities in order to obtain a score for each strategic option. The assessment in this study can be viewed as a first estimate, because a more accurate opportunity and risk assessment could be realized if the opportunities and risks are quantified. The opportunity and risk assessment of the strategic options have been carried out in consultation with the CFO of Jumbo.

7.1.3 Intermediate Conclusions

The methods that have been discussed in this section provide room for interpretation, but have been carried out in consultation with Jumbo. The interpretation of these methods will be discussed in section 7.2 and section 7.3 to formulate and assess strategic options for Jumbo for both market segments.

7.2 Strategic Options for Jumbo in the Special Segment

This section discusses the formulation and assessment of strategic options for the special segment. The formulation and assessment of a strategic option for a pro-active approach by Jumbo is discussed in section 7.2.1 and for a re-active approach in section 7.2.2. Section 7.2.3 provides the conclusions from the formulation and assessment of the strategic options in the special segment.

7.2.1 A Pro-active Approach to Information Links

The SWOT format for a pro-active approach by Jumbo in the special segment is shown in table 7.1. Establishing a client portal for both Jumbo Shipping and Jumbo Offshore is proposed as a strategic option for this approach, that facilitates the exchange of information with customers. The formulation of this strategic option is discussed, referring to table 7.1.

Table 7.1: SWOT Analysis: Pro-active Approach in the Special Segment

		Strengths	Weaknesses

		• **Reputation: Quality & Safety**
		• **Diversification: Shipping + Offshore**
		• **Joint Venture Jumbo + Biglift**
		• **Level of Attention to Projects**
			• **Low Flexibility**
			  • Small Fleet
			  • Manual Schedule
			• **Routine Communication With Clients through Email and Phone Contact**

Opportunities	• **Improve Customer Service**
	• **Replace Routine Tasks**
	  • Save Time
	  • Reduce # Errors
		• **Establishing a Client Portal for Shipping and Offshore to Maximize**
		  • **Customer Service**
		  • **Replacement of Routine Tasks**
			• **Reduce Routine Communication**
			  • **Time Spent on Routine Tasks**
			  • **# Errors**

Threats	• **Risk of Investment**
	• **Copying from Jumbo**
	  • Success
	  • Failure
		• **Start with a Client Portal for Shipping or Offshore only to Minimize the Risk of Investment**
		• **Establish a Client Portal for Both Shipping and Offshore in order to Minimize the Risk of Copying**
			• **Develop Sophisticated Sailing Schedule**

The impact of the opportunity to improve the customer service is maximized if Jumbo would establish information links to customers of Jumbo Shipping and Jumbo Offshore, because Jumbo may attract more clients in both of their branches by providing value adding services and information to their clients. By establishing a client portal, Jumbo can provide a coherent set of personal and digital customer service to their clients.

The routine tasks associated with the communication with clients may be replaced (partially) by the information links to these clients. The time that is spent by Operations to routine tasks such as progress updates, or by Commerce Shipping to the evaluation with clients can be reduced if these tasks are (partially) replaced by the client portal.

The impact of the risk of investment may be reduced if information links are established to customers from Jumbo Shipping and Jumbo Offshore, because these links can first be developed for either Jumbo Offshore or Jumbo Shipping only and later to both branches of Jumbo. The lessons learned during the development and the implementation of the system for one of the branches (for example Shipping) can be utilized during the development and implementation of the system for the other branch of Jumbo.

The probability of the risk that competitors copy Jumbo's client portal may be minimized if Jumbo establishes this client portal to customers of both Jumbo Shipping and Offshore. The unique combination of information links to both branches may inhibit competitors from copying ideas from Jumbo's client portal. However, Jumbo's competitor SAL also has both a shipping and offshore branch and may copy or learn from Jumbo's initiatives.

Before a client portal can be established, the replacement of the current sailing schedule may be necessary. For example, the current sailing schedule in Excel does not allow the coupling of schedule information to automatic progress or status update to clients and or project stakeholders, but requires an employee to fulfill this task of providing updates. The development of a modern sailing schedule may increase the impact of the risk of investment.

Table 7.2: Opportunity & Risk Assessment of the Client Portal

Client Portal Shipping + Offshore			
Opportunity	Probability	Impact	Score
Improve Customer Service	3	3	9
Replace Routine Tasks	3	1	3
Risk	Probability	Impact	Score
Risk of Investment	1	3	3
Copying from Jumbo	2	1	1
Total			**8**

The assessment of the opportunities and risks associated with establishing a client portal for customers of Jumbo Shipping and Jumbo Offshore are shown in table 7.2. The sum of opportunities and risks is positive for the proposed strategic option for a pro-active approach to information links in the special segment. Some scenarios are discussed that may influence the opportunities and risks of this strategic option.

If the client portal is established successfully for Jumbo Shipping, it can be extended to Jumbo Offshore as well. If the client portal is not established successfully, Jumbo can choose to further develop the system, which would lead to an increase of the impact of the risk of investment. They can also quit developing this system, which maximizes the probability of the risk of investment but limits the impact.

If Jumbo's competitors copy Jumbo's client portal, Jumbo can start to differentiate their own client portal by further development, increasing the impact of the risk of investment and increasing the probability and impact of improving their customer service over competitors (temporary). Jumbo can also choose to stop developing new features for their client portal in order to reduce the risk of copying.

7.2.2 A Re-active Approach to Information Links

The SWOT format for a re-active approach by Jumbo in the special segment is shown in table 7.3. A re-active approach by Jumbo to information links in the special segment leaves no other strategic option than wait and see attitude.

Table 7.3: SWOT Analysis: Re-active Approach in the Special Segment

		Strengths	Weaknesses

		• **Reputation: Quality & Safety**
		• **Diversification: Shipping + Offshore**
		• **Joint Venture Jumbo + Biglift**
		• **Level of Attention to Projects**
			• **Low Flexibility**
			  • Small Fleet
			  • Manual Schedule
			• **Routine Communication With Clients through Email and Phone Contact**

Opportunities	• **Copying from Competitors**
	  • Success
	  • Failure		

Threats	• **Become Obsolete**		

The SWOT format can not be applied for a re-active approach by Jumbo in the special segment, because the opportunity and risk involved with this approach can not be influenced by Jumbo's internal environment. In other words, Jumbo is fully dependent on the actions of other parties when they adopt a re-active approach.

Table 7.4: Opportunity & Risk Assessment of the Wait and See Attitude

Wait and See			
Opportunity	Probability	Impact	Score
Copying from Competitors	2	1	2
Risk	Probability	Impact	Score
Become Obsolete	1	3	3
Total			**-1**

The assessment of the opportunity and risk associated with adoption of a wait and see attitude are shown in table 7.4. The result from the opportunity and risk analysis is negative for the re-active approach in the special segment, which may discourage Jumbo to adopt this approach for Jumbo. Some scenarios are discussed that may influence the opportunities and risks involved with the wait and see approach.

If competitors succeed to establish information links to customers, Jumbo can copy these systems for relatively low costs, minimizing the impact and probability of the risk of investment in these systems (which is a risk of the pro-active approach to information links). The impact of the risk of becoming obsolete depends on the timing and the quality of the initiatives of competitors and Jumbo. For example, if SAL succeeds to establish a client portal to increase their customer service, they may have an advantage over Jumbo when competing for a contract to which SAL and Jumbo are qualified. Jumbo may be at disadvantage until Jumbo succeeds to establish a client portal of the same or better quality.

The duration of the advantage of the competitor that improves their customers service through a client portal and the difference in customer service may influence impact of the risk to Jumbo of becoming obsolete.

If Jumbo's competitors establish a client portal that fails, Jumbo can either learn from their failure by sticking to a wait and see strategy. Jumbo can also learn from the conditions for success and failure, based on the initiatives from competitors. If Jumbo chooses for a pro-active approach of information links based on the lessons learned from competitors, the probability of the risk of investment may be reduced.

7.2.3 Intermediate Conclusions

Two strategic options have been formulated for the special segment, distinguished in a pro-active approach and a re-active approach. Establishing a client portal for Jumbo Shipping and Offshore is proposed as strategic option for the re-active approach and a wait and see approach for the re-active approach of information links. Based on the opportunity and risk analysis of both strategic options, the client portal for Jumbo Shipping and Offshore is proposed as the option for the special segment that will contribute the most to profit maximization for Jumbo. However, the risk of investment may discourage Jumbo, because they are going through challenging times and are generating a small operating loss. Establishing a client portal first for Jumbo Shipping and subsequently for Jumbo Offshore may reduce the impact of the risk of investment. A wait and see strategy may be an alternative, until a competitor in the special segment establishes a client portal, that can be copied by Jumbo in order to reduce the impact of the risk of investment and to learn from failures and successes of the initiatives from competitors.

7.3 Strategic Options for Jumbo in the Commodity Segment

This section discusses the formulation and assessment of strategic options for the commodity segment. The formulation and assessment of a strategic option for a pro-active approach by Jumbo is discussed in section 7.3.1 and for a re-active approach in section 7.3.2. Section 7.3.3 provides the conclusions from the formulation and assessment of the strategic options in the special segment.

7.3.1 A Pro-active Approach to Marketplaces

The SWOT format for a pro-active approach by Jumbo in the commodity segment is shown in table 7.5. Establishing a joint booking portal together with BBC is proposed as the strategic option for a pro-active approach in the commodity segment. The formulation of this strategic option is discussed, referring to table 7.5.

Table 7.5: SWOT Analysis: Pro-Active Approach in the Commodity Segment

		Strengths	**Weaknesses**

		• **Reputation: Quality & Safety**
		• **Alliance Jumbo + BBC Chartering**
			• **Low Flexibility**
			  • Small Fleet
			  • Manually Scheduling in Excel
			• **Routine Communication With Clients through Email and Phone Contact**
			• **Lack of Market Access**
			  • Inefficient Handling Inquiries
			  • Sharing Positions + Availability
			  • Dependence on Intermediaries

Opportunities	• **Improve Market Access**
	  • Searching for Cargoes
	  • Sharing Availability
	  • Increase Yield
	  • Reduce Dependence on Intermediaries
		• **Cooperate with BBC to Maximize Market Access**	• **Establish Booking Portal to Gain Market Access**

Threats	• **Risk of Investment**
	• **Exposure of Sensitive Information**
	• **Channel Conflicts**
	• **Copying from Jumbo**
	  • Success
	  • Failure
		• **Cooperate with BBC to Minimize the Risk of:**
		  • Investment
		  • Channel Conflicts
		  • Copying
			• **Develop Sophisticated Sailing Schedule**

Jumbo and BBC are assumed to be willing to cooperate in order to establish this system, because they are already in an alliance. In addition, BBC is a main player in the comodity segment, which suggests that the opportunity to increase Jumbo's market access to the commodity segment is maximized by cooperation with BBC. A joint booking portal with other High-end Tramp Operators that emphasizes on the promotion of unused cargo space would be an alternative to a the joint booking portal with BBC. However, the level of rivalry among Jumbo, Biglift, SAL and Hansa is expected to inhibit cooperation among these parties. Jumbo and Biglift may be willing to invest in a joint booking portal, because they already have been working in a Joint Venture. However, the joint fleet of Jumbo and Biglift only counts 25 vessels, which suggests that they would lack the clout to attract charterers from the commodity segment to their joint system.

The low level of flexibility due to Jumbo's small fleet of only 10 vessels can be countered by a joint booking portal with BBC if this system allows to remove the friction of interchanging cargoes from the commodity segment between Jumbo and BBC. Jumbo's weaknesses that prevent them from market access to the commodity segment can be countered by the opportunity of increased market access if they invest in a joint booking portal. Moreover, their dependence on forwarders and brokers as a channel for market access may be reduced if the booking portal is rolled out successfully.

The investment that is required for the development of a booking portal can be shared if a joint booking portal with BBC is possible, which may reduce the impact of the risk of investment. The probability of the risk of investment due to a failed system is minimized in this collaboration, as the joint fleet of 180 vessels can be listed on this system, which makes the system more valuable for charterers that have to search for a vessel for the transportation of their cargo, reducing the probability of the risk of investment. However, the impact of the risk of investment may be large by the large investment required to develop a joint system that has to be connected to the organization of both parties, which is expected to be complicated.

When Jumbo and BBC together establish a booking portal, the channel conflict could be minimized if the system is established successfully at once. If the system fails, the impact of the risk of channel conflicts with brokers and forwarders could be large, because near half of Jumbo's revenue is currently obtained from the commodity segment. The probability of the risk of channel conflicts may be limited by the cooperation with BBC, because brokers and forwarders are assumed dependent on BBC as a key supplier. The probability of the risk that other shipowners copy the booking portal is minimized if Jumbo and BBC establish a joint booking portal, because they as a coalition can establish a unique system.

Establishing a booking portal, whether in cooperation with other shipowners or not, requires the development of a modern sailing schedule in order to automatically connect the positions and availability of Jumbo's vessels to the booking portal, in order to provide charterers insight into positions and availability.

Table 7.6: Opportunity & Risk Assessment of the Joint Booking Portal

Joint Booking Portal with BBC			
Opportunity	Probability	Impact	Score
Increase the Yield	3	3	9
Reduce Dependence On Interm.	2	1	2
Risk	Probability	Impact	Score
Risk of Investment	2	3	6
Channel Conflicts	2	3	6
Exposure of Sensitive Information	1	2	2
Copying from Jumbo	1	1	1
Total			**-4**

The assessment of the opportunity and risk associated with joint booking portal are shown in table 7.6. The sum of the assessed opportunity and risk turns out to be negative, which may discourage Jumbo to adopt this approach. Especially the risk of channel conflict is high, if Jumbo and BBC would establish joint booking portal that does not immediately work or attracts charterers. Several scenarios are considered that may influence the opportunities and risks involved with establishing a booking portal.

A scenario may be that BBC is unwilling to cooperate with Jumbo to establish a booking portal. In this case, Jumbo could approach other High-end Tramp Operators to establish a joint booking portal that lists their joint fleets. If collaboration among these shipowners is not possible, Jumbo would have to establish a system on their own and this would lead to a very high probability and reduced impact of the risk of investment.

If Jumbo and BBC do not succeed to attract charterers to their booking portal, they have the option to subsidize the participation of charterers to their system, which would increase the impact of the risk of investment, but may be decreasing the probability of this risk if subsidized charterers are attracted to the booking portal.

7.3.2 A Re-active Approach to Marketplaces

The SWOT format for a re-active approach by Jumbo in the commodity segment is shown in table 7.7. Participation and refraining from participation to marketplaces from third parties are two possible strategic options for a re-active approach in the commodity segment. The formulation of these strategic options is discussed, referring to table 7.7.

Table 7.7: SWOT Analysis: Re-Active Approach in the Commodity Segment

		Strengths	**Weaknesses**

		• **Reputation: Quality & Safety**
		• **Alliance Jumbo + BBC Chartering**
			• **Low Flexibility**
			  • Small Fleet
			  • Manually Scheduling in Excel
			• **Routine Communication With Clients through Email and Phone Contact**
			• **Lack of Market Access**
			  • Inefficient Handling inquiries
			  • Sharing Positions + Availability
			  • Dependence on Intermediaries

Opportunities	• **Increase Market Access by Participation to Marketplaces**
	  • Searching for Cargoes
	  • Sharing Availability
	  • Increase Yield
	• **Copying from Competitors**
	  • Success
	  • Failure
		• **Utilize Jumbo's Reputation as a Source of Trust on Marketplace to Maximize Market Access**	• **Flexible Market Access to Commodity Segment by Participation to Marketplace**

Threats	• **Exposure of Sensitive Information**
	• **Dependence on Dominant Intermediary**
		• **Refrain from Participation and Rely on the Alliance with BBC in order to Minimize the Risk of**
		  • **Exposure of Sensitive Information**
		  • **Dependence on Dominant Intermediary**	

If Jumbo would participate to a marketplace from a third party such as Shipnext, they could improve their market access to the commodity segment at low cost. The cost of participation would only be the fee that has to be paid to the owner of the system. Jumbo's strong reputation may help Jumbo to be viewed by charterers on such marketplace as a trustworthy counter-party.

If Jumbo is able to search for more transportation demands that would fill the gaps of the sailing schedule, to find more spot cargoes through these media, the utilization and

revenue can be improved. By participation to a marketplace, Jumbo could counter their weakness of small fleet, because this would enable them to sublet fixed cargoes that do not fit their schedule. In addition, Jumbo can flexibly start and quit participating to these marketplaces. However, the dissemination of information about Jumbo's positions and availability may not be as effective as it would be the case for a pro-active approach to marketplaces in the commodity segment. By participating to marketplaces, Jumbo can only disseminate this information in the way the owner of this marketplace orchestrates the sharing of positions and availability. The digital intermediaries are expected to only provide positions of a vessel that is 'open' for new inquiries and not expected to provide the opportunity to share specific information about available cargo space in the hold or on deck during voyages.

