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Digitalitalization of the shipbroking market

Changing tides, a new wave of digital platforms entering the shipbroking market

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1. Abstract

This thesis contributes with an overview of the market landscape for digital platforms in the shipbroking industry and a typology to classify these platforms. Further, it examines the value proposition of digital platforms in the shipbroking industry and their ability prove commercially successful. This is investigated by analysing their ability for efficient searching and matching of vessels and cargoes, and their ability to provide additional services. Finally, we analyse of the digital platforms ability to successfully enter the shipbroking market.

If one takes all the potential efficiency gains, cost reduction and additional services a digital platform can provide into consideration, the value proposition seems promising. However, there are many hurdles a digital platform provider must overcome before he is able to efficiently challenge the market position of traditional brokers. The most important hurdle to overcome in order to prove commercially successful is to obtain a commercially interesting network.

2. Introduction

2.1 Motivation for the topic chosen

In the shipping market the shipbroker is an important player, undertaking the role of matching buyers and seller of freight. In this way the shipbroker makes the market mechanism run more smoothly (Strandenes, 2000). In return for matching the buyer and seller, the broker charges a brokerage. Usually the brokerage is about 1.25% of the fixture value per shipbroker involved in the transaction (Plomaritou & Papadopoulos, 2018). However, the shipping industry is a margin business, and in many cases, the parties try to bypass the broker, and deals are done directly. However, this is not always easy as the broker in many cases is the best-informed player in the market, making it costly and often difficult to bypass him.

However, since the early 2000s people has believed that the role of the broker can be replaced by digital platforms, making the process of connecting vessels and cargos more efficient. During the dotcom era in the early 2000s, about thirty digital platforms was established. All these platforms failed to prove efficient and failed to disrupt the shipbroking market, mainly due to a low-quality service and the inability to build attractive networks (Batrinca , 2008).

Since the early 2000s there has been a major technological development in internet based digital platforms. Across several industries, companies like Airbnb and Uber has in recent years disrupted several markets with the help of digital platforms. This digital trend is also present in the shipping industry. Most of digitalization initiatives in the shipping industry so far has been targeting the technical side of operations, because the operational cost accounts for about 75 % of total costs (Drewry Maritime Research , 2013). However, today a new wave of digital platforms is entering the scene, targeting and challenging the market positions currently occupied by the traditional broker. These platforms are targeting the commercial side of shipping operations. Aiming to reduce the transaction costs and make the matching process of cargos and vessels more efficient, as well as making the market more transparent. In the last two years there have been launched four digital chartering market platforms for sales and purchase of seaborne freight, and four shipping market intelligence services. This recent development raises the question if these platforms will be able to enter the market successfully, or if they will fail as their predecessors did in the early 2000s. Furthermore, one may ask if these platforms will be able to deliver on reduced costs, reduced risk and increased market

efficiency, and if they are able to supply additional services, equal to or better than the services provided by the traditional brokers today.

The latest development in the market for digital platforms that challenge the traditional broker and the consequences of this development, has so far not been investigated from an academic point of view. The objective of this thesis is therefore to investigate the potential impact digital platforms may have on the shipping market, and how the role of the traditional broker might be affected.

2.2 Thesis outline

This thesis starts with a market overview of the current market for digital platforms. This overview provides a short presentation of the current players, in detail describing the pure digital platforms, with a particular focus on digital chartering market platforms. The market overview is followed by a summary of the most important literature concerning digital chartering marketplaces for seaborne freight. In addition, we provide insight on key literature on shipbroking, digital intermediaries and network effects that are used as basis for this thesis.

After the literary review a concise outline of the research questions is provided, and we in detail present what this thesis aims to answer. The following chapters give an overview of the methodical approach used to analyse the research questions, before an extensive analysis is given. The analysis covers the searching and matching function of digital platforms, the cost of using digital platforms, additional services provided by digital platforms and the ability of digital platforms to enter the market successfully.

At the end we summarize the main results of the analysis, conclude on the initial research questions and provide thoughts on how this thesis can be followed up by further research.

2.2.1 Limitations of the thesis

The thesis mainly examines the digital chartering market platforms and the services closely related to them. Broking related to sales and purchase and project financing is considered outside the boundaries of this thesis. Other limitations is commented in their respective sections.

2.3 Definitions

The two most central terms used in this thesis are “traditional broker” and “digital platform”.

2.3.1 Traditional broker

Stopford (2009) defines a shipbroker is an individual with current market knowledge who acts as an intermediary between buyers and sellers in return for a percentage commission of the transaction. There are several types of these, for example, chartering brokers deal with cargo; sale and purchase brokers deal with buying and selling ships; newbuilding brokers deal with contracts for new ships.

A second definitions is given by Strandenes (2000). According to Strandenes, a shipbroker is a person who search, match agents and assist in the bargaining process between these agents. The shipbroker also takes care of formalities in the contract. For the service the broker charges the agents a commission.

Based on these definitions this thesis defines a traditional broker as an individual with market knowledge, who undertake the task of searching the market in order to match charterers and ship owners, and who assist them with the bargaining process and with legal matters. In this thesis we often refer to the broker as one individual, but we acknowledge that a charterer or ship owner often use multiple brokers when fixing a cargo or vessel.

2.3.2 Digital platform

According to the OECD (2010) a web e-commerce intermediary is a connector of buyers and sellers, who enables internet-based transactions between them. The web e-commerce intermediary often provides a range of often bundled services such as fixing prices, transaction processing and co-ordination, quality guarantees, and monitoring. An internet transaction is the sale or purchase of goods or services, between businesses, households, individuals, governments or other public and private organisations, conducted over the internet. The goods or services are ordered over the internet, while the payment and the ultimate delivery of the good or service may be conducted on or off-line. The web e-commerce intermediary facilitates sales of goods and services often on an auction or ordering basis, and generally receive a commission or fee for the service.

A second definition is given by Clark & Lee (1999), electronic intermediaries are providers of IT- and business infrastructure to facilitate the completion of commercial transactions over the internet. To build trust among market participants, electronic intermediaries establish policies and processes that regulate responsibilities and duties of market participants and legitimate transactions, reduce risk and establish trust among market participants.

Based on the definitions above this thesis define a digital platform as an internet-based service provider, that supply the needed infrastructure and related services for charters and ship owners to conduct the fixing of vessels and cargos and other business-related transactions.