The risk associated with the participation to marketplace of third parties may be minimized by Jumbo's alliance with BBC. This means that if Jumbo notices that sensitive information is exploited by other parties or if the digital intermediary is becoming powerful, they can stop participating and rely on the alliance with BBC in order to gain market access to the commodity segment.

Table 7.8: Opportunity & Risk Assessment of Participation

Participation to Third Party Marketplace(s)			
Opportunity	Probability	Impact	Score
Improve Market Access	2	3	6
Copying from Competitors	1	1	1
Risk	Probability	Impact	Score
Exposure of Sensitive Information	2	2	4
Dependence on Dominant Interm.	1	3	3
Total			**0**

The assessment of the opportunity and risk associated with participation to marketplaces from third parties are shown in table 7.8. The opportunities involved with this approach to marketplaces in the commodity segment may cancel out the risks. However, the development of the demand in the heavy lift shipping industry may influence the opportunities and risks involved with a re-active approach to marketplaces.

If demand for transportation in the special segment increases, which may be driven by the oil price or the rise of renewable energy, Jumbo's dependence on the commodity segment as a source of revenue decreases. This means that the impact of the opportunity to improve their market access to the commodity segment is reduced. However, another possibility is the shift of the distinction of the special and the commodity segment. Information from Jumbo suggests a trend of the rise of the weight of commodity cargoes, which would increase Jumbo's dependence on the commodity segment as a source of revenue. In this case, the impact of the opportunity to gain market access is increased.

7.3.3 Intermediate Conclusions

Two strategic options have been developed for the commodity segment, distinguished in a strategic option for a pro-active approach and two strategic options for a re-active approach. Establishing a joint booking portal with BBC is proposed as strategic option for the pro-active approach to marketplaces in the commodity segment. A wait and see strategy and participation to marketplaces from third parties are proposed as strategic options for a re-active approach to marketplaces in the commodity segment. From the assessments of the opportunities and risks that are associated with the strategic options in the commodity segment can be concluded that it may be wise for Jumbo to choose for a re-active approach by participation to marketplaces initiated by third parties in this market segment instead of establishing a marketplace. Jumbo may not be in the position to establish their booking portal, because at this moment they can only list 10 of their vessels on their system. By cooperating with BBC, they may maximize the probability of the opportunity associated with establishing a booking portal and minimize the risk of investment. However, the opportunity of improved market access does not outweigh the risks involved with this option. Especially the channel conflict is the most extreme risk associated with a pro-active approach by Jumbo in the commodity segment. A re-active approach by Jumbo to marketplaces in the commodity segment involves only the risk of exposure of information and dominance of a digital intermediary. By only participating to a marketplace, Jumbo has the flexibility to stop participation immediately without the sunk costs of investment in a marketplace. If demand in the special segment grows, Jumbo would becomes less dependent on the commodity segment as a source of revenue and the opportunity of gaining market access to the commodity segment would not outweigh the risk of exposure of sensitive information that may result in losing high value contracts from the special segment.

7.4 Strategic Advice to Jumbo

The aim of this chapter is to provide a strategic advice to Jumbo, based on the formulation and assessment of strategic options for the possible approaches by Jumbo to information links in the special segment and to marketplaces in the commodity segment. Even though the opportunities and risks have not been quantitatively assessed by the opportunity and risk assessment, a first estimate of the degree of opportunities and risks associated with the strategic options is provided.

The proposed strategic option in the special segment for Jumbo is to establish client portal for Jumbo Shipping and if this client portal drives the attraction or retention of customers in the special segment due to the the improved customer service, the client portal can also be established for Jumbo Offshore. A wait and see approach in the special segment is not recommended because Jumbo may be at disadvantage when competing for contracts with competitors in the special segment that may invest in information links to improve their customer service and to attract and retain more customers.

The proposed strategic option for the commodity segment is to participate to marketplaces that are established by other parties as a tool to gain market access to the commodity segment at low cost. The yearly revenue that is gained by the improved market access may be in the range of the estimate of $ 1.5 million that has been determined in chapter 4. If the demand from the charterers in the special segment grows and reduces Jumbo's dependence on the commodity segment as a source of revenue, Jumbo can easily stop participating to marketplaces from third parties in order to minimize the risk of exposure of sensitive information that may be exploited by competitors in the special segment. The opportunities for Jumbo involved with establishing a joint booking portal with BBC or a coalition of High-end Tramp Operators do not justify the risk of investment and the risk of channel conflict. In addition, establishing a booking portal does not provide the flexibility of starting and stopping participation at any time.

Chapter 8

Conclusions & Recommendations

This chapter contains the conclusions and recommendations of this research. First, the conclusions of this research are provided in section 8.1. Secondly, the recommendations for further research are discussed in section 8.2.

8.1 Conclusions

The main objective of this research is to contribute to profit maximization for Jumbo, by the development and the assessment of a digital strategy for Jumbo, to seize the new opportunities and to defend their position against the new threats driven by digital platforms in the heavy lift shipping industry. In order to achieve the main objective, first, a framework has been developed to address the impact of digital platforms on the heavy lift shipping industry. The characteristics of the heavy lift shipping industry have been addressed that are determinant for the impact of digital platforms. The current strategy, business procedures and performance of Jumbo have been analyzed in order to address the strengths and weaknesses of Jumbo. The impact of digital platforms on the heavy lift shipping industry has been analyzed by the application of the framework to the characteristics of the heavy lift shipping industry. The opportunities and threats of digital platforms to Jumbo have been defined, based on Jumbo's position in the by digital platforms affected market space. Finally, a strategic advice has been provided to Jumbo, after the formulation and assessment of strategic options.

The framework has provided insight into the impact of digital platforms in industrial competition and enables a structured analysis of the impact of digital platforms on the heavy lift shipping industry. The digital platforms in this industry facilitate and improve the exchange of information and improve the coordination in vertical market settings, which can be information links in bi-lateral settings or marketplaces in multi-lateral settings. The determinant characteristics for the analysis of the impact of digital platforms on the heavy lift shipping industry are the level of fragmentation, differentiation and strategic conduct of the supply side, the level of fragmentation and heterogeneity and behaviour of the demand side, the nature of market coordination and the market role and power of intermediaries. The types, value adding processes, effects and strategic implications of digital platforms can be analyzed by the comparison of the framework to the determinant characteristics of the heavy lift shipping industry.

The market analysis has improved the insight into industrial competition in the heavy lift shipping industry and has demonstrated a clear distinction in two market segments. The special segment is typed as an oligopoly and the supply side of this segment consists of 8 High-end Tramp Operators including Jumbo, that operate a differentiated fleet of 71 ves-

sels. These shipowners serve the highly complex transportation demands of charterers that have to transport their project cargoes with a weight exceeding 500 tons. The commodity segment is typed as monopolistic competition and the supply side of this segment consists of dozens of Low-end Tramp Operators and Low-end Liner Operators that achieve competitive advantage by providing low cost services through economies of scale and scope. These shipowners serve the less complex transportation demands of charterers that have to transport their breakbulk cargoes with a weight of less than 500 tons. The turnover is estimated at $ 0.5 billion in the special segment and $ 1.5 billion in the commodity segment. The demand side is fragmented and consists of charterers that are characterized by heterogeneity. The price elasticity of demand is inelastic in this industry, because of a lack of a cheaper alternative transportation mode for breakbulk and project cargo. The market transactions between shipowners and charterers are coordinated by the exchange of information through email, phone and personal contact. The services from brokers and forwarders account for $ 25 million of transaction costs in the special segment and $ 37.5 million in the commodity segment.

The company analysis of Jumbo has addressed the strengths and weaknesses of Jumbo and provided insight into the utilization of their fleet during the year 2016. The vessels of Jumbo are positioned for the contracts they fix from the special segment and Jumbo tries to maximize the utilization of their fleet by fixing contracts from the commodity segment. The current market conditions have caused Jumbo's profits to decrease and caused their dependence on the commodity segment as a source of revenue to increase. Jumbo's market access to the commodity is limited, because their tonnage is not fit to compete in this market segment. The analysis of the voyages of Jumbo's fleet during 2016 has revealed that Jumbo's fleet sailed 29 percent of the distance and 33 percent of the days in motion without cargo on board during 2016. The analysis of the stowage plans of voyages in Q3 and Q4 of 2016 has demonstrated that 50 percent of the cargo carrying capacity of Jumbo's fleet is unused. The findings of the analyses of the voyages of Jumbo's fleet in 2016 suggest a potential to increase the yield of the fleet if Jumbo gains more market access to the commodity segment. The potential annual revenue that can be generated by Jumbo's fleet from the utilization of 22 free days a year is estimated at $ 1.5 million and the potential annual result is estimated at $ 0.6 million.

This research has provided a first analysis of the impact of digital platforms on the heavy lift shipping industry, which turns out to be different in the special segment and the commodity segment. Information links are expected in both market segments as an investment in the improved exchange of information and coordination in bi-lateral relations of shipowners, charterers and intermediaries. Marketplaces are especially expected in the commodity segment, because the supply side and the demand side of this market segment are both fragmented and the transactions in this segment are less complex compared to the transactions in the special segment. The most significant effect of marketplaces is the reduction of search costs for charterers to locate the availability of shipowners and for shipowners to locate the transportation demands from charterers. The introduction of marketplaces in this industry is not expected to drive price competition significantly, because instant information about prices is provisionally not provided to charterers through a marketplace. The reduction of transaction costs caused by marketplaces is not expected to increase the quantity demanded from the current charterers, because the price elasticity of demand is near inelastic in this industry. Charterers that currently choose for alternative transportation modes may be attracted to the heavy lift shipping industry by the introduction of marketplaces. The High-end Tramp Operators may benefit from improved market access to the commodity segment to increase the utilization of their fleets and

shipowners may reduce their dependence on brokers and forwarders, whose market role and power may be threatened. The impact of digital platforms in the heavy lift shipping industry is associated with strategic implications for ship owners, charterers and (digital) intermediaries, whose actions will influence the actual impact. The scenario of a dominant digital intermediary is not expected, because of the presence of competition from alternative channels for market coordination.

This research has clearly formulated the opportunities and risks of digital platforms to Jumbo, based on their approach to information links in the special segment and to marketplaces in the commodity segment. The probability and impact of the unique set of opportunities and risks of each approach is influenced by the implementation of each approach. Based on the SWOT analyses that resulted in strategic options and the opportunity and risk assessment of these strategic options, a pro-active approach is proposed for the special segment and a re-active approach is proposed for the commodity segment. This research advises Jumbo to develop and establish a client portal for Jumbo Shipping and subsequently for Jumbo Offshore, in order to drive the attraction and retention of customers from the special segment and to reduce the risk of investment. The wait and see approach to the special segment requires no capital investment, but the risk of becoming obsolete is not in line with the goal of profit maximization for Jumbo. This research advises Jumbo to participate to marketplaces from third parties to increase their market access to the commodity segment in order to increase the yield of their fleet. The advantage of participation to marketplaces is the flexibility to start or stop participating to marketplaces for low costs, which allows Jumbo to respond to changing market conditions in the special segment that increase or decrease their dependence on the commodity segment. Jumbo could also establish a booking portal in order to control the orchestration of their market access to the commodity segment, but the opportunities associated to this strategic option do not justify the risks of investment and channel conflict, even if Jumbo would initiate a booking portal with BBC in order to reduce these risks.

The main objective of this research has been achieved, because a well substantiated advice has been provided to Jumbo for their approach to digital platforms in order to contribute to profit maximization, based on the formulation and assessment of strategic options in the special segment and the commodity segment of the heavy lift shipping industry.

8.2 Recommendations

The market analysis has only covered the market segment of the heavy lift shipping industry that contains tonnage fitted with a minimum crane capability of 250 tons. The supply side of the market segment that includes tonnage fitted with cranes with a lower crane capability than 250 tons is even more fragmented, suggesting that the search functions of marketplaces are more effective in this market segment. The impact of digital platforms on this market segment, but also the impact of digital platforms on other shipping markets are an open area for further research.

The number of days in motion, the sailed distance and the stowage plans of Jumbo's fleet have been analyzed to address the potential to increase the yield of Jumbo's fleet. Further research is required to determine the yield of Jumbo's fleet that should be aimed for. The freight volumes on global ocean trade routes of breakbulk and project cargo should be investigated in order to determine the quantity of freight that could be shipped by Jumbo, the marginal revenue and the marginal cost for Jumbo of shipping these cargoes.

The opportunities and risks of digital platforms have only been analyzed from Jumbo's point of view. If the opportunities and risks are analyzed from the perspective of other market stakeholders such as other shipowners, charterers, forwarders, brokers and digital entrants, a more complete analysis of the impact of digital platforms on the heavy lift shipping industry could be realized.

The opportunities and risks associated with the four strategic options of Jumbo have been assessed qualitatively. These opportunities and risks would be more accurate if these opportunities and risks are quantified. The costs of development of the client portal should be investigated in order to quantify the risk of investment.

The features and the implementation of the client portal that is proposed as a strategic option for Jumbo requires further research. A questionnaire could be sent to Jumbo's customers to address their desires for value adding services and information that have to be included in the client portal. A questionnaire could be sent to Jumbo's employees to address the most time-consuming routine tasks that can be automated.

Appendix A

Jumbo Maritime

A.1 The Historic Fleet of Jumbo

Table A.1: The Historic and Current Fleet of Jumbo

Vessel	Class	Crane Capability [t]	In service since	Status
Stellaprima	-	12	1956	Out of service
Stellanova*	A	55-70	1968	Out of service
Daniella	A	55	1969	Out of service
Fairlift	A	55	1969	Out of service
Gabriella	B	320	1974	Out of service
Fairload	B	320	1974	Out of service
Mirabella	C	600	1977	Out of service
Fairlane	C	600	1974	Out of service
Jumbo Challenger	D	1000	1983	Out of service
Fairmast	D	1000	1983	Out of service
Daniella**	E	500-650	1989	Out of Service
Fairlift**	E	500-650	1990	Currently employed
Stellaprima	E	650	1990	Currently employed
Jumbo Callisto***	N/A	70	1990	Out of service
Jumbo Spirit	G	500	1994	Out of service
Fairload	G	500	1994	Out of service
Stellanova	G	500	1995	Out of service
Jumbo Vision	H	800	2000	Currently employed
Fairlane	H	800	2000	Currently employed
Jumbo Javeling	J	1800	2004	Currently employed
Fairpartner	J	1800	2004	Currently employed
Fairplayer	J	1800	2008	Currently employed
Jumbo Jubilee	J	1800	2008	Currently employed
Jumbo Kinetic	K	3000	2015	Currently employed
Fairmaster	K	3000	2015	Currently employed

* The lifting capability the Stellanova has been upgraded from 55 to 70 tons

** One of the 250 tons cranes has been upgraded to a 400 tons crane

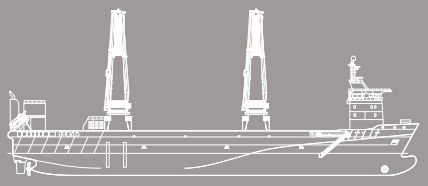
*** No class is known, because this vessel had been bought in 1990

A.2 The Current Fleet of Jumbo

K3000
3000 TONS LIFT CAPACITY

DEADWEIGHT:	14,000T
HOLD CAPACITY:	21,000M³
FREE DECKSPACE:	3,250M²
CRANES:	2 X 1,500T CRANES - IN COMBI 3,000T
SPEED:	17.0 KNOTS
LENGTH O.A.:	152.60M
BEAM O.A. (HULL):	27.40M
ICE CLASS:	1A FS
DRAFT:	8.1M

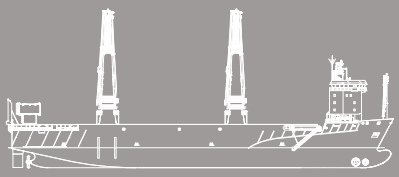
HLV JUMBO KINETIC
HLV FAIRMASTER



J1800
1800 TONS LIFT CAPACITY

DEADWEIGHT:	13,278T
HOLD CAPACITY:	19,800M³
FREE DECKSPACE:	3,100M²
CRANES:	2 X 900T CRANES - IN COMBI 1,800T
SPEED:	17.0 KNOTS
LENGTH O.A.:	144.41M
BEAM O.A. (HULL):	26.70M
DRAFT:	8.1M / 7.5M IN OPEN CONDITION

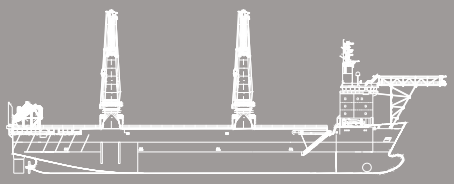
JUMBO JAVELIN (FITTED WITH DP2 & DDS)
HLV FAIRPARTNER
HLV JUMBO JUBILEE



J1800
1800 TONS LIFT CAPACITY

LENGTH:	144.1M
BEAM:	26.7M
DEPTH:	14.1M
ACCOMMODATION:	80 POB
HELIDECK:	SIKORSKY S-92
SPEED:	17 KNOTS
CRANES:	2 X 900T CRANES - IN COMBI 1,800T
DEPTH RATING:	3,000M