2.4 The market landscape for digital platforms

Over the last couple of years several "new" digital platforms have been introduced to the shipbroking market. To the extent of our knowledge there are today eleven platforms, that in some way are targeting the market today occupied by shipbrokers. These platforms can be divided in to three categories; chartering platforms, market intelligence platforms and information pooling platforms for shipbrokers. In this section we give an overview of these platforms and map out the market landscape for digital platforms in the shipbroking market. In addition to the "new" platforms, we also have several digital market intelligence platforms supplied by traditional shipbroking firms, these platforms are spinoffs from the brokering and research activities they already provide. In contrast the "new" market intelligence platforms are to a large extent independent information providing firms. We will therefore only briefly touch upon market intelligence platforms supplied by traditional shipbroking firms, and not provide a complete overview of them. There are also brokering platforms for internal use in shipbroking firms, but because of their internal character they are considered outside the boundaries of this thesis and will only be mentioned briefly.

In the market space for digital platforms in the shipbroking market we have therefore identified the following "new" platforms:

Platform	Country	Web address	Launched	Type	Main focus
Chartering platforms:					
ShipNEXT	Ukraine	shipnext.com	2017	Chartering	General and dry bulk cargo
BHP	Singapore		2017	Chartering	Iron ore
OpenseaPro	USA	opensea.pro	2014	Chartering	Matching
VesselBot	Greece	vesselbot.com	2017	Chartering	Matching
FreieXchange	Norway	freixchange.com	2018	Chartering & Information	Oil Products and offshore
Market intelligence platforms:					
Vortexa	UK	vortexa.com	2016	Information	Oil markets
Xeneta	Norway	xeneta.com	2012	Information	Container
The Ocean Frith Exchange	Singapore	theofe.com	2015	Information	Market info
Vessels Value	UK	vesselsvalue.com	2017	Information	Valuation
Signal Ocean	Greece	Signalocean.com	2015	Information	Tanker market
Information pooling platforms:					
AXS Marine	UK	axsmarine.com	2000	Information	Information Pooling

Table 1 - Overview of digital platforms I (by the authors)

Platform	Pricing	Users
Chartering platforms:		
ShipNEXT	1% brokerage	Owners and charterers
BHP	Free	Only for invited shipowners
OpenseaPro	0 – 850 $/month + 1% brokerage	Brokers, Owners, Charterers
VesselBot	1% brokerage	Owners and charterers
FreiXchange	0.25% brokerage	Owners and charterers
Market intelligence platforms:		
Vortexa	Undisclosed	Charterers
Xeneta	Undisclosed	Charterers
The Ocean Freight Exchange	450 $ per user per month	Brokers, Owners, Charterers
Vessels Value	5000 GBP -	Brokers, Owners, Charterers
Signal Ocean	280 $ per month -	Brokers, Owners, Charterers
Information pooling platforms:		
AXS Marine	Undisclosed	Brokers

Table 2 - Overview of digital platforms II (by the authors)

2.4.1 Chartering market platforms

Digital chartering market platforms are platforms where cargoes and vessels are matched, and the freight rates are negotiated. This happens via online systems where ship owners and cargo owners post their positions. The platform´s algorithm suggests the best available matches, then players enter into direct negotiation and submits offers to fix the posted vessel or cargo. The

users of chartering market platforms are mainly charterers and ship owners that can be categorized in four groups: The first group is innovating companies with a leadership that believe the future success of their business depend on their ability to adopt new technology. The second group is companies using the platforms as a part of their legal compliance measures. The third, and largest group is users who are seeing this as an additional channel to find and conclude business, particularly in markets they do not know. The forth group is small market players that are struggling to get access to the main market places.

BHP Billiton

Global miner and major charterer BHP launched its own digital platform for sales and purchase of freight in 2017, with the goal to reduce chartering costs. The platform is auction-based, the price is settled in a Dutch auction, where the lowest bidder is the winner. The idea is to reduce the cost in two ways. First, by bypassing the broker and second, by introducing a more competitive auction form. The platform makes it easier for a larger number of bidders to take part in the auctions, making the prices more competitive. There is no user fee for platform members (BHP Billiton , 2017).

To secure the quality of the bidding ship owners, only invited ship owners can submit bids on the platform. As part of the prequalification process all terms and conditions are pre-negotiated, the auction only settles the price. The bids are not disclosed to other bidders and the winning bidder is not disclosed. So far, the platform mainly focuses on the iron ore trade from Australia to China, but BHP Billiton (2017) has announced that they will expand the platform to cover more trades in the future.

According to BHP Billiton the first fixtures concluded at the platform realized a rate 5% lower than the current spot rate. If used in all shipping activities during 2017 it would represent 76 million USD in reduced shipping costs from Australia to China for BHP (Wallis, 2017).

FreiXchange

FreiXchange is a Norwegian based chartering platform established in 2016, which went online in the spring of 2018. FreiXchange provide an online market place where ship owners and cargo owners can post their vessels and cargoes, aiming to make matching more efficient and transparent. The price is settled by direct negotiations between the ship owner and charterer (FreiXchange, 2018). In addition, FreiXchange is using data generated to provide a market intelligence service with a real-time market data feed. (FreiXchange, 2018) The platform brokerage is 0.25% of the fixture value. The market intelligence service is free for all platform

members. All contact between the parties are recorded, the platform is autogenerating the required documents and all documentation is stored in a private data base (FreiXchange, 2018).

ShipNEXT

ShipNEXT is a Ukrainian chartering platform launched in 2017, the platform is open for all shipowners and charterers. The platform is using algorithms, big data analysis and linear programming to match vessels and cargoes. The matching process can be concluded by direct negotiations or by a pre-set auctioning. The latest fixtures rates are quoted on the platform. ShipNEXT also provides solutions for contract management and can set up block-chain based smart contracts.

By October 2018 ShipNEXT has mainly opened for dry bulk and general cargo fixtures, but various other segments like tankers and car carriers are also marketed at the platform. ShipNEXT is web scraping a large amount of tender e-mails and post open tenders on the platform. At any given time, they are covering about 15% of the global fleet (ShipNEXT, 2018). Though this might seem impressive, we do believe that few of the ship owners know that their ships are present at the platform. Several Norwegian ship owners we have been in contact with, was not aware that their vessels where listed at the platform. ShipNEXT aims to be a cost-efficient alternative and charges a brokerage fee below or equal to 1% for their service (Dixon, 2018). ShipNEXT is a dependent company of the Ukrainian shipping company Varamar.