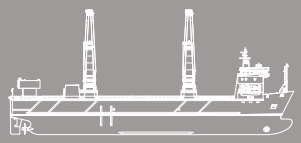
FAIRPLAYER (FITTED WITH DP2 & DDS)



H800
800 TONS LIFT CAPACITY

DEADWEIGHT:	7,051T
HOLD CAPACITY:	9,500M³
FREE DECKSPACE:	1,500M²
CRANES:	2 X 400T CRANES - IN COMBI 800T
SPEED:	15.5 KNOTS
LENGTH O.A.:	110.49M
BEAM O.A. (HULL):	20.85M
DRAFT:	7.72M

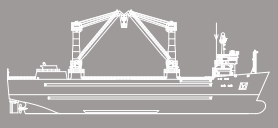
HLV JUMBO VISION
HLV FAIRLANE



E650
650 TONS LIFT CAPACITY

DEADWEIGHT:	7,580T
HOLD CAPACITY:	10,902M³
FREE DECKSPACE:	1,375M²
CRANES:	1 X 250T CRANE / 1 X 400T CRANE - IN COMBI 650T
SPEED:	13.5 KNOTS
LENGTH O.A.:	100.78M
BEAM O.A. (HULL):	20.98M
DRAFT:	7.42M

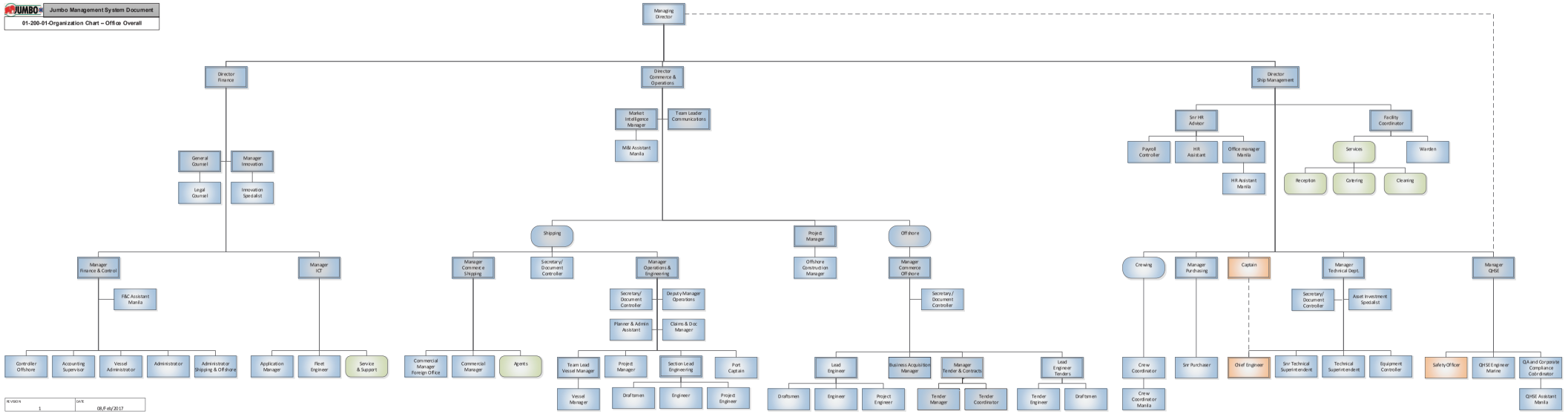
HLV STELLAPRIMA
HLV FAIRLIFT



A.3 Jumbo's Organization of Office Employees

Jumbo Management System Document

01-200-01-Organization Chart – Office Overall



REVISION	DATE
1	08/Feb/2017

Appendix B

Market Analysis: The Heavy Lift Fleet

B.1 Fleet Characteristics Operators

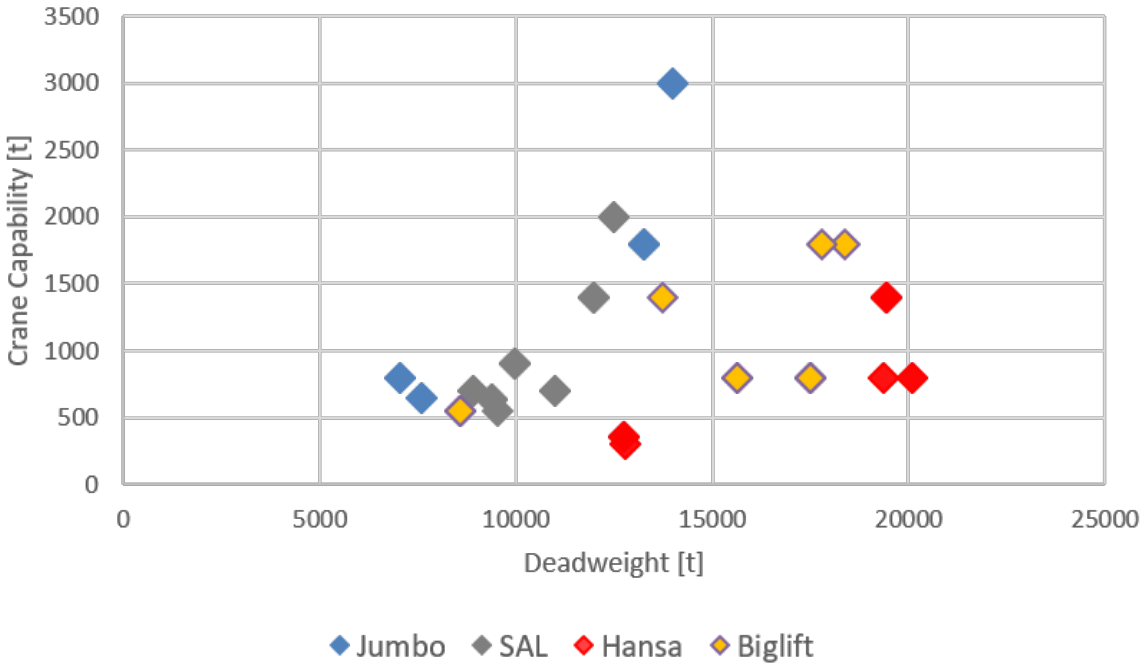


Figure B.1: High-end Tramp Operators

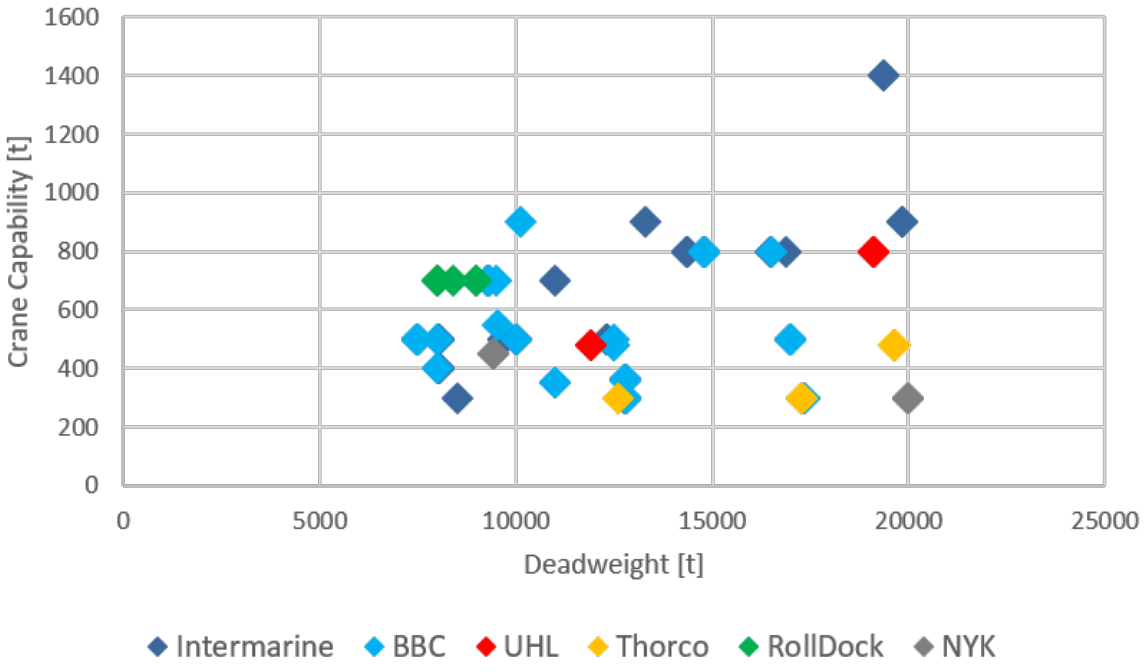


Figure B.2: Low-end Tramp Operators

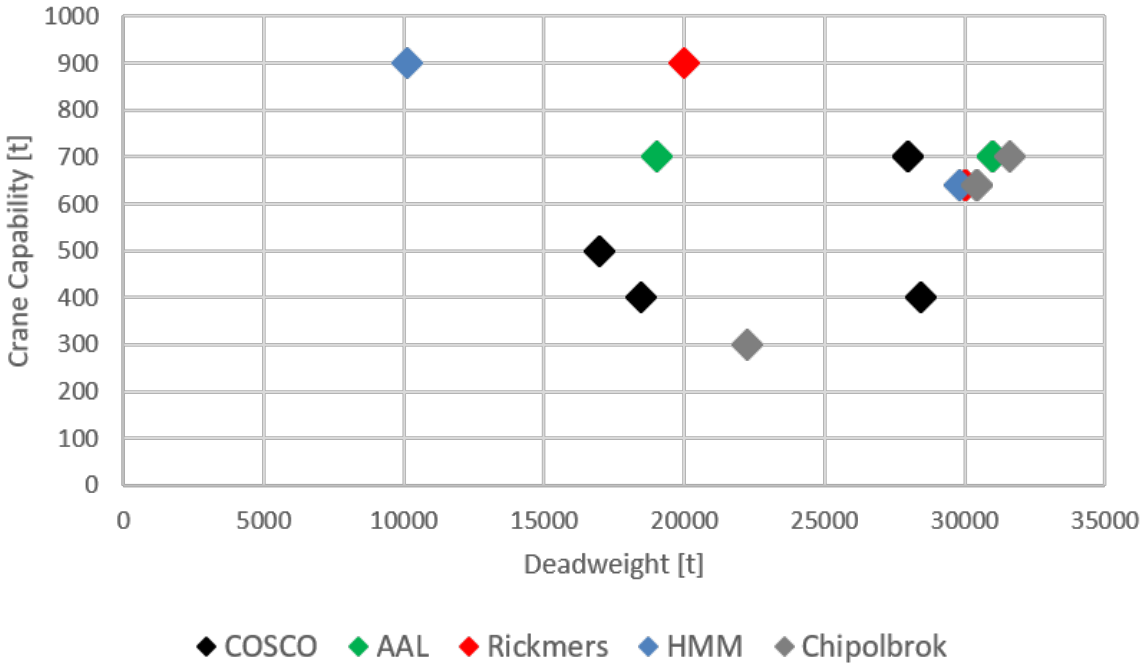


Figure B.3: Low-end Liner Operators

B.2 The Scenarios for Expansion of Jumbo's Fleet

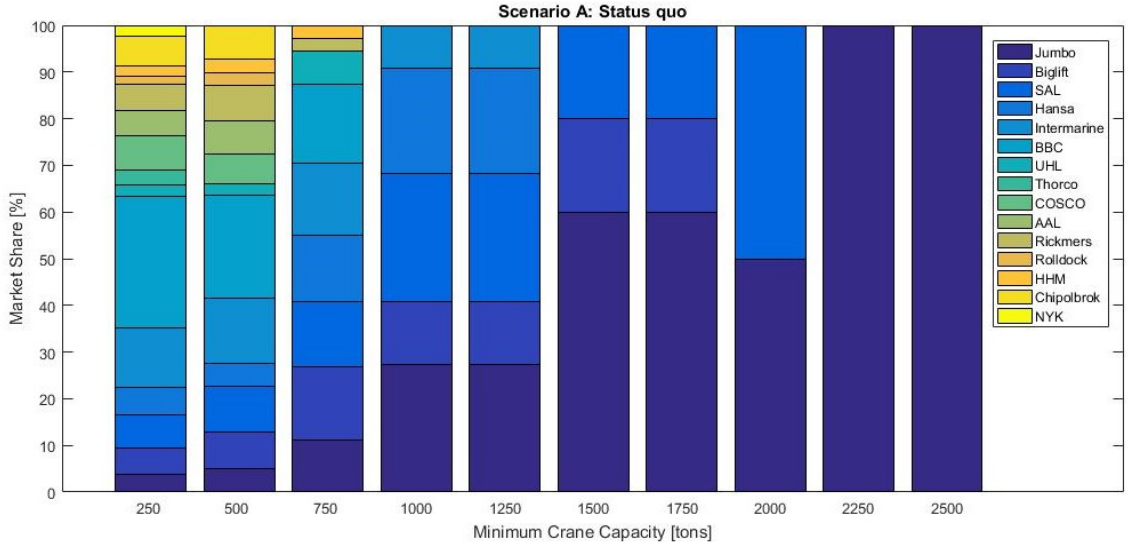


Figure B.4: Scenario A: Status quo

B.2.1 Newbuilding of Vessels

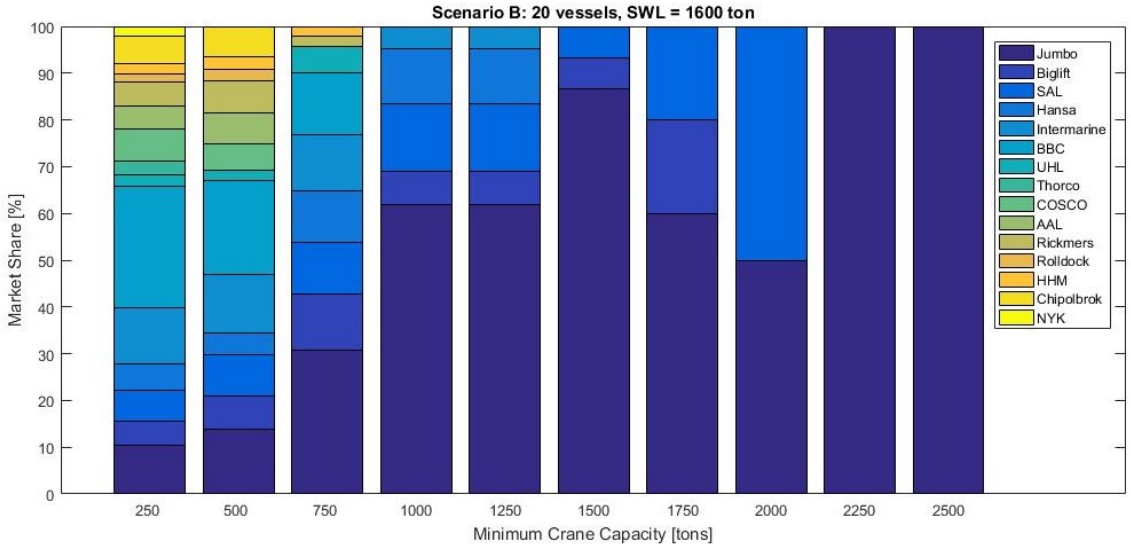


Figure B.5: Scenario B: Newbuilding 20 vessels, 1600 tonnes

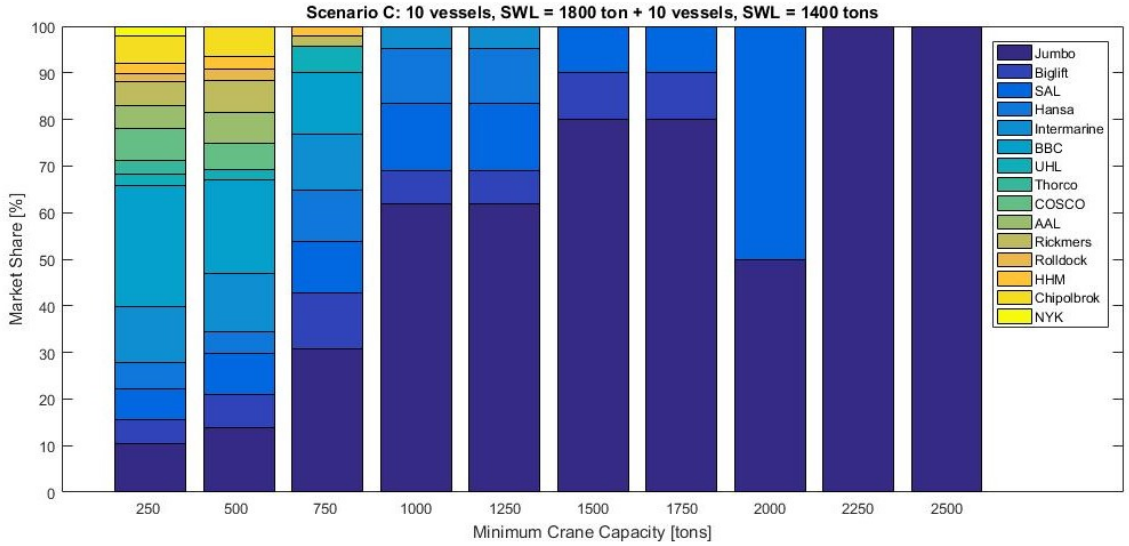


Figure B.6: Scenario C: Newbuilding 10 vessels, 1800 tonnes + 10 vessels, 1400 tonnes