VesselBot

VesselBot is a Greek chartering platform for charterers and ship owners. The platform uses an algorithm to match possible counterparties based on several factors. The main criteria are proximity between vessel and cargo. The platform brings the best matches together for direct negotiations. The negotiation process is handled through the platform. Once the negotiation is concluded, the platform provides online contracts that is signed by both parties. When the cargo is delivered the counterparties rates each other, making it easy to stay clear of unreliable counterparties (VesselBot, 2018). In addition to the online matching service VesselBot has a team of maritime specialist, that are available to deal with problems that may arise between parties. Furthermore, the team of maritime specialists can advise on freight rates, provide market insights, charter party terms and post fixing operations. The cost of these complementary services is dependent on the user's business relation with VesselBot (VesselBot, 2018).

OpenSea.Pro

OpenSea.Pro is a US based chartering platform, for ship owners, charterers and shipbrokers. The players can post their open market positions on the platform and with the help of the OpenSea.pro algorithms the members are presented with the optimal matches. The matched parties enter then into direct negotiations. To use the system, users pay a monthly subscription fee from 0 - 850 USD depending on the subscription type, and a 1% brokerage for transactions concluded on the platform (OpenSea.Pro, 2018).

2.4.2 Market intelligence platforms

Market intelligence platforms provide commercial market data. In general, these platforms are gathering and systemizing large amounts of quantitative data, providing the market players with extensive market information in a user-friendly interface. The target groups of these platforms consist of many different types of market players, such as ship owners, charterers, banks and investors.

Xeneta

Xeneta is a Norwegian based platform providing market intelligence, focusing on the container market. With the use of big data, Xeneta provide an intelligence- and analytics platform, feeding charterers and ship owners with real time data to compare freight rates with their database of global contracted rates. Enabling freight rate benchmarking and providing market intelligence (Xeneta, 2018).

Vortexa

Vortexa is a market intelligence platform, providing data, cargo tracking and analytics on crude oil and refined products traded in real time. The company is mainly targeting traders and aim to supply them with quality market intelligence they may need in their trading activities (Vortexa, 2018).

The Ocean freight exchange

The Ocean freight exchange is a market intelligence platform for charterers, ship owners, and brokers in the dry bulk-, tanker-, and gas market. The platform provides brokers and ship owners with the opportunity to post their vessel positions, the platform then enables charterers to directly contact the broker or ship owner. In addition, the platform provides an overview of the latest fixtures and a system for displaying the voyage history of the vessels. The cost of using the system is starting at 450 USD a month per user (The Ocean Freigth Exchange , 2018).

Vessels Value

Vessels Value is a digital platform for valuation of vessels. With the help of vessel tracking and market intelligence, the platform provides users with up to date valuations of specific vessels. Giving an indication of the market price of the vessel and how the value has developed historically. The platform is covering the global fleet of Bulkers, Tankers, Containers, LPG, LNG, Small Tankers, Small Dry, Offshore and Superyachts. The services are targeting banks, investment funds, ship owners and other market players. The subscription fee for the service starts at 5 000 GBP annually (VesselsValue, 2018).

Signal Ocean

Signal Ocean is an analytics company providing a digital market intelligence platform. The platform provides market information on rates and trade flows. It can also analyse the user's private information and combine it with market data to provide company specific analysis. The platform is targeting players such as ship owners, charterers and commodity traders. The subscription fee starts at 280 USD per month. The company is owned by the Greek Signal Marine Group (Signal Ocean , 2018).

Other market intelligence platforms

In addition to the services described above we also find that existing shipbroking firms provides market intelligence platforms. These market intelligence platforms are partly provided as an inhouse service, and partly as an external market intelligence platform. These platforms are typically spinoffs from inhouse research activities. Possibly, the most well-known of these services are the platforms of Clarksons. In total their research company provide a spectre of five different online platforms for market intelligence (*The Shipping Intelligence Network, The Offshore Intelligence Network, The World Fleet Register, The World Offshore Register and SeaNet)*. Other examples of similar services are Bassoe Analytics, the digital market intelligence platform of Bassoe Shipbrokers. SSYOnline, the digital platforms of the shipbroking firm Simpson, Spence & Young. These services are similar to the new digital market intelligence platforms. The main difference is that the “new” platforms mainly are independent data driven information- and intelligence companies operating a digital platform and the “old” platforms mainly are traditional brokers offering their knowledge on a digital platform.

2.4.3 Information pooling platforms

Digital information pooling platforms are platforms where shipbrokers can pool their information to get a broader market understanding. They mainly focus on small shipbroking

firms and independent shipbrokers that are unable to do efficient information gathering themselves.

AXS Marine

AXS Marine, is an information pooling platform owned by the Paris-based broker Barry Rogliano Salles and Oldendorff Carriers. AXS Marine was formed during the dotcom era and is one of the few survivors of the first wave of digital shipping platforms from this period. The platform is mainly designed for brokers as a place where they can pool their information, creating a broad common information base, across segments and geography. The platform is mainly targeting the dry bulk-, tanker- and liner markets. The platform provides brokers with an overview of historical fixtures, vessel descriptions and trade flows. The platform is also supplying market insights to operators, owners, charterers, research firms and financial institutions (AXS Marine, 2018).

2.4.4 Brokering platforms

Brokering platforms are used by shipbrokers to keep track of their chartering activity and the movements of the world fleet. These platforms are typically for internal use in shipbroking firms, and is an important part of their information gathering process. These platforms are outside the boundaries of this thesis, we will therefore just mention their existence without any further elaboration.

2.4.5 The market landscape

Based on the above overview of digital market platforms we can develop a typology to classify the different types of digital platforms. Dividing the platforms in to four categories based on two dimensions; the user dimension and the service dimension. The user dimension (*Y-axis*), tell us about the target group of the platform, it varies from being oriented towards the shipbroker to being oriented towards charterers and ship owners. The service dimension (*X-axis*), tell about the service the platforms provide, it varies from being chartering based services to being intelligence-based services. With different combinations of these two dimensions we find the four categories: Chartering market platforms, market intelligence platforms, information pooling platforms and brokering platforms.