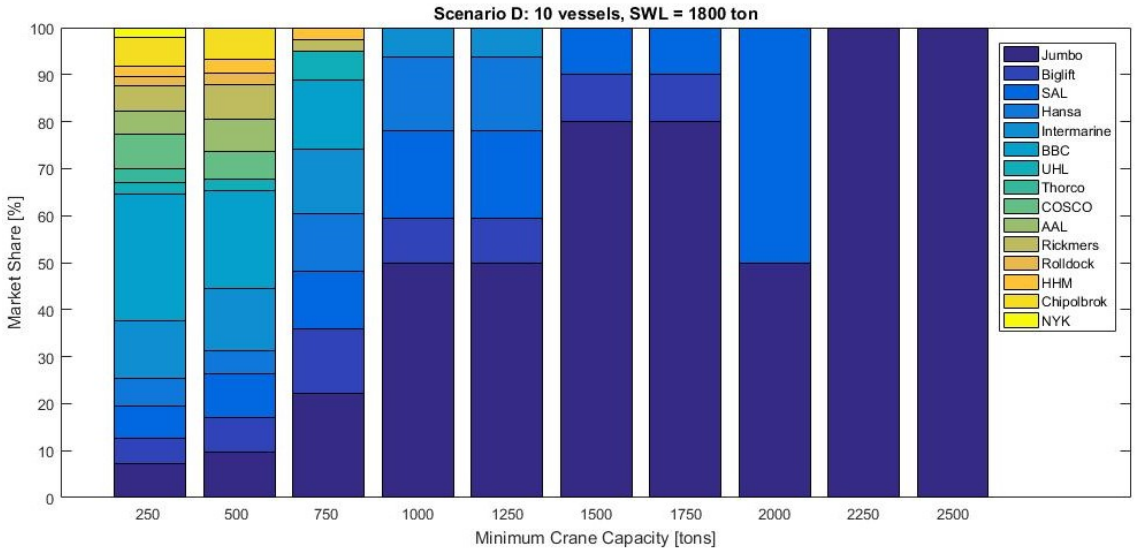


Figure B.7: Scenario D: Newbuilding 10 vessels, 1800 tonnes

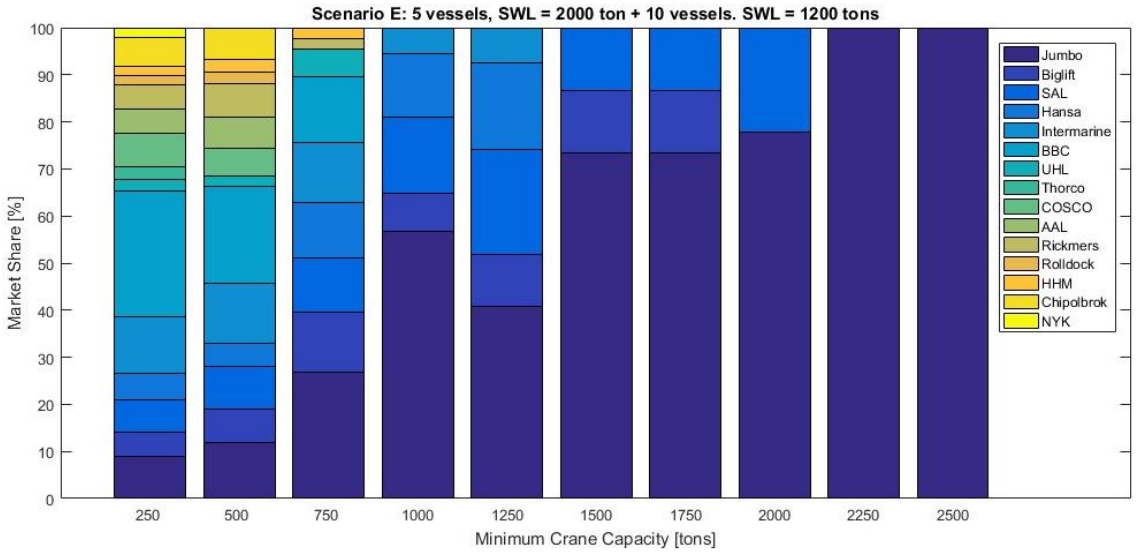


Figure B.8: Scenario E: Newbuilding 5 vessels, 2000 tonnes + 10 vessels, 1200 tonnes

B.2.2 Acquisition of Vessels from other Shipowners

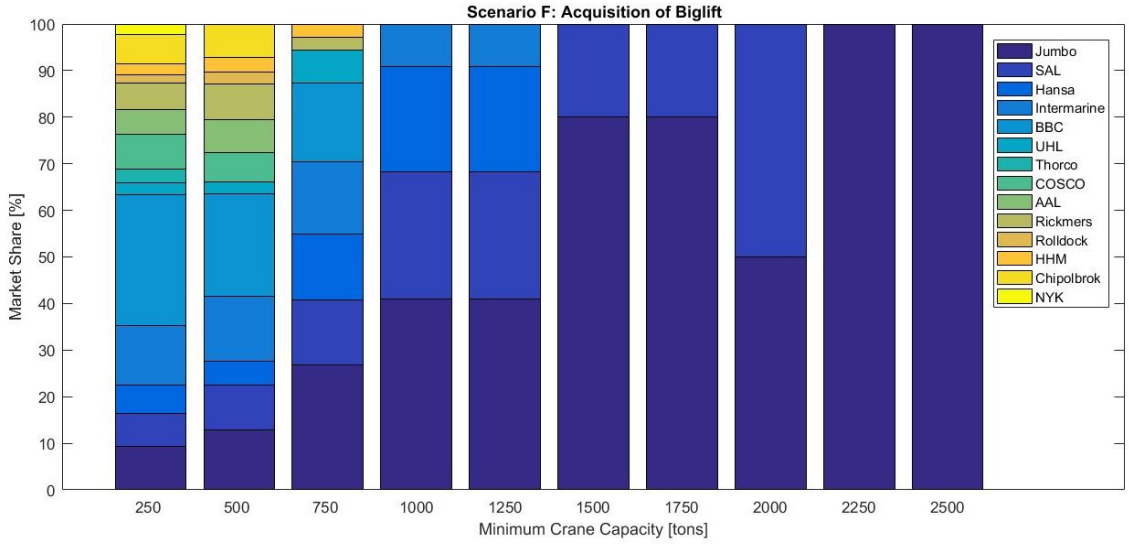


Figure B.9: Scenario F: Acquisition of Biglift

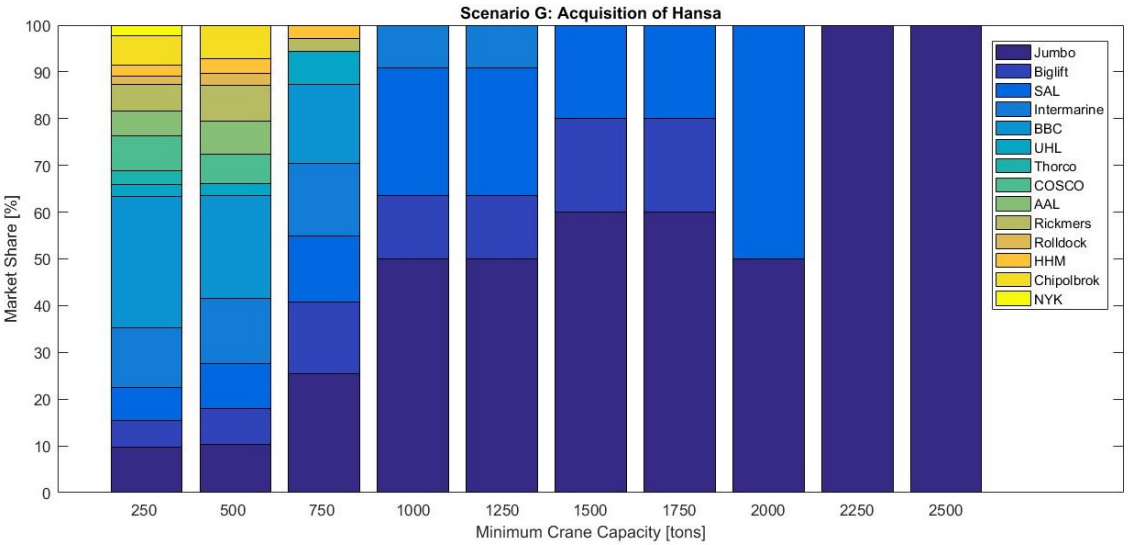


Figure B.10: Scenario G: Acquisition of Hansa

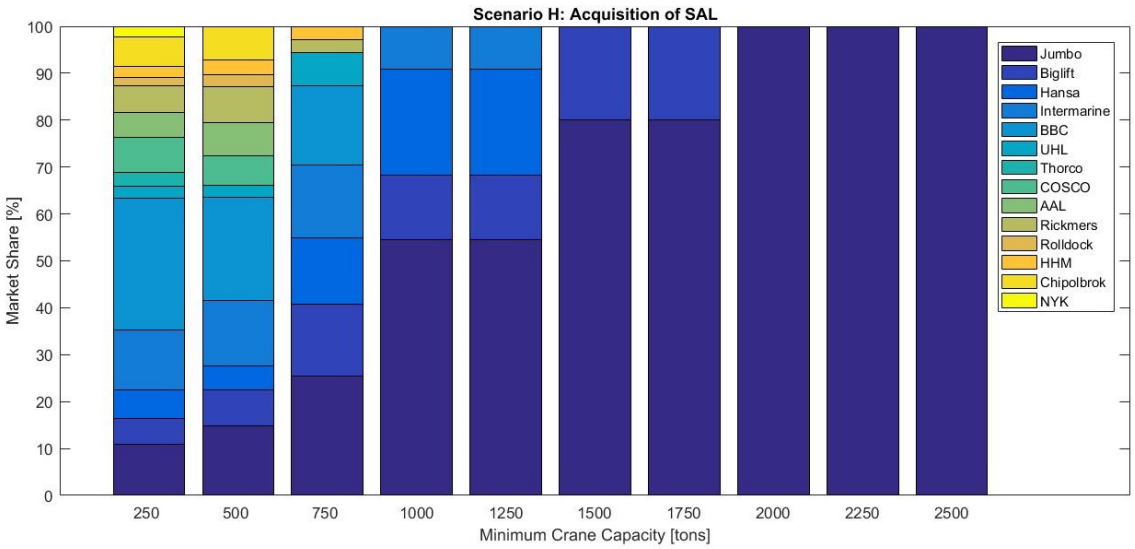


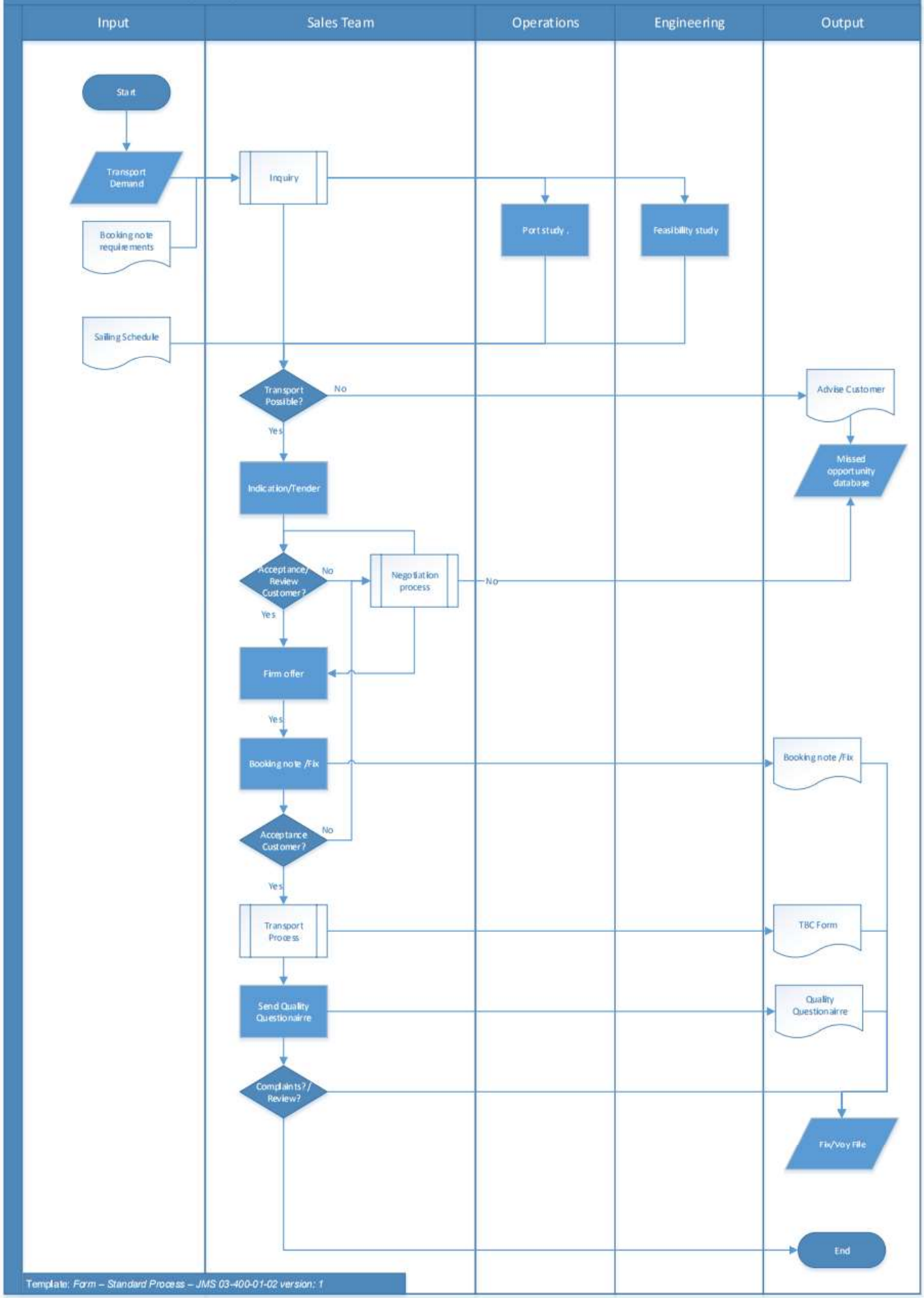
Figure B.11: Scenario H: Acquisition of SAL

Appendix C

Commerce Shipping: Procedures and Flow of Information

C.1 Booking Process Shipping

04-100-01-05 - Booking Cargo Process



C.2 Sailing Schedule

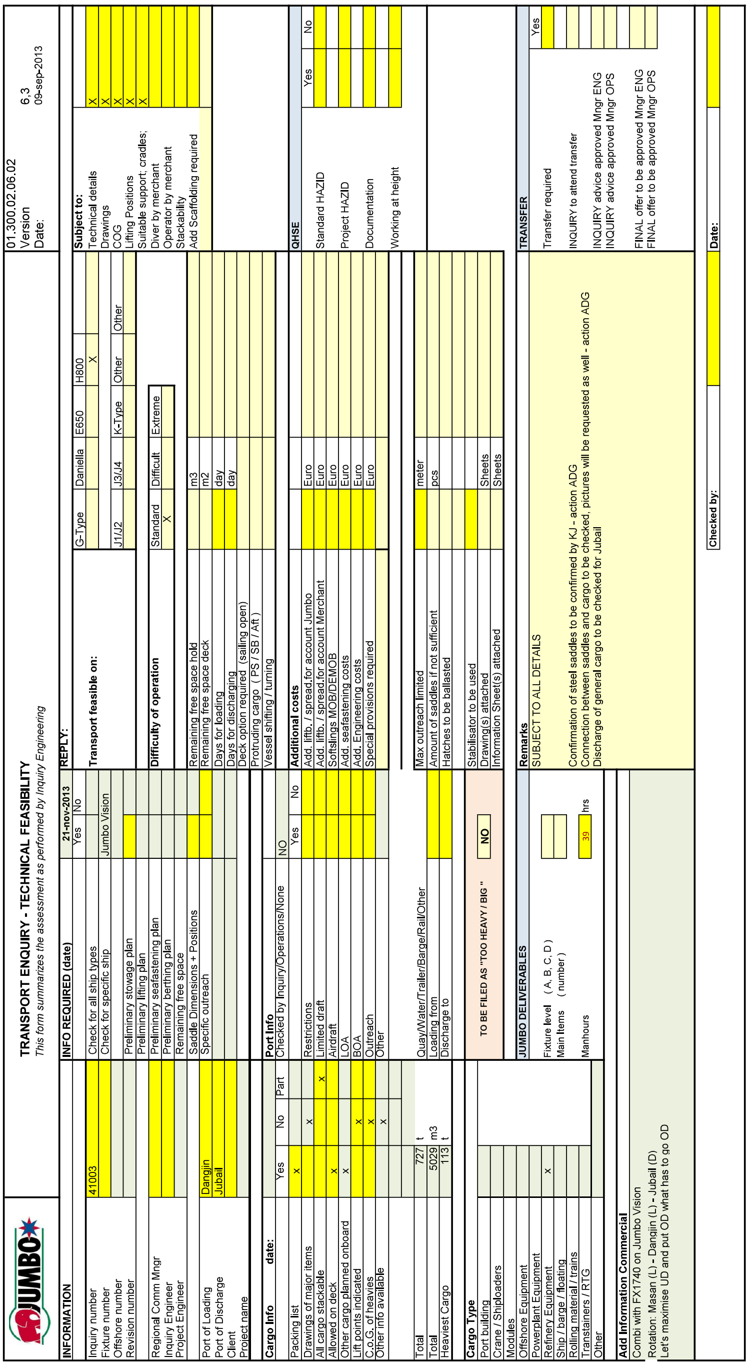
14-11-2016 issuedate: 14-11-16 15:49 **SAILING SCHEDULE** 01.200.02.01.04 / 01-01-09

	MV	" JUMBO VISION "	VAR %	MV	" FAIRLANE "	VAR %	MV	" STELLAPRIMA "	95%	MV	" FAIRLIFT "	80%
		LAKES FITTED			(Capt M Rehorst - Setubal 16/11) LAKES FITTED			LAKES FITTED			LAKES FITTED	
		o/b Oct 19th 2016			o/b Aug 24th 2016			o/b Sep 26th 2016			o/b Nov 11th 2016	
		o/b Nov 12h 2016			o/b Oct 6th 2016			o/b Oct 17th 2016			o/b Sep 27th 2016	
	VM MDG / NW			VM MDG / ADG			VM RB			VM RB		
	2											
	4 **VOY 126** 2055 **20-Oct - 17-Nov**			**VOY 119** 2114 **24-Oct - 14-Dec**			**VOY 179** 2112 **4-Nov - 21-Nov**			**VOY 191** 2101 **30-Oct - 2-Jan**		
	6 VLISSINGEN / NEWPORT NEWS			SETUBAL / UMM QASR			AVILES / HULL			YOKOHAMA / NEWPORT NEWS		
	8 fix 2107 - MT Oct 18 - 25			fix 2118 Nov 12 - 17			fix 2112 Nov 7 - 10			fix 2101 - CB Oct 10 - Nov 10		
	10 **Latest arrival Newport News Nov 9th**											
N	12			SETUBAL / JUBAIL #1			aviles 7-Nov - 8-Nov			ULSAN / HOUSTON		
O	14 SETUBAL / NORFOLK #1			fix 2114 Nov 17 - 24			hull 840 12-Nov - 13-Nov			fix 2106 - RM CB&I Oct 20 - Nov 15		
V	16 fix 2055 - MT Oct 21 - Oct 31			**Max transittime 35 days wp/fme** 20			aviles 840 16-Nov - 17-Nov			**Max transittime 45 days wp/fme** 37		
	18 **Direct sailing**						hull 840 20-Nov - 21-Nov					
	20			setubal OS 13-Nov - 19-Nov						yokohama 11-Nov - 12-Nov		
	22 vlissingen 21-Oct - 25-Oct			suez canal 2310 27-Nov - 28-Nov			**DIRECT SAILING**			ulsan KT 656 14-Nov - 17-Nov		
	24 setubal 1137 28-Oct - 1-Nov			**corridor 1-Dec - 3-Dec**						(+ internal audit)		
	26 **plus complete annual**			jubail 3123 8-Dec - 10-Dec						panama canal 8800 17-Dec - 18-Dec		
	28 norfolk 3147 12-Nov - 15-Nov			umm qasr 219 11-Dec - 14-Dec			**OPEN HULL** **21-Nov**			houston 1565 23-Dec - 25-Dec		
	30 newport news 14 15-Nov - 17-Nov						hull / setubal 21-Nov - 25-Nov			newport news 1697 31-Dec - 2-Jan		
	2			**WANT COMPLETION**			1237 miles					
	4 **WANT COMPLETION**									**WANT COMPLETION**		
	6											
	8						**VOY 180** 2056 **21-Nov - 10-Dec**					
	10 **OPEN NEWPORT NEWS** **17-Nov**						SETUBAL / NORFOLK #2					
D	12						fix 2056 - MT Nov 25 - Dec 5					
E	14			**OPEN UMM QASR** **14-Dec**			**Direct sailing**					
C	16											
	18						setubal 25-Nov - 28-Nov					
	20						norfolk 3147 8-Dec - 10-Dec			**Check wires**		
	22											
	24											
	26											
	28						**OPEN NOREFOLK** **10-Dec**					
	30						norfolk / setubal 10-Dec - 21-Dec			**OPEN NEWPORT NEWS** **2-Jan**		
	2						3147 miles			newport news / setubal 2-Jan - 13-Jan		
	4									3148 miles		
	6											
	8						**VOY 181** 2115 **10-Dec - 14-Jan**			**Gap** **2** **days**		
	10						SETUBAL / JUBAIL #2					
J	12						fix 2115 GE Greenville Dec 15 - 22					
A	14						**Max transittime 35 days wp/fme** 20			**VOY 192** 2115 **2-Jan - 7-Feb**		
N	16									SETUBAL / JUBAIL #3		
	18						setubal **21-Dec** - 23-Dec			fix 2116 Jan 15 - 22		
	20						suez canal 2310 31-Dec - 1-Jan			**Max transittime 35 days wp/fme** 19		
	22						**corridor** **4-Jan - 6-Jan**					
	24						jubail 3123 12-Jan - 14-Jan			setubal 15-Jan - 17-Jan		
	26									suez canal 2310 24-Jan - 25-Jan		
	28						**WANT COMPLETION**			**corridor** **28-Jan - 30-Jan**		
	30									jubail 3123 5-Feb - 7-Feb		
	2											
	4						**OPEN JUBAIL** **14-Jan**			**WANT COMPLETION**		
	6											
	8											
	10									**OPEN JUBAIL** **7-Feb**		
F	12											
E	14											
B	16											
R	18											
	20											
	22											
	24											
	26											
Note	**Check wires / maintenance**			**Check wires / maintenance**			**Check wires / maintenance**			**Check wires / maintenance**		
	Interim survey			**Interim survey**			**Interim survey**			**Interim survey**		
	Motoroverhaul			**Motoroverhaul**			Ext ISM / ISPS - Ext MLC			Ext ISM / ISPS - Ext MLC		
	Ext ISM/ISPS/MLC			Ext ISM /ISPS/MLC			Int ISM/ISPS/MLC			Int ISM/ISPS/MLC		
	Int ISM/ISPS/MLC			Int ISM/ISPS/MLC								

14-11-2016 issuedate: 14-11-16 15:49 **SAILING SCHEDULE** 01.200.02.01.04 / 01-01-09

Date	NOT YET SCHEDULED J- and K-TYPES	cr / laycan	cargo	vessels type	intention
JAN - FEB 2017	ULSAN / UMM QASR fix 2034 - SV	Jan 15 / Feb 28, 2017 **Latest Oct 15th Merchant** **to narrow to a 3 week window**	6 units - 4,058.28 ts / 40,499 cbm as follows: 2 units LPG Bullet, dims: 64.847 x 7.938 x 12.2 mtrs / 664.73 ts each 3 units Unsaturated LPG Bullet, dims: 69.247 x 8.84 x 11.972 mtrs / 712.896 ts each 1 unit LPG Product Bullet, dims: 64.95 x 8.14 x 11.26 mtrs / 590.132 ts	J- or K-Class	
MAR - MAY 2017	TIANJIN / RICHARD'S BAY #1 fix 2058 - MW	Mar 01 - May 29, 2017	1 x off Shiploader + 1 x off Stacker Reclaimer ttl. 1580 ts	J- or K-Class	
APR - JUL 2017	TIANJIN / RICHARD'S BAY #2 fix 2059 - MW	Apr 5 - Jul 4, 2017	1 x off Shiploader + 1 x off Stacker Reclaimer ttl. 1580 ts	J- or K-Class	
APR - MAY 2017	ULSAN + MASAN / UMM QASR fix 2035 - SV	Apr 1 - May 15, 2017 **Latest Dec 30th Merchant** **to narrow to a 3 week window**	6 units – 2,951,048 ts / 32,971 cbm as follows: 2 units Propane Bullet, dims: 58.663 x 7.52 x 10.55 mtrs / 572.754 ts each 2 units Butane Bullet, dims: 66.847 x 8.7 x 11.751 mtrs / 532.385 ts each (Masam / Umm Qasr) 1 unit Atmospheric Tower, dims: 62.2 x 8.3 x 8.48 mtrs / 399.77 ts 1 unit Vacuum Tower, dims: 37.273 x 13.15 x 11.41 mtrs / 341.0 ts	J- or K-Class	
MAY - JUN 2017	DALIAN / ABU DHABI fix 2070 - RT	May 5 - Jun 15	1 unit ship-unloader, 1710 tons dimensions 99.1 x 31.8 x 62.5 meters and accessories packed in 10 x 40'SOC	K-Class	
MAY - JUN 2017	SCHIEDAM / RECIFE fix 1860 - MH	May - Jun 2017	1 VLS 1309ts dims: 54,0 x 21,5 x 18,5 mtrs plus total 563ts / 1,020 cbm PLSV equipment – hull 163ts	K-Class	
MAY 2017	SINGAPORE / YAMPI SOUND fix 2103 - MH	May 22 - Jun 1, 2017	see recap	J-Class	
JUN 2017	MACEIO+ITAJAI / QINGDAO fix 1973 #6 - SK	Jun 2017	1x M16 Power Generator 23x22x34 M 1424.6 TS 1x M09A Pig Launcher 27x22x7 M 1509.6 TS 1x M09B Pig Launcher 27x22x8.5 M 1107.9 Ts	K-Class	
JUNE 2017	HENDERSON / PORT KEMBLA #1 fix 2075 - RM	Jun 15 - Jul 17, 2017	Shipment 1: 1410 Mt heaviest item 500Mt	K-Class	
JUN - JUL 2017	SZCZECIN / LIMERICK fix 2110 - SK	Jun 4 - Jul 4, 2017	1 Shiploader – 1800 mts unit weight	K-Class	
JULY 2017	HENDERSON / PORT KEMBLA #2 fix 2076 - RM	Consecutive on shipment 1	Shipment 2: 2,132MT, heaviets item 1452Mt	K-Class	

C.3 Inquiry Form



TRANSPORT ENQUIRY - TECHNICAL FEASIBILITY
This form summarizes the assessment as performed by Inquiry Engineering

01.300.02.06.02
Version 6,3
Date: 09-sep-2013

INFORMATION	
Inquiry number	41003
Fixture number	
Offshore number	
Revision number	
Regional Comm Mngr	
Inquiry Engineer	
Project Engineer	
Port of Loading	Dangjin
Port of Discharge	Jubail
Client	
Project name	

Cargo Info date:	Yes	No	Part
Packing list	x		
Drawings of major items		x	
All cargo stackable			x
Allowed on deck	x		
Other cargo planned onboard	x		
Lift points indicated		x	
C.o.G. of heavies		x	
Other info available		x	

Total	727	t
Total	5029	m3
Heaviest Cargo	113	t

Cargo Type	
Port building	
Crane / Shiploaders	
Modules	
Offshore Equipment	
Powerplant Equipment	
Refinery Equipment	x
Ship / barge / floating	
Rolling material / trains	
Transtainers / RTG	
Other	

Add Information Commercial
Combi with FX1740 on Jumbo Vision
Rotation: Masan (L) - Dangjin (L) - Jubail (D)
Let's maximise UD and put OD what has to go OD

INFO REQUIRED (date)	21-nov-2013 Yes	No
Check for all ship types		
Check for specific ship	Jumbo Vision	
Preliminary stowage plan		
Preliminary lifting plan		
Preliminary seafastening plan		
Preliminary berthing plan		
Remaining free space		
Saddle Dimensions + Positions		
Specific outreach		

Port Info		
Checked by Inquiry/Operations/None	NO	
	Yes	No
Restrictions		
Limited draft		
Airdraft		
LOA		
BOA		
Outreach		
Other		
Quay/Water/Trailer/Barge/Rail/Other		
Loading from		
Discharge to		

TO BE FILED AS "TOO HEAVY / BIG " — NO

JUMBO DELIVERABLES		
Fixture level (A, B, C, D)		
Main Items (number)		
Manhours	39	hrs

REPLY:

Transport feasible on:	G-Type	Daniella	E650	H800	
				X	
	J1/J2	J3/J4	K-Type	Other	Other

Difficulty of operation	Standard	Difficult	Extreme
	X		

Remaining free space hold		m3
Remaining free space deck		m2
Days for loading		day
Days for discharging		day
Deck option required (sailing open)		
Protruding cargo (PS / SB / Aft)		
Vessel shifting / turning		

Additional costs		
Add. liftb. / spread.for account Jumbo		Euro
Add. liftb. / spread.for account Merchant		Euro
Softslings MOB/DEMOB		Euro
Add. seafastening costs		Euro
Add. Engineering costs		Euro
Special provisions required		Euro

Max outreach limited		meter
Amount of saddles if not sufficient		pcs
Hatches to be ballasted		
Stabilisator to be used		
Drawing(s) attached		Sheets
Information Sheet(s) attached		Sheets

Remarks
SUBJECT TO ALL DETAILS

Confirmation of steel saddles to be confirmed by KJ - action ADG
Connection between saddles and cargo to be checked, pictures will be requested as well - action ADG
Discharge of general cargo to be checked for Jubail

Subject to:	
Technical details	X
Drawings	X
COG	X
Lifting Positions	X
Suitable support; cradles;	X
Diver by merchant	
Operator by merchant	
Stackability	
Add Scaffolding required	

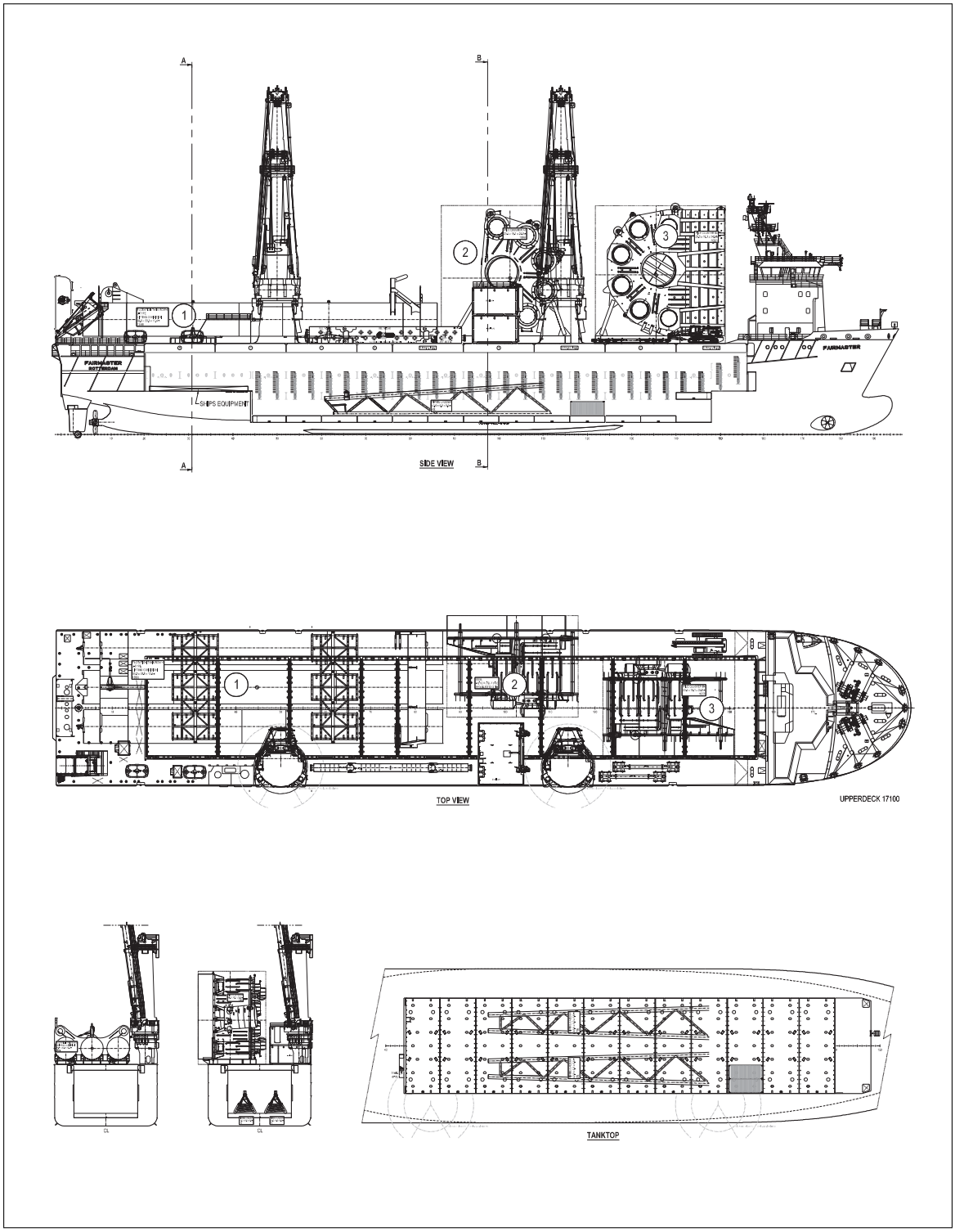
QHSE	Yes	No
Standard HAZID		
Project HAZID		
Documentation		
Working at height		