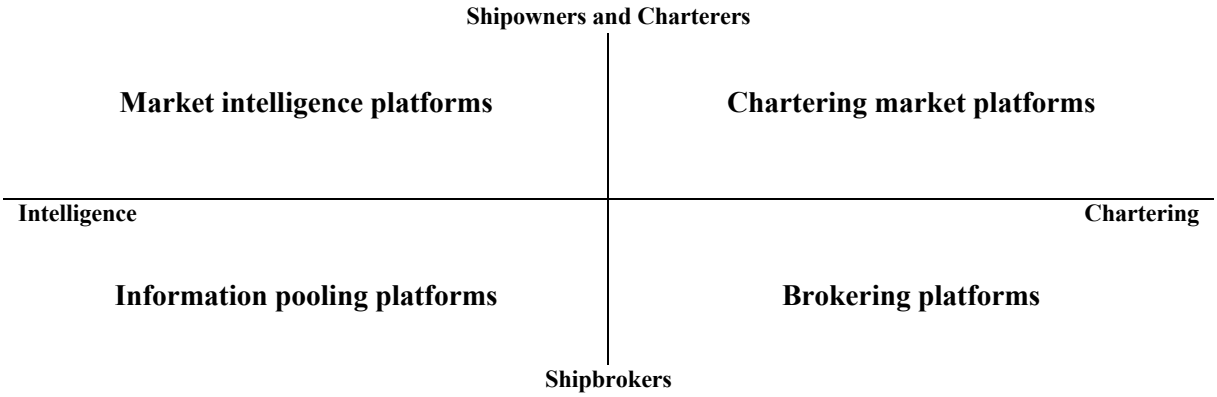

Figure 1 - The market landscape typology (by the authors)

Based on our typology we draw out the current market landscape. We also distinguish between "old" and "new" platforms. Among the "old" platforms we find the inhouse brokering platforms of various shipbroking firms and their spinoff information platforms. Among the "new" platforms we mainly find independent platforms that are targeting the chartering- or information service side of the shipbroking business.

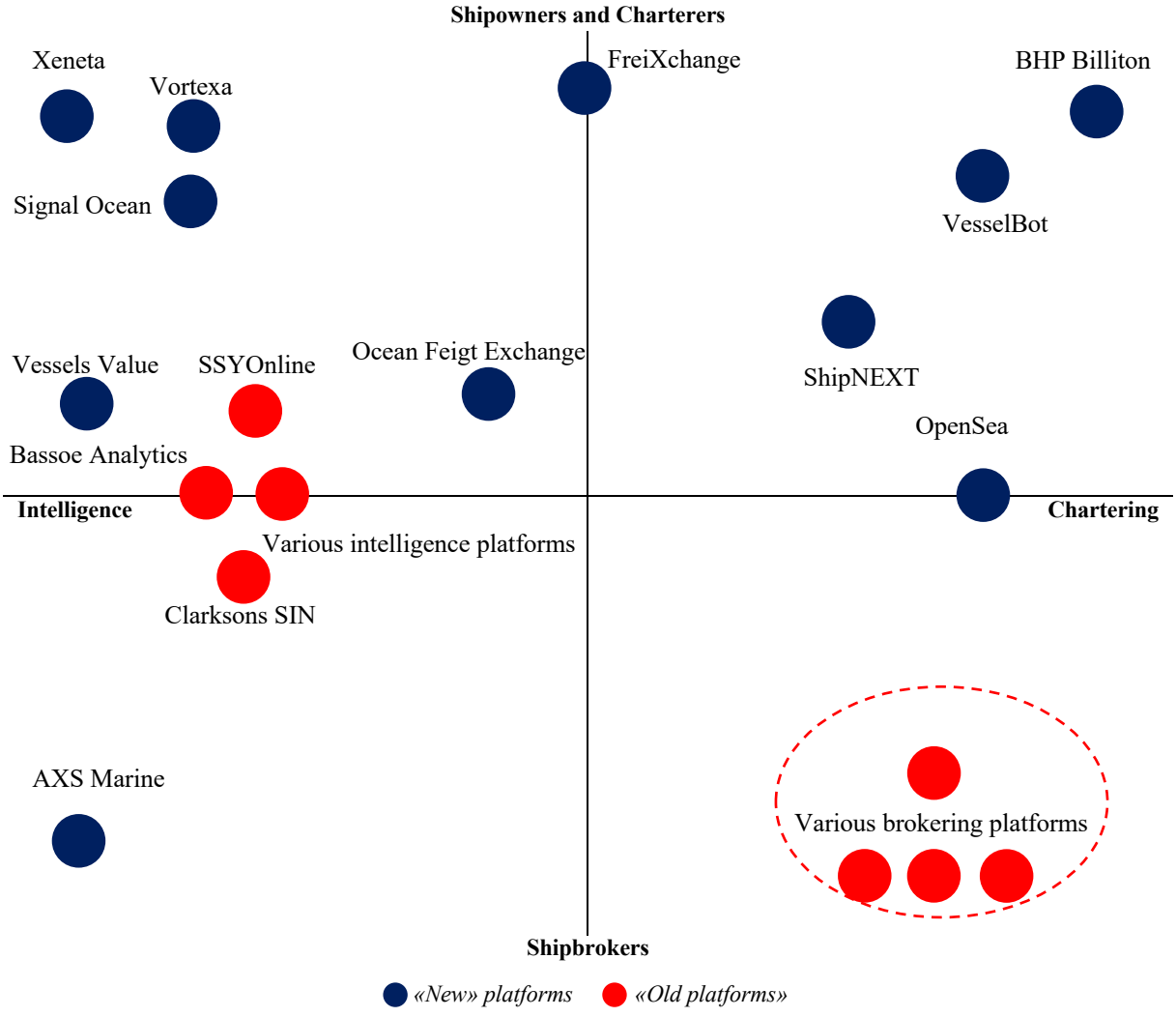

Figure 2 - The market landscape (the horizontal axis represents the platform type; the vertical axis represents the targeted user group) (by the authors).

From the market landscape map one can see that the "new" digital platforms are particularly different form the "old" ones along the user dimension. The development of these "new" platforms represent a user shift from shipbrokers towards ship owners and charterers. This shift is trigged by a belief that digital platforms in general, and digital chartering platforms in particular can offer a competitive value proposition in competition with the traditional broker. Based on the above market overview we can say that the general value proposition of the digital platforms compared to traditional brokers has four main features; 1. Increased searching and matching efficiency in the chartering process. 2. A more cost-efficient chartering process. 3. Increased market transparency. 4. Reduced commercial- and legal risk by increasing the traceability and transparency of deals and communication.

The market landscape we have described in the above sections did not exist just a few years ago. The "new" market intelligence platforms we have detected has been launched between 2012 and 2018. The "new" chartering market platforms we have described have all been launched between 2017 and 2018. Today the market landscape can be mapped as Figure 2 shows.

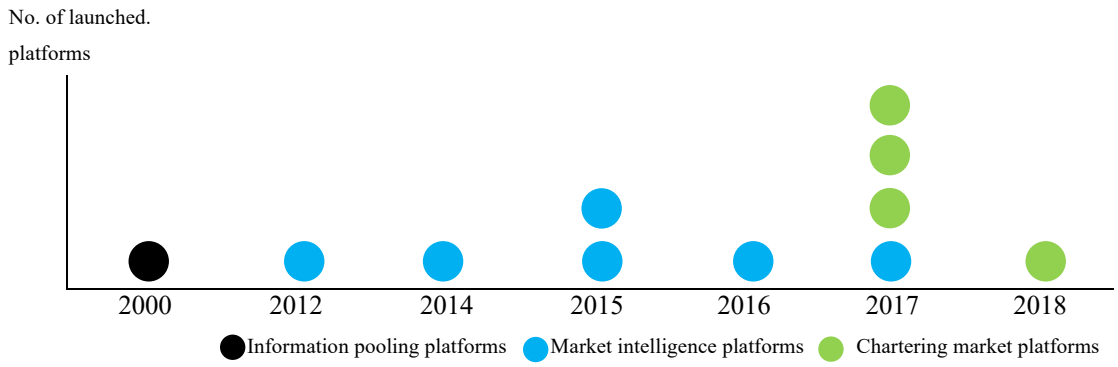

Figure 3 – Market entries of "new" digital platforms (by the authors)

2.5 Litterature review

There are few academic studies on digital platforms in the shipping industry. The few studies existing are mainly from the dotcom period around 2000, several of these studies do not discuss digital platforms in particular, but more generally how digitalization will affect the information flows in the industry.

Pisanias & Willcocks (1999) discuss the role of relations as a barrier that slows the adoption of information technology in brokering markets. They conclude that technology adoption is delayed by that digital platforms are not able to imitate the interpersonal relations of the traditional broker.

Stopford (2002) gives an historic overview of how the communication methods has changed over time in the shipping industry. He concludes that digitalization will make chartering go online, but that the broker will remain in business as a commercial advisor.

Fiotakis (2005) discuss the impact of information technology (IT) upon the shipbroking profession, concluding that IT can make traditional brokers provide better services and make them stay on top of the market. But he also recognizes the threat posed by digitalisation on the shipbroking profession as a result of automatization of work processes.

The latest to discussing digitalization of the shipbroking business is Betrinca (2008). Betrinca is providing a short historical overview of the first wave of digital platforms. Further discussing why, the first wave of digital platforms failed to succeed in the early 2000s, and what requirements a platform must meet in order to succeed. Betrinca concludes that these platforms failed due to the user's unwillingness to share information and that internet adoption was too weak. In combinations with inferior service quality, Betrinca argue that the success of a digital platform is dependent on their ability to supply a user-friendly service. The platform provider must be an independent third party (*not one of the current market players*). The service provider would also need substantial funding to maintain the platform as they build the required network size. Betrinca estimates that a platform would need to capture 10% of the market before it will manage to establish a successful market position.

While there is little literature on digitalization of the shipbroking profession there are several studies on the middleman and the shipbroking profession in more general. This thesis relies on the works of Plomaritou & Papadopulos (2018) and Strandenes (2000). Plomaritou & Papadopulos (2018) are giving a broad account of all aspects of the shipbroking profession, providing a comprehensive accounting on how the shipbroking business is conducted.

Strandenes (2000) discusses the role of the shipbroker and provides an overview of the shipbroker's activities and resources, discussing how these contribute to market efficiency. In addition, Strandenes states that the shipbroker is providing services based on two types of

information: First, knowledge about the market agents' capacities and availability, and second, knowledge on quality of services offered. She suggests that only the first type of information may be replicated by internet intermediaries.

In the land-based freight market we have already seen the development of digital platforms, and several studies have been performed. This thesis is there for partly based on insight form the land-based freight market.

Janssen & Verbraeck (2008) discuss the introduction of internet based real time matching mechanisms in the land-based freight market. The article argues that internet based matching platforms can be advantageous in many ways. However, the article discusses the problems of introducing standardized models in a market with many different matching contexts. Charterers interviewed revealed that reduced searching time and -cost are the most prominent reasons to opt for digital platforms. The article also proposes a matching model with variables based on interviews with charterers and transportation firms.

A paramount factor for in the shipbroking business and digital platforms is the presence of network effects. An area where several studies has been performed. This thesis utilizes the insight from some key studies on network effects and digitalisation.

Belik, Kundsen, Lien, Pandy & Timmerman (2018) discusses the features of network effects and big data. They consider how these two elements affect the competitive situation in a market. Concluding that network effects have the ability to create stable competitive outcomes, if combined with big data an even more stable outcome can be achieved.

2.6 Research questions

2.6.1 Main research question

The fundamental research question of this thesis is:

"What is the value proposition of digital platforms in the shipbroking industry and do they have the ability to be commercially successful?"

This question is answered based on an assessment of to which extend digital platforms can fill the functions of the traditional ship broker role described in section 2.3.1. Additionally, the thesis investigates whether digital platforms are able to enter the ship broking market successfully.

The following sections provide an outline of the sub questions this thesis will address in order to answer the fundamental research question:

2.6.2 Sub question 1 - searching & matching

The main role of the traditional broker is to efficiently search for potential matches of vessels and cargoes and then match the parties. To examine whether a digital platform can outperform traditional brokers in the searching and matching function we ask the following question:

Can digital platforms find and match buyers and sellers of seaborne transportation more efficiently than traditional brokers?

2.6.3 Sub question 2 - additional services

In addition to the searching and matching function, the traditional broker often provides additional services for the charterers and ship owner. A charterer or ship owner may rely on the broker's expertise to evaluate and exclude low quality counterparties, hedge future freight rates, mitigate risk of mistakes in the fixing process and various other commercial and legal matters. To examine if, and to which extent a digital platform can fill this function we ask the following question:

Do the traditional broker add value in ways that cannot be replicated by a digital platform?