TRANSFER	Yes
Transfer required	
INQUIRY to attend transfer	
INQUIRY advice approved Mngr ENG	
INQUIRY advice approved Mngr OPS	
FINAL offer to be approved Mngr ENG	
FINAL offer to be approved Mngr OPS	

Checked by: Date:

Page : 1
File: Inquiry combi masan- dangjin-jubail 21-nov-2013 Sheet: Inquiry

C.4 Stowage Plan: Jumbo Kinetic



C.5 The Jumbo Position List

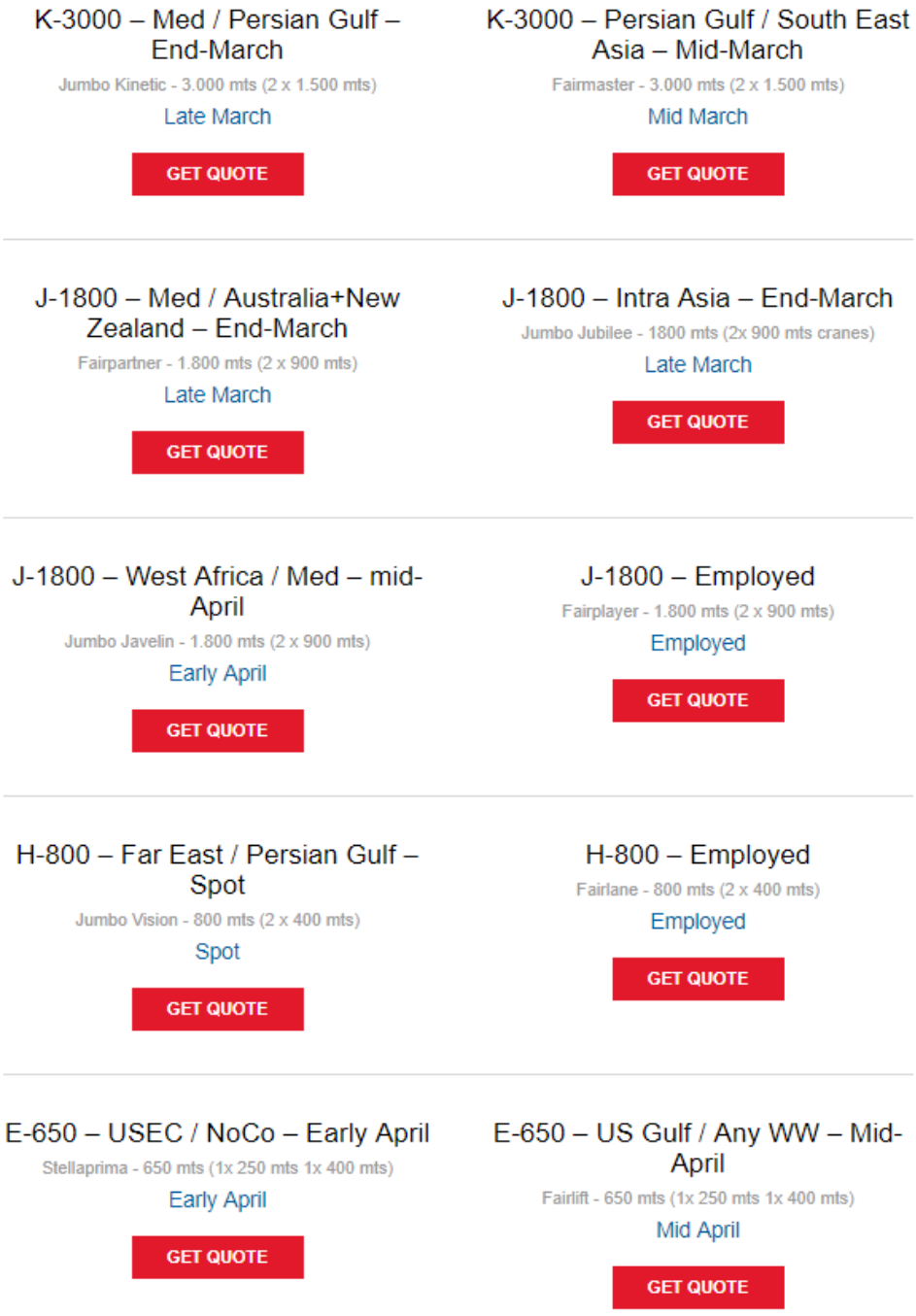


Figure C.1: Jumbo Positions List

C.6 Technical Feasibility

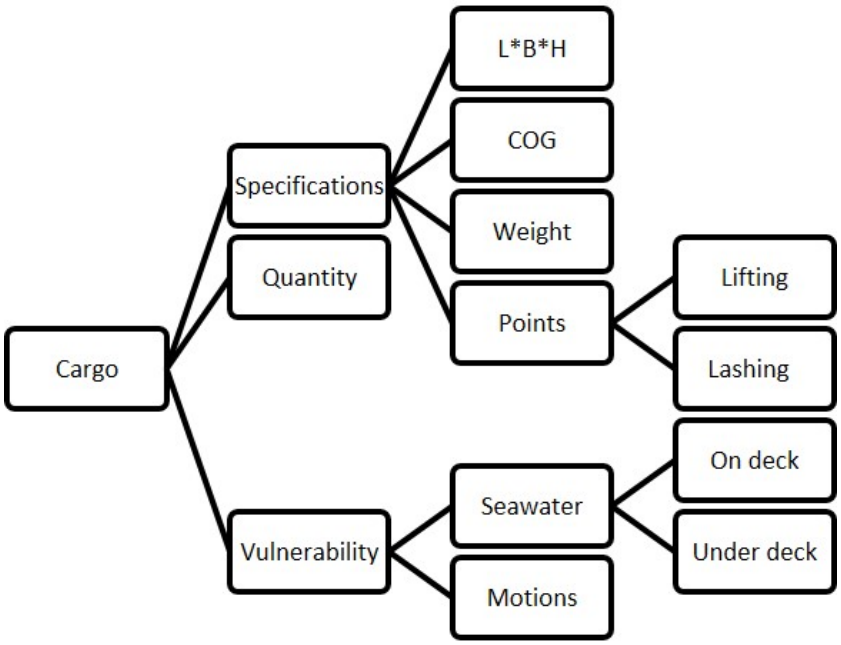


Figure C.2: Cargo Specifications

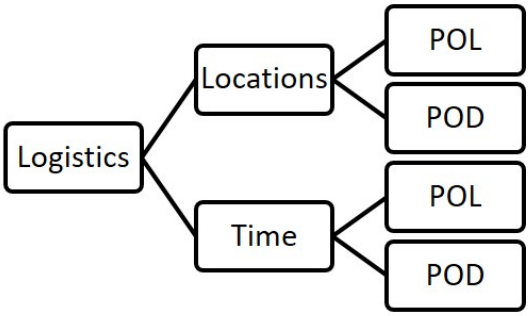


Figure C.3: Logistics Specifications

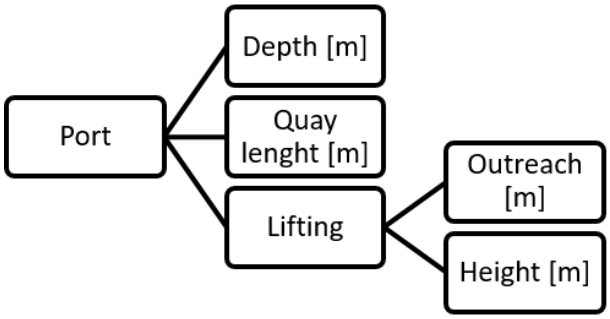


Figure C.4: Port Specifications

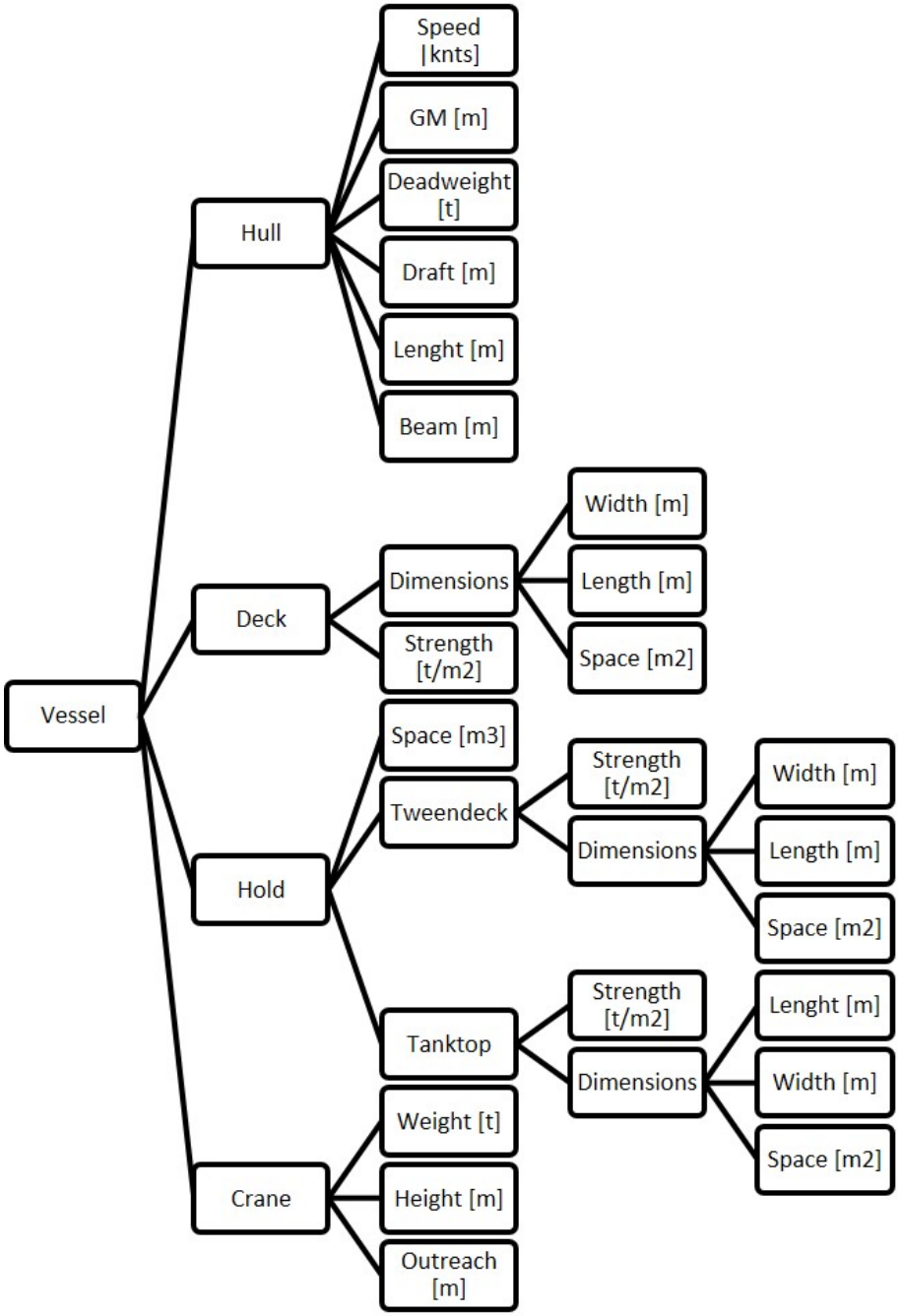


Figure C.5: Vessel Specifications

C.7 Commercial Viability

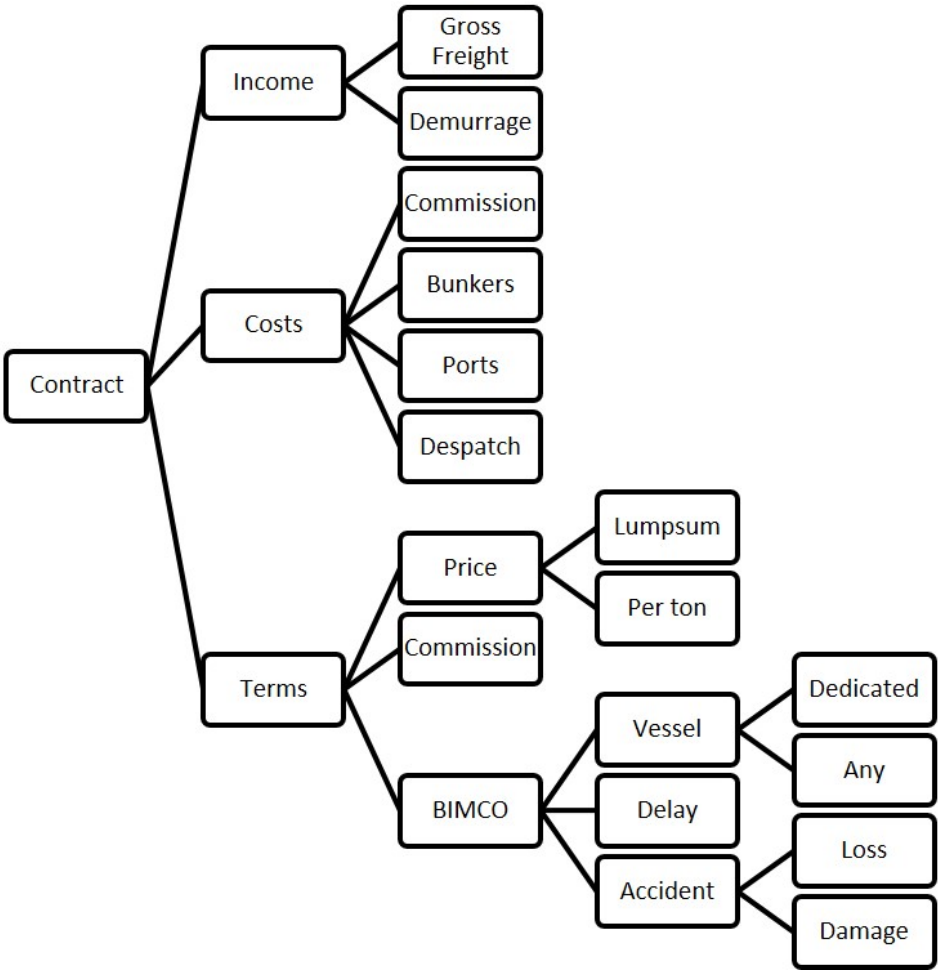


Figure C.6: Commercial Viability

C.8 Shipnet: Voyage Estimator

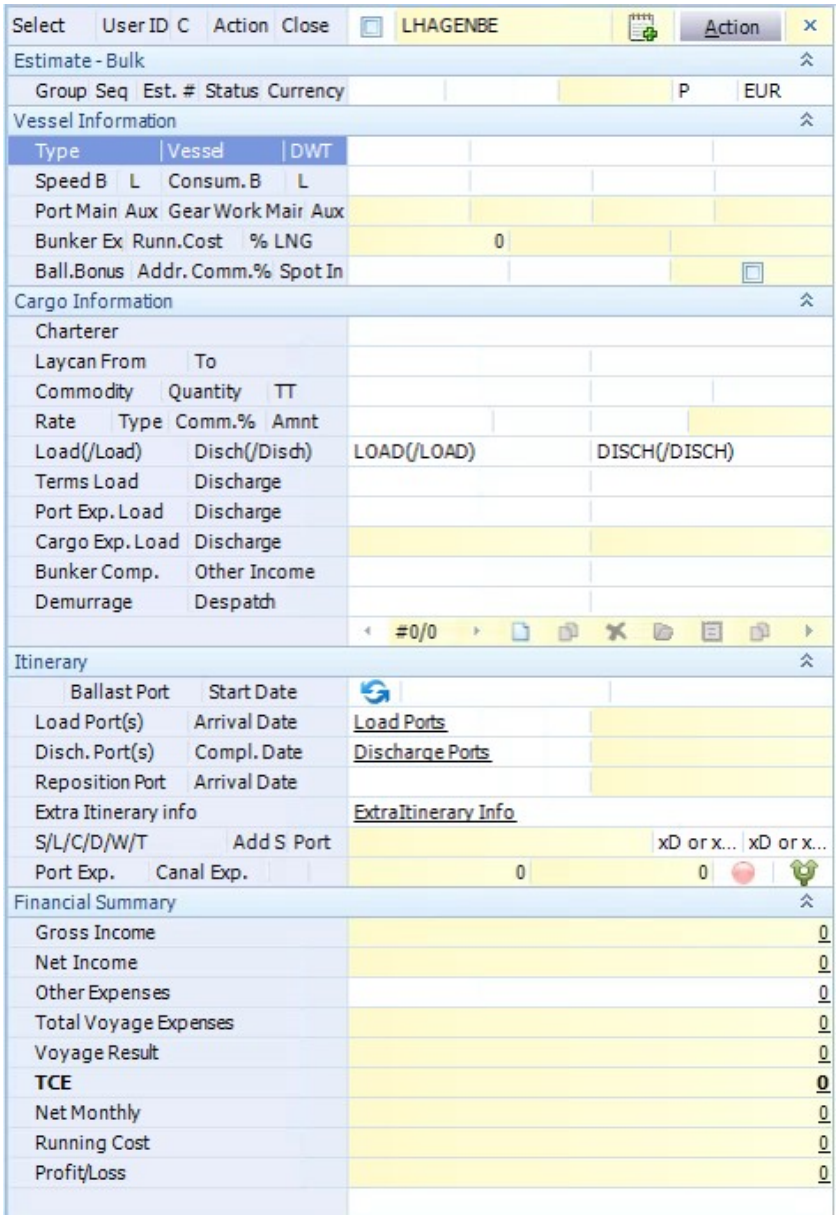


Figure C.7: Shipnet: Voyage Estimator

C.9 Example of Voyage Data: Stellaprima

Port Name	Arrival	Departure	Port Days	Steam Days	Speed	Distance	fix	
LAAYOUNE	16-11-2015 15:15	20-11-2015 18:07	4,12	0,00	0,00	305	1984	
LAS PALMAS	23-11-2015 10:00	28-11-2015 20:00	5,42	2,66	5,24	335		
ALGECIRAS	10-12-2015 06:33	18-12-2015 15:20	8,37	11,44	2,56	703		
GIBRALTAR	21-12-2015 09:25	21-12-2015 16:30	0,30	2,75	0,02	14		
CADIZ	19-1-2016 10:55	20-1-2016 17:00	1,25	28,77	0,03	40		
RAVENNA	3-2-2016 14:50	5-2-2016 18:10	2,14	13,91	5,33	1.781		
ORTONA	6-2-2016 20:40	13-2-2016 10:40	6,58	1,10	6,92	184		2000
BLYTH	25-2-2016 14:35	26-2-2016 19:15	1,19	12,16	10,75	3.137	1950	2000
LAKE CHARLES	18-3-2016 02:45	19-3-2016 22:00	1,80	20,31	11,79	5.750	1950	
THEODORE	21-3-2016 18:00	24-3-2016 12:57	2,79	1,83	0,00	493		
VITORIA	11-4-2016 14:22	14-4-2016 07:24	2,71	18,06	11,63	5.040	1906	
VITORIA	14-4-2016 08:00	15-4-2016 05:11	0,88	0,03	0,00	0		
ITAJAI	17-4-2016 09:00	18-4-2016 13:45	1,20	2,16	12,41	643		2043
LAS PALMAS	2-5-2016 14:10	2-5-2016 19:52	0,24	14,02	11,49	3.940	2036	2043
KALUNDBORG	10-5-2016 20:45	11-5-2016 20:00	0,97	8,04	12,42	2.316	2036	2043
ANCONA	22-5-2016 17:24	24-5-2016 09:35	1,67	10,89	0,00	3.562	2036	
TRIESTE	24-5-2016 21:45	26-5-2016 08:30	1,45	0,51	0,00	3.613		
CEUTA	31-5-2016 18:25	1-6-2016 00:10	0,24	5,41	0,00	1.702	2031	
DAKAR	5-6-2016 13:25	8-6-2016 16:12	3,12	4,55	28,97	3.165	2031	
SANTANDER	16-6-2016 08:50	21-6-2016 15:15	5,27	7,69	0,00	2.084		
PASCAGOULA	6-7-2016 11:45	9-7-2016 12:00	3,01	14,85	13,62	4.855	1945	
SETUBAL	25-7-2016 20:10	19-8-2016 16:05	24,83	16,34	0,00	4.576		
ST. NAZAIRE	22-8-2016 06:30	23-8-2016 19:00	1,52	2,60	11,82	738		
DAKAR	31-8-2016 08:00	1-9-2016 21:25	1,56	7,54	12,27	2.221	2089	
FOS	16-9-2016 08:10	19-9-2016 23:00	3,62	14,45	0,00	2.193		
ROUEN	26-9-2016 03:20	30-9-2016 03:20	4,00	6,18	13,20	1.958	2091	
ANTWERP	8-10-2016 14:25	9-10-2016 14:25	1,00	8,46	0,00	307		
ANTWERP	9-10-2016 14:25	11-10-2016 09:05	1,78	0,00	0,00	0		
SEVILLE	16-10-2016 07:15	17-10-2016 19:15	1,50	4,92	12,07	1.426	2102	
SEVILLE	17-10-2016 19:15	18-10-2016 13:15	0,75	0,00	12,00	4.255	2102	
SEVILLE	18-10-2016 13:15	21-10-2016 09:33	2,85	0,00	0,00	0	2102	
TARRAGONA	23-10-2016 10:20	25-10-2016 17:04	2,28	2,03	0,00	651		
AVILES	3-11-2016 03:08	4-11-2016 14:30	1,47	8,42	6,23	1.259	2110	
AVILES	4-11-2016 14:30	8-11-2016 21:30	4,29	0,00	0,00	0		
HULL	12-11-2016 01:15	13-11-2016 17:35	1,68	3,16	11,09	840	2112	
AVILES	16-11-2016 11:40	18-11-2016 17:15	2,23	2,75	13,12	867		
HULL	21-11-2016 13:40	24-11-2016 14:10	3,02	2,85	12,50	855	2112	
SETUBAL	28-11-2016 11:05	4-12-2016 17:15	6,26	3,87	0,00	1.273		
NORFOLK	18-12-2016 18:00	22-12-2016 18:00	4,00	14,03	9,63	3.147	2056	
ANTWERP	5-1-2017 06:15	7-1-2017 12:20	2,25	13,51	0,00	3.530		
MARIN	10-1-2017 12:45	11-1-2017 20:00	1,30	3,02	0,00	3.147	2138	
SETUBAL	12-1-2017 16:00	18-1-2017 18:30	6,10	0,83	11,89	3.147		
NORFOLK	1-2-2017 12:30	3-2-2017 07:00	1,77	13,75	11,77	3.075	2057	

C.10 Occupancy Rate Stowage Q3 + Q4 2016

Voyage Data									Utilization					
Class	Vessel	Voyage	date	from	to	distance [NM]	Status	fix on vessel	HoldVol	HoldAr	Hold	Deck	Weight	Total
K	Jumbo kinetic	12	21-11-2016	rostock	rostock	0	9 day gap		0%	0%	0%	0%	0%	0%
	Jumbo kinetic	12		rostock	antwerp	768	want completion	2120	1%	8%	8%	80%	6%	54%