2.6.4 Sub question 3 - market entery

The digital platforms may have the potential to transform the way business is done in the shipping industry, but based on the experiences from the early 2000s, the they proved unable to enter the market successfully. Therefore, we ask the following question:

Are digital platforms able to successfully enter the ship broking market?

3. Data and Methodology

According to Wijnolst & Wergeland (2009) there are two main approaches to study shipping markets, traditional industry analysis and formal modelling. Traditional industry analysis has a descriptive purpose and is often combined with theoretical frameworks in order to have an analytical approach to the description of phenomena. Formal modelling, in contrast is based on mathematical models, being econometric- or equilibrium models using algorithms to solve numerous equations, or they can be system dynamics models aiming to describe how a system may work based on various assumptions.

This thesis deploys formal modelling to review how digital broking may compare to traditional broking based on a system dynamics model. Additionally, simple statistical methods are performed to compare vessels and cargoes between different platforms. Further, the thesis deploys traditional industry analysis to evaluate the additional services provided by the digital platforms, cost efficiency and the digital platforms ability to enter the market.

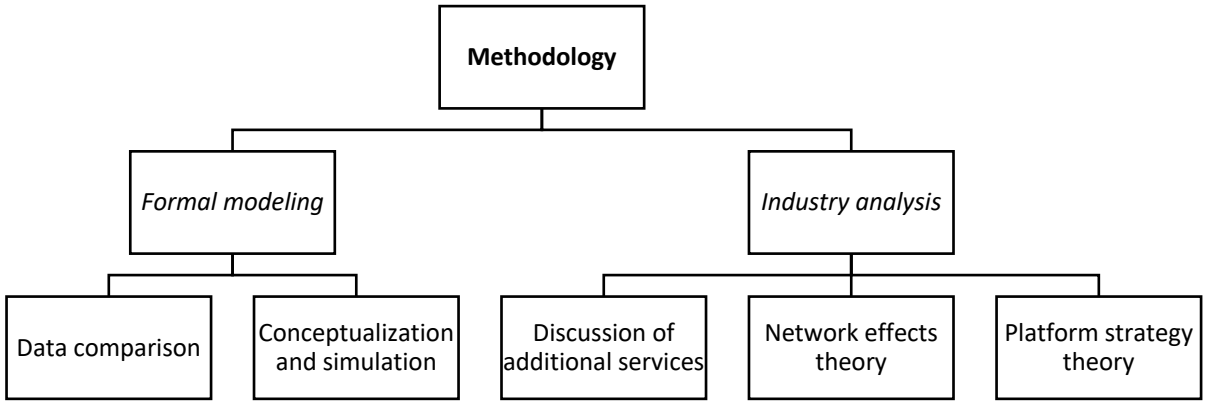

Figure 4 - Overview of methods (by the authors)

3.1 Data

This master thesis is based on four main sources of data; Vessel and cargo data from ShipNEXT, cargo data from OpenSea, vessel and market data from Clarksons Shipping Intelligence Network (SIN) and interviews with industry professionals.

3.1.1 Vessel and cargo data

We have collected historical data on vessels and cargoes from Clarksons, ShipNEXT and OpenSea. From Clarksons World Fleet Register we have downloaded a dataset on the

complete world fleet the 11. Of November 2018. The data set consist of IMO-numbers, size (dead weight tonnes), building year, type and name. Clarksons World Fleet Register is used as it to our knowledge has the most complete list of the world fleet and the individual vessel specifications. From ShipNEXT we have obtained IMO-numbers on 3000 open ships and data on 50 open cargoes. This data was collected by extracting data from ShipNEXT.com the 11. of November 2018. From OpenSea we have obtained data on 20 open cargoes, the data was extracted on the 11. of November 2018. The data was structured in Excel, the Clarksons database was included with a binary variable that indicated whether a vessel was listed on ShipNEXT or not to be able to compare the subset of vessels listed on ShipNEXT with the world fleet.

3.1.2 Interviews with industry professionals

We have interviewed four industry professionals with different positions within the shipping industry. The interviews were performed based on two pre-made questionnaires (see 7.1), one for platform owners and one for platform users. Interviews was performed via telephone or by physical meetings. The objects interviewed did all have a first-hand experience with digital platforms from different sides of the industry, all of them have more than twenty years of experience from the industry. The object of the interviews was to gather knowledge and thoughts on the market for digital platforms in the shipping industry.

In addition to the formal interviews, we have informally been in contact with and discussed the research questions with several industry professionals. Hence, the contact we have had with industry professionals during the work on this thesis has covered the perspective of ship owners, charterers, traditional brokers and digital platform providers.

3.2 Formal modelling

3.2.1 Data comparison

As we have obtained data on open vessels and cargoes on the ShipNEXT platform (section 3.1), we perform a statistical comparison between the vessels listed on ShipNEXT and global fleet data from Clarksons. The intent of the comparison is to unveil if there are features of the sample data from ShipNEXT that can affect the platforms ability to perform searches and to match the parties, or if there are features that make the platform less attractive for some charterers or ship owners

3.2.2 Searching and matching

Formal modeling is further deployed in the form of conceptualization of a system dynamics model which can solve the searching and matching function. Additionally, we create a simple model and run simulations to showcase some of the differences between traditional brokers and digital platforms.

Conceptualization
We provide a conceptualization of how an optimally designed searching and matching model of a digital platform could look like and discuss if such a platform can outperform traditional brokers in the searching and matching function.

Matching model
In former literature on the shipbroking market we cannot find arguments for any specific matching model to deploy. Therefore, we looked for research on matching models from similar markets. Chen, Zhi-Ping, & Chen (2016) Introduce a matching model for electronic intermediated two-sided markets, their work was done in order to describe how such a model can be created from a computer engineering perspective. The model was improved and reviewed from an economics perspective by Le, Zhang, & Ren (2018). Hence, we deploy this matching model, but the more computer technical sides are left outside the boundaries of this thesis.

Simulation
The conceptualized matching model cannot be tested with the data we have obtained. Therefore, we create a highly simplified model of the search and matching process and run simulations it under various assumptions. The results are presented and discussed in the light of sub question 1.

3.3 Industry analysis

Industry analysis can be performed in many ways and there are no single method or approach to how it should be performed. Industry analysis is deployed to make the understanding of chartering markets and the shipbroking functions more explicit. There are many elements one can include when conducting an industry analysis (Wijnolst & Wergeland, 2009), this analysis focuses on the market structure and critical success factors for digital platforms. Hence, we

provide a qualitative discussion on additional services provided by the traditional broker and a discussion on network effects and market entry in the light of network theory.

3.3.1 Qualitative discussion on additional services

To assess the additional services provided by traditional brokers, and the ability of digital platforms to replicate these services, we provide a qualitative discussion on the challenges and possibilities faced by digital platforms in competition with traditional brokers.

3.3.2 Network effects theory

Network effects is a type of complement, where the willingness to pay for a service increases with the network size, which in turn often is determined by the number of users of a service. Complementarity is created by users complementing each other, making the value and attractiveness of the network dependent on the number of users (Besanko, Dranove, Shanley, & Schaefer, 2017). The complementarity is making the demand curve shift outwards, increasing the value creation. A classic example of firms utilizing network effects in a two – sided market is the classified pages in newspapers. Newspaper subscribers and advertisers are complementary to each other. The number of subscribers affects the value of advertising in the newspaper, and the number of adverts increases the value of the information the subscriber gets from reading classified pages. We can graphically display how complementarity increases value creation:

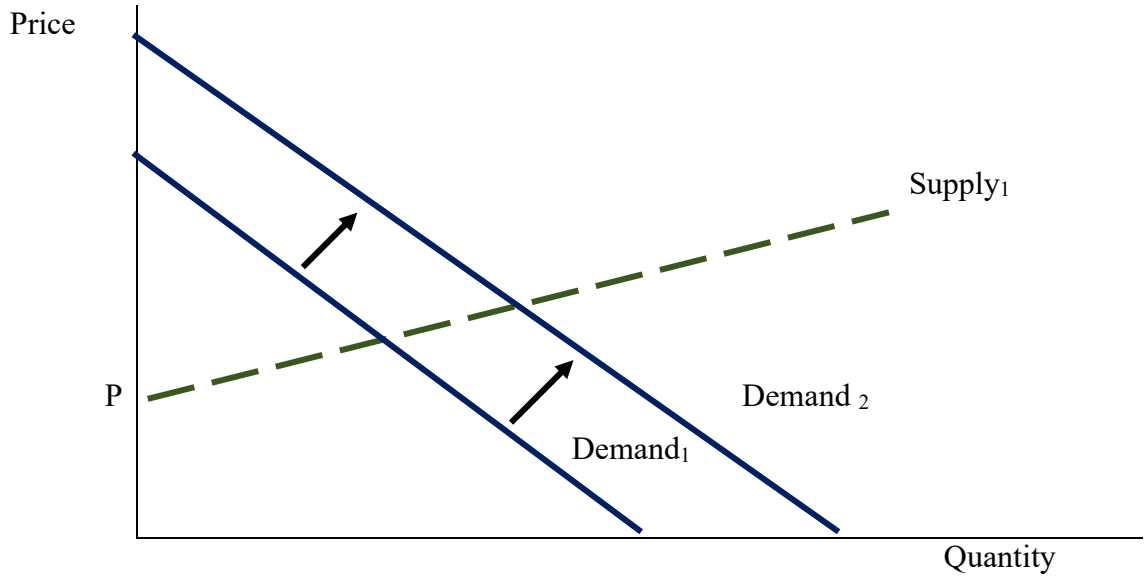

Figure 5 - positive demand effects of complementarity (by the authors)

The complementarity increases as a function of the network size, increasing the value of the service, leading to increased demand and increased value creation, making the demand curve shift to outwards.

Network effects can be direct or indirect. Direct network effects are effects that affect the attractiveness and the direct value of the product or service because of the network size itself (Belik, Knudsen, Lien, Pandey, & Timmermans, 2018). Indirect network effects are a result of complementarity created because of the network size. Additional services or products are made available because of the network size, increasing the value of the service or product (Belik, Knudsen, Lien, Pandey, & Timmermans, 2018). Network effects are in nature self-reinforcing as customers are attracted to the largest networks, because of the increasing complementarity (Besanko, Dranove, Shanley, & Schaefer, 2017).

The multi-sided networks are one type of networks. These networks have multiple user groups connected to the platform. In multi-sided networks the value increases when the number of users from multiple user groups increases, like in the newspaper example above (Besanko, Dranove, Shanley, & Schaefer, 2017). A multisided network can be illustrated in the following way:

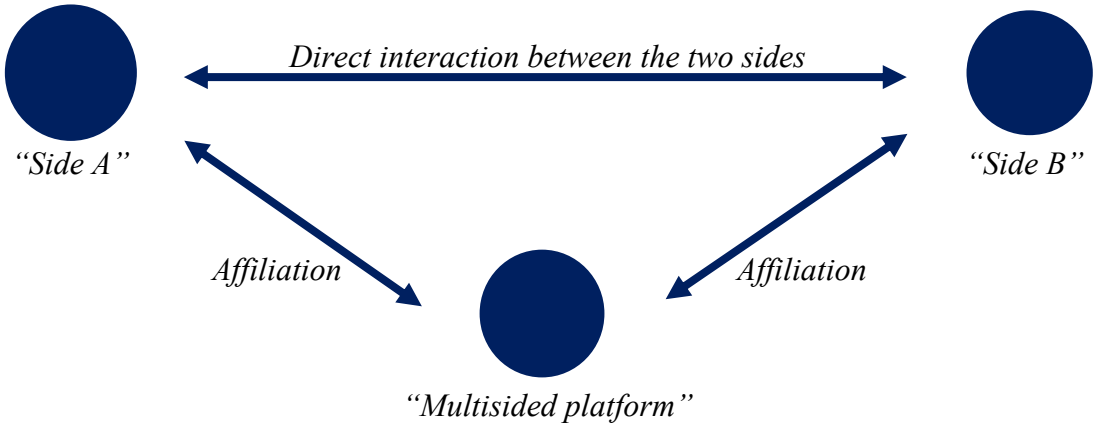

Figure 6 - Multisided platform (Hagiu & Wright, 2015)

Network effects can be present at both firm and technology level. Meaning that the overall number of users of a technology increases the value of the technology independent of the supplier of the technology, or that the network effects only apply for the users of a specific service or product supplied by a specific firm independent of the overall number of technology users (Besanko, Dranove, Shanley, & Schaefer, 2017). An example of the technology dependent network effects is e-mail. The overall number of e-mail users affect the

attractiveness of using e-mail. Independently of which e-mail account supplier one is using. In contrast eBay is an example firm specific network effect. The number of sellers and buyers connected to eBay determines the network attractivity, independent of the overall number of e-commerce platform users.