	Jumbo kinetic	12		antwerp	port qasim	6261	want completion	2120+2030	16%	93%	93%	80%	9%	85%
	Jumbo kinetic	12	23-1-2017	port qasim	ennore	1912	want completion	2120	1%	8%	8%	80%	6%	54%
											68%	**80%**	**8%**	**76%**
K	fairmaster	9	16-8-2016	dubai	fujairah	202	dedicated vessel	2011	100%	100%	100%	100%	100%	100%
	fairmaster	9		fujairah	verdal	7035	dedicated vessel	2011	100%	100%	100%	100%	100%	100%
	fairmaster	10		verdal	rotterdam	855	ballast		0%	0%	0%	0%	0%	0%
	fairmaster	before 11		rotterdam	dunkirk	105	ballast		0%	0%	0%	0%	0%	0%
	fairmaster	before 11		dunkirk	dunkirk	0	17 day gap		0%	0%	0%	0%	0%	0%
	fairmaster	11		dunkirk	durban	6855	dedicated vessel	2129	100%	100%	100%	100%	100%	100%
	fairmaster	11	28-2-2017	durban	darwin	5567	dedicated vessel	2129	100%	100%	100%	100%	100%	100%
											95%	**95%**	**95%**	**95%**
J	fairpartner	95	2-9-2016	nantong	rugau	234	full ship	2085	100%	100%	100%	100%	100%	100%
	fairpartner	95		rugau	corpus christi	10144	full ship	2085	100%	100%	100%	100%	100%	100%
	fairpartner	before 95		corpus christi	corpus christi	5	day gap		0%	%	0%	0%	0%	0%
	fairpartner	before 96		corpus christi	vlissingen	5067	ballast		0%	0%	0%	0%	0%	0%
	fairpartner	before 96		vlissingen	newcastle	296	ballast		0%	0%	0%	0%	0%	0%
	fairpartner	96		newcastle	rosyth	123	dedicated vessel	part 2103	100%	100%	100%	100%	100%	100%
	fairpartner	96		rosyth	singapore	8751	dedicated vessel	2103	100%	100%	100%	100%	100%	100%
	fairpartner	before 97		singapore	kaohsiung	1618	ballast		0%	0%	0%	0%	0%	0%
	fairpartner	97		kaosiung	masan	928	want completion	2128	7%	14%	14%	0%	1%	6%
	fairpartner	97		masan	hitachi	976	want completion	2128+2121+2126	40%	89%	89%	80%	30%	84%
	fairpartner	97		hitachi	surabaya	3164	want completion	2128+2121+2126+2127	45%	97%	97%	80%	34%	87%
	fairpartner	97		surabaya	umm qasr	4552	want completion	2128+2121+2126	40%	89%	89%	80%	30%	84%
	fairpartner	97		umm qasr	shuaiba	88	want completion	2128+2121	40%	89%	89%	0%	20%	37%
	fairpartner	97	18-2-2017	shuaiba	jubail	161	want completion	2128	7%	14%	14%	0%	1%	6%
											76%	**73%**	**61%**	**74%**
J	jumbo jubilee	48	29-7-2016	hamriyah	singapore	3578	ballast		0%	0%	0%	0%	0%	0%
	jumbo jubilee	48		singapore	hong kong	1419	ballast		0%	0%	0%	0%	0%	0%
	jumbo jubilee	48		hong kong	angra dos reis	10236	want completion	2074	0%	0%	0%	90%	22%	45%
	jumbo jubilee	48		angra dos reis	rio de janeiro	83	want completion	part 2074	0%	0%	0%	45%	11%	22%
	jumbo jubilee	48		rio de janeiro	cristobal	4221	want completion	part 2074 + 2098	100%	100%	100%	100%	100%	100%
	jumbo jubilee	48	22-12-2016	cristobal	dalian	9728	want completion	2098	40%	54%	54%	70%	19%	62%
											33%	**69%**	**28%**	**51%**
J	jumbo javelin	78	4-10-2016	dampier	singapore	1702	want completion	2099	10%	18%	18%	100%	9%	59%
	jumbo javelin	before 79		singapore	taichung	1706	ballast		0%	0%	0%	0%	0%	0%
	jumbo javelin	79		taichung	bayuquan	1054	want completion	2108	5%	2%	5%	0%	1%	3%
	jumbo javelin	79		bayuquan	nantong	684	want completion	2108+2109	60%	100%	100%	0%	15%	50%
	jumbo javelin	79		nantong	dalian	560	want completion	2108+2095+2109	60%	100%	100%	35%	20%	68%
	jumbo javelin	79		dalian	durban	7440	want completion	2108+2095+2109+1978	60%	100%	100%	100%	27%	100%
	jumbo javelin	79		durban	rio grande	4212	want completion	2095+2109+1978	55%	97%	97%	100%	27%	99%
	jumbo javelin	79		rio grande	santos	602	want completion	2109+1978	55%	97%	97%	50%	22%	74%
	jumbo javelin	79	1-1-2017	santos	sao sebastiano	70	want completion	2109	55%	97%	97%	0%	14%	49%
											77%	**77%**	**20%**	**77%**
J	fairplayer	before 43	14-10-2016	lake charles	durban	8192	ballast		0%	0%	0%	0%	0%	0%
	fairplayer	before 43		durban	dampier	4605	ballast		0%	0%	0%	0%	0%	0%
	fairplayer	43		dampier	cape preston	62	dedicated vessel	2105	100%	100%	100%	100%	100%	100%
	fairplayer	before 44		cape preston	singapore	1845	ballast		0%	0%	0%	0%	0%	0%
	fairplayer	before 44		singapore	kuantan	199	ballast		0%	0%	0%	0%	0%	0%
	fairplayer			kuantan	visakhapatnam	1942	ballast		0%	0%	0%	0%	0%	0%
	fairplayer			visakhapatnam	goa	1505	want completion	2139	0%	0%	0%	90%	8%	45%
	fairplayer	44	23-1-2017	goa	new mangalore	177	want completion	part 2139	0%	0%	0%	50%	4%	25%
											0%	**8%**	**1%**	**4%**

Voyage Data									Utilization					
Class	Vessel	Voyage	date	from	to	distance [NM]	Status	fix on vessel	HoldVol	HoldAr	Hold	Deck	Weight	Total
	jumbo vision	before 125	3-10-2016	ceuta	nice	768	ballast		0%	0%	0%	0%	0%	0%
	jumbo vision	125		nice	palma	374	want completion	part 2104	5%	0%	5%	33%	4%	17%
	jumbo vision	125		palma	falmouth	1511	want completion	2104	5%	0%	5%	60%	7%	29%
	jumbo vision	125		falmouth	southhampton	164	want completion	part 2104	5%	0%	5%	25%	3%	14%
	jumbo vision	before 126		southhampton	vlissingen	202	ballast		0%	0%	0%	0%	0%	0%
H	jumbo vision	126		vlissingen	setubal	1137	want completion	2107	50%	88%	88%	50%	18%	72%
	jumbo vision	126		setubal	norfolk	3147	want completion	2107+2055	70%	100%	100%	80%	48%	91%
	jumbo vision	126		norfolk	newport news	14	want completion	2107	50%	88%	88%	50%	18%	72%
	jumbo vision	before 127	17-11-2016	newport news	newport news	0	4 day gap		0%	0%	0%	0%	0%	0%
	jumbo vision	before 127		newport news	setubal	3148	ballast		0%	0%	0%	0%	0%	0%
	jumbo vision	127		setubal	jubail	5433	want completion	2119+2115	50%	95%	95%	80%	45%	89%
	jumbo vision	127	11-1-2017	jubail	umm qasr	219	want completion	2119	40%	76%	76%	0%	23%	43%
											60%	**53%**	**27%**	**57%**
	fairlane	before 119	11-9-2016	bay bulls	rotterdam	2293	ballast		0%	0%	0%	0%	0%	0%
	fairlane	before 119		rotterdam	rotterdam	0	20 day gap		0%	0%	0%	0%	0%	0%
	fairlane	before 119		rotterdam	setubal	1112	ballast		0%	0%	0%	0%	0%	0%
H	fairlane	119		setubal	jubail	5433	want completion	2118+2114	50%	96%	96%	90%	25%	93%
	fairlane	119		jubail	umm qasr	219	want completion	2118	26%	51%	51%	0%	23%	29%
	fairlane	before 120		umm qasr	hazira	1498	ballast		0%	0%	0%	0%	0%	0%
	fairlane	120	30-12-2016	hazira	chennai	1576	want completion	2125	0%	0%	0%	21%	10%	10%
											44%	**43%**	**13%**	**43%**
	stellaprima	before 177	30-9-2016	rouen	antwerp	307	ballast		0%	0%	0%	0%	0%	0%
	stellaprima	177		antwerp	seville	1438	want completion	2102	0%	0%	0%	80%	5%	34%
	stellaprima	before 178		seville	tarragona	648	ballast		0%	0%	0%	0%	0%	0%
	stellaprima	before 178		tarragona	tarragona	0	5 day gap		0%	0%	0%	0%	0%	0%
	stellaprima	178		tarragona	aviles	1272	want completion	2111	0%	0%	0%	36%	5%	16%
	stellaprima	before 179		aviles	aviles	0	2 day gap		0%	0%	0%	0%	0%	0%
	stellaprima	179		aviles	hull	840	direct sailing	2112	33%	61%	61%	80%	12%	69%
	stellaprima	before 180		hull	setubal	1237	ballast		0%	0%	0%	0%	0%	0%
E	stellaprima	180		setubal	norfolk	3147	direct sailing	2056	38%	88%	88%	0%	28%	50%
	stellaprima	before 181		norfolk	lisbon	3134	ballast		0%	0%	0%	0%	0%	0%
	stellaprima	before 181		lisbon	setubal	46	ballast		0%	0%	0%	0%	0%	0%
	stellaprima	before 181a		setubal	setubal	0	7 day gap		0%	0%	0%	0%	0%	0%
	stellaprima	181a		setubal	norfolk	3147	want completion	2057	39%	85%	85%	0%	30%	49%
	stellaprima	before 181b		norfolk	setubal	3147	ballast		0%	0%	0%	0%	0%	0%
	stellaprima	181b		setubal	norfolk	3147	want completion	2133	39%	85%	85%	0%	30%	49%
	stellaprima	before 182		norfolk	le trait	3341	ballast		0%	0%	0%	0%	0%	0%
	stellaprima	182	1-3-2017	le trait	port harcourt	3341	want completion	2124	50%	100%	100%	90%	33%	96%
											42%	**19%**	**15%**	**32%**
	fairlift	190	30-9-2016	bintan	dampier	1646	dedicated vessel	2082	100%	100%	100%	0%	100%	100%
	fairlift	190		dampier	singapore	1702	dedicated vessel	2082	100%	100%	100%	0%	100%	100%
	fairlift	before 191		singapore	yokohama	2886	ballast		0%	0%	0%	0%	0%	0%
	fairlift	191		yokohama	ulsan	656	want completion	2101	3%	5%	5%	0%	6%	6%
E	fairlift	191		ulsan	panama	8800	want completion	2101+2106	60%	98%	98%	85%	20%	92%
	fairlift	191		panama	houston	1565	want completion	2101+2106	60%	98%	98%	85%	20%	92%
	fairlift	191		houston	newport news	1697	want completion	2101	3%	5%	5%	0%	6%	6%
	fairlift	before 192		newport news	setubal	3150	ballast		0%	0%	0%	0%	0%	0%
	fairlift	192	14-2-2017	setubal	jubail	5433	want completion	2116+2135	50%	96%	96%	90%	41%	93%
											68%	**50%**	**29%**	**66%**

Appendix D

Examples of Marketplaces in the Heavy Lift Shipping Industry

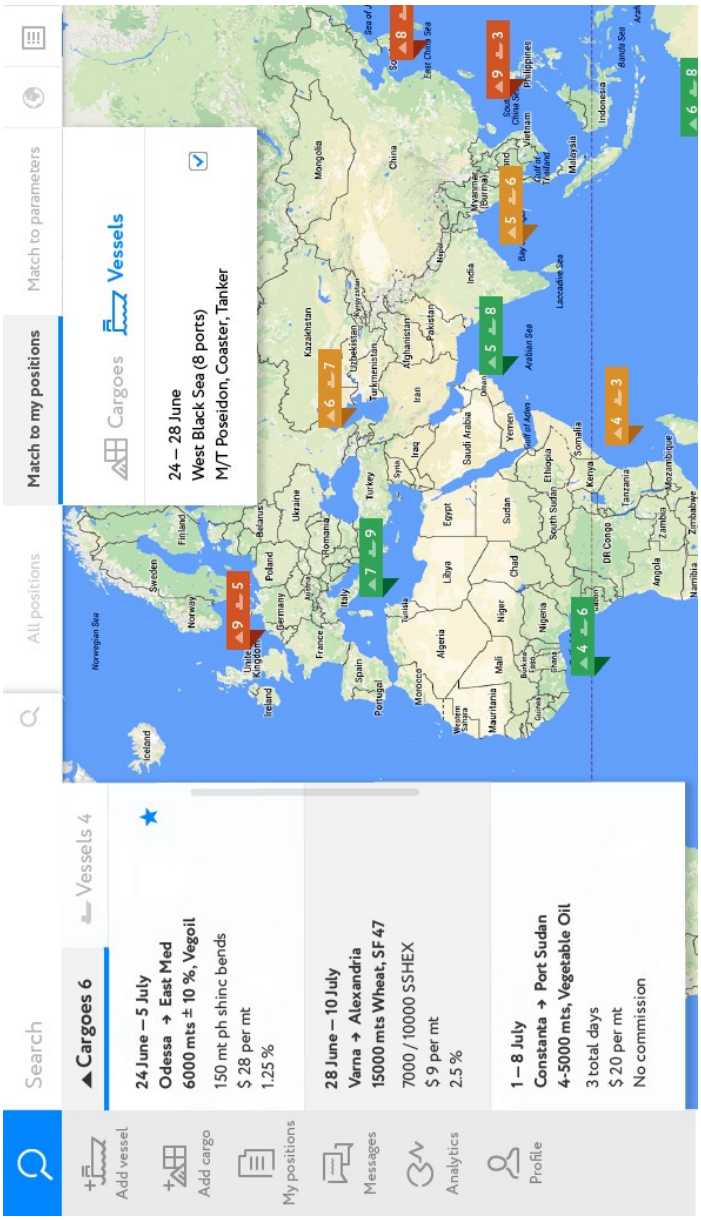


Figure D.1: The Interface of Opensea.pro [Opensea.pro, 2018]

CARGO Status Dark view

REF	POL POD	CARGO	WEIGHT(MT) VOLUME(M3)	LAYCAN	FREIGHT	STATUS
064-7E2-C0269	MERSIN CONSTANTZA	Cement	9,000 —	11-4-2018 15-4-2018	— add offer	0hr 0min
064-7E2-C0268	MERSIN CONSTANTZA	Cement	8,000 —	11-4-2018 15-4-2018	— add offer	0hr 0min
064-7E2-C0267	PUERTO ANGAMOS HUELVA	Copper Concentr...	10,900 —	23-4-2018 27-4-2018	— add offer	0hr 00min
064-7E2-C0266	MASSAWA NANJING	Zinc Concentrates	11,500 —	6-4-2018 13-4-2018	— add offer	0hr 00min
064-7E2-C0259	CONSTANTZA ASSALUYEH	Steam Drum	194 —	16-4-2018 20-4-2018	— add offer	0hr 25min
064-7E2-C01B9	CONSTANTZA ASSALUYEH	Steam Drum	195 —	20-4-2018 30-4-2018	— add offer	2hr 46min
064-7E2-C01AF	CONSTANTZA ASSALUYEH	Steam Drum	195 —	20-4-2018 30-4-2018	— add offer	2hr 49min
064-7E2-C018A	MUMBAI YANGON	Drilling Equipment	251 1,240	25-4-2018 30-4-2018	— add offer	3hr 15min
064-7E2-C00BA	PORT KLANG MALDIVE ISLANDS	Boat	62 —	16-4-2018 30-4-2018	— add offer	4hr 50min
054-7E2-C031D	FIJI OLBIA	Boat	230 —	20-4-2018 10-5-2018	— add offer	22hr 53min
054-7E2-C031C	LIVORNO BOURGAS	Crane	250 —	15-4-2018 30-4-2018	— add offer	22hr 55min
054-7E2-C0319	LIVORNO BOURGAS	Crane	250 —	15-4-2018 30-4-2018	— add offer	23hr 07min
054-7E2-C0317	LIVORNO BOURGAS	Crane	250 —	15-4-2018 30-4-2018	— add offer	23hr 23min
054-7E2-C0316	LIVORNO BOURGAS	Crane	250 —	15-4-2018 30-4-2018	— add offer	23hr 23min
054-7E2-C0308	CONSTANTZA ASSALUYEH	Steam Drum	194 —	16-4-2018 30-4-2018	— add offer	23hr 42min

Figure D.2: The Interface of ShipNext: Cargoes [Shipnext, 2018]

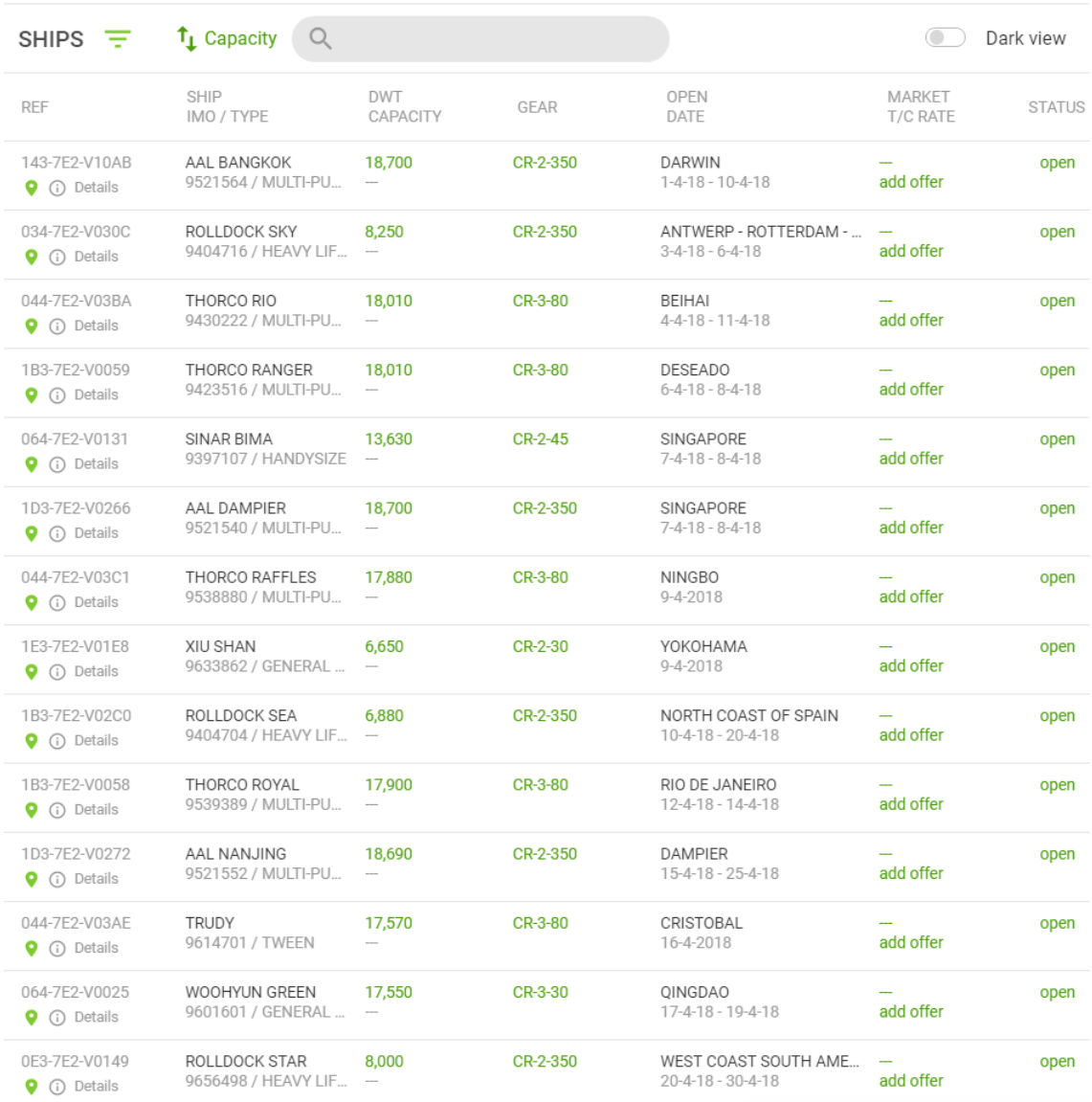


Figure D.3: The Interface of ShipNext: Vessels [Shipnext, 2018]

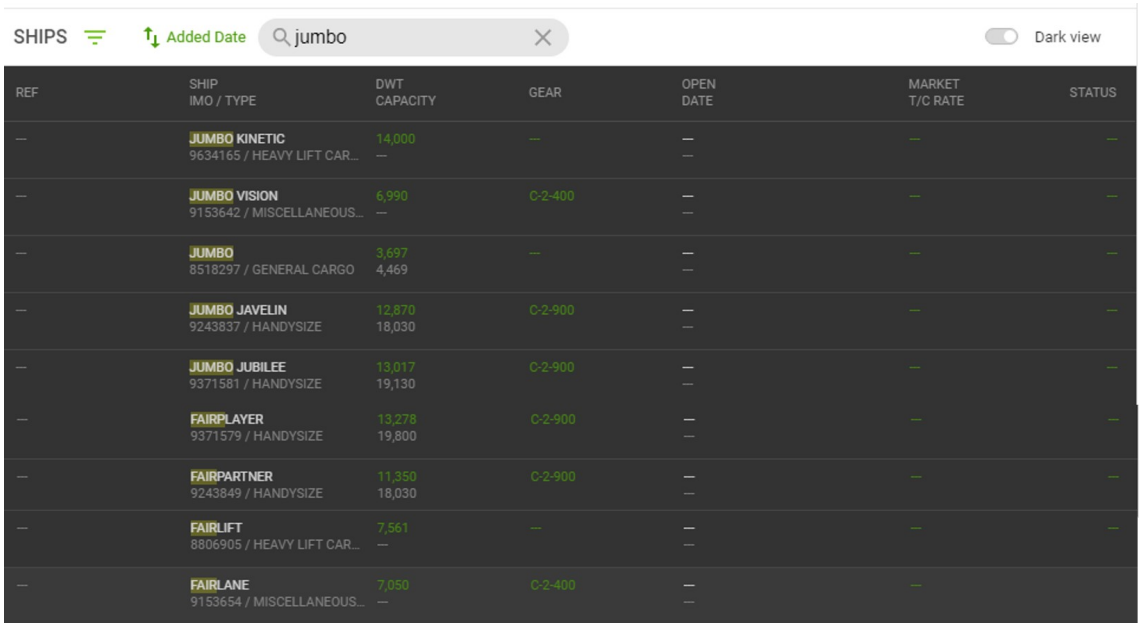


Figure D.4: Jumbo Tonnage on ShipNext [Shipnext, 2018]

Appendix E

Opportunity and Risk Analysis

E.1 Formulation of Strategic Options through a SWOT analysis

The format that is used for the formulation of strategic options is shown in table E.1. Strategic options are formulated that counter the threats, take advantage of the opportunities, leverage the strengths and counter weaknesses, using this format. Four types of strategic options can be formulated using this format of a SWOT analysis. The first type of options leverage strengths to maximize opportunities. The second type of options leverage strengths to minimize threats. The third type of options counter weaknesses through the exploitation of opportunities. The fourth and final type of options counter weaknesses and threats.

Table E.1: Formulation of Strategic Options through SWOT Analysis

	Strengths	Weaknesses
Opportunities	Leverage Strenghts to Maximize Opportunities	Counter Weaknesses Through Exploiting Opportunities
Threats	Leverage Strengths to Minimize Threats	Counter Weaknesses & Threats

E.2 Opportunity and Risk Assessment of the Strategic Options

The opportunity and risk matrices are included in this appendix that are used for the opportunity and risk assessment of the strategic options in chapter 7. The opportunity matrix is shown in table E.2 and the risk matrix is shown in table E.3.

Table E.2: Opportunity Matrix

	Impact	Negligible	Minor	Moderate	Severe	Major	
Probability		**1**	**2**	**3**	**4**	**5**	Very Low
Very Unlikely	**1**	1	2	3	4	5	Low
Unlikely	**2**	2	4	6	8	10	Medium
Moderate	**3**	3	6	9	12	15	High
Likely	**4**	4	8	12	16	20	Very High
Very Likely	**5**	5	10	15	20	25	Extreme

Table E.3: Risk Matrix

	Impact	Negligible	Minor	Moderate	Severe	Major	
Probability		**1**	**2**	**3**	**4**	**5**	Very Low
Very Unlikely	**1**	1	2	3	4	5	Low
Unlikely	**2**	2	4	6	8	10	Medium
Moderate	**3**	3	6	9	12	15	High
Likely	**4**	4	8	12	16	20	Very High
Very Likely	**5**	5	10	15	20	25	Extreme

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