Before the self-reinforcing processes created by network effects can take place, a network must be of a critical size. Companies are therefore often providing initial incentives for early adopters to reach the critical network size. This is done to increase the value of the product or service for the users before the self-reinforcing complementarity kicks in (Van Alstyne, Parker, & Choudary, 2016). For example, it is free for buyers to use eBay, while sellers have to pay a fee for using eBay.

At the course of network effects, we find demand side economies of scale. Meaning that the willingness to pay increases with the number of customers. Making the effects different from economics of scale where the fixed costs per unit is reduced with the number of units sold (Van Alstyne, Parker, & Choudary, 2016). Instead of lowering cost per unit, you increase the price per unit to capture value.

We can graphically display the network effects:

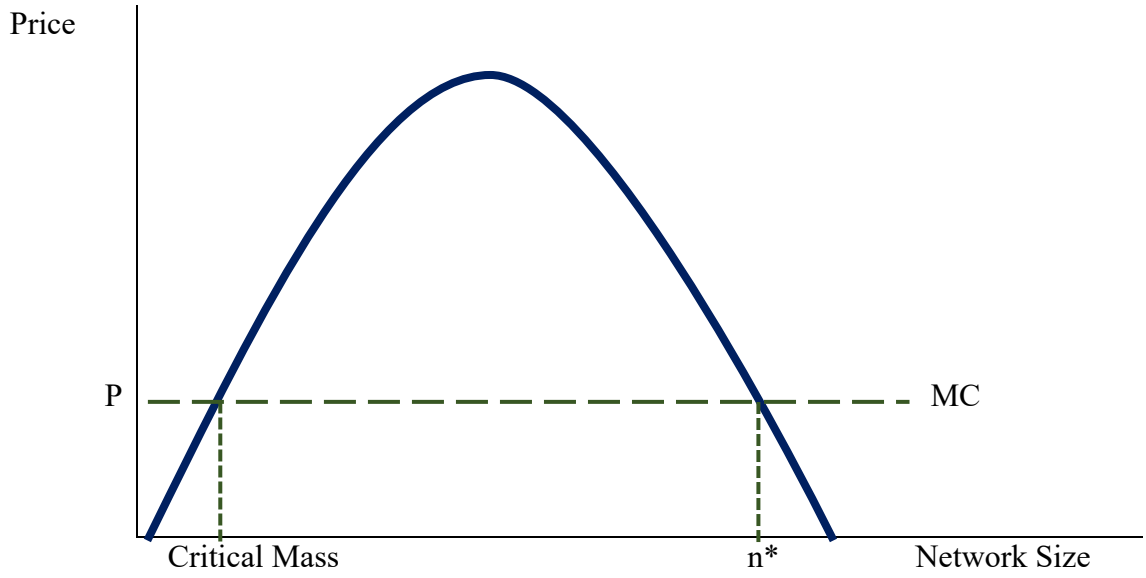

Figure 7 - Network effects (by the authors)

For a given price *p* there is low and a high equilibrium. But only n* is a stable equilibrium. The Critical mass is the point where demand takes off and the network effects become self-reinforcing. The challenge for a digital platform is to grow to the point of critical mass, after this point the network effects accelerate the growth.

3.3.3 Platform strategy theory

Network effects are fundamental for platform strategies. Platform strategies mainly utilize two-sided network effects by allowing different user groups to transact and create value on the platform. These types of platforms are commonly referred to as multisided platforms (MSPs) (Van Alstyne, Parker, & Choudary, 2016).

Platform strategies can be used in traditional markets, but new digital versions of MSPs have taken platform strategies to a new level. The digital MSPs scalability is unprecedented by traditional MSPs. This can be attributed to the great complementarity created by the network size. In addition, the growth of digital MSPs is unconstrained by physical assets (Hagiu & Wright, 2015). A shopping centre is an example of a multisided platform, but its network size is constrained by the building size limiting the number of shops, and the number of neighbouring people is limiting the number of customers. In contrast the number of sellers and buyers on eBay is not constrained by physical limitations. Making everyone with internet access potential eBay users.

Digital MSPs are not just unconstrained by physical limitations, they are also generating large amounts of user data. Enabling big data analysis, that can be used to build even stronger complementarity increasing the self – reinforcing network effects. This feature leads to strong «winner takes it all» dynamics. As a result, fierce battles for dominance might occur in the markets before they are consolidated with a dominating platform (Hagiu & Wright, 2015). Entertainment services like Netflix and HBO have utilized big data in this way. In turn the network effects enable firms to take property to and accumulate unique user data not available to competitors. Potentially yielding a competitive advantage (Belik, Knudsen, Lien, Pandey, & Timmermans, 2018).

Competition in markets with firms utilizing platform strategies, tend to be characterized by initial fierce competition before a stable competitive outcome is reached. Usually with one or some few platforms surviving. The initial fierce competition is a result of the potential value that can be captured by securing a large network. The stable outcome is a consequence of the network complementary which is hard for entrants to replicate (Belik, Knudsen, Lien, Pandey, & Timmermans, 2018). A consequence of the stable competitive outcome with one or just a few players, is that the competition for the market itself is more important than the competition in the market.

4. Analysis

In this section we deploy the methods described in section 3 to answer the research questions described in section 2.6.

4.1 Data comparison

In the shipbroking business information is paramount. However, a shipbroker can have access to a large number of vessels and cargoes without being relevant in the market. Paramount is having the right vessels for the right cargoes at the right time. Hence, we look into differences between the data set of the world fleet and the subset listed on ShipNEXT to evaluate whether the quality of the vessels on ShipNEXT differ from the quality of the world fleet or not. Additionally, we examine the quality of the cargoes listed on ShipNEXT and OpenSea.

4.1.1 Vessels

The objective criteria to classify vessels by quality are not obvious as there are many things that can affect the attractiveness of a vessel which may differ across segments and charterers. However, based on former research on quality differences in the dry bulk market (Tamvakis & Thanopoulou, 2000) there is especially one criterion that indicate the quality of vessels; 1. Building year of the vessel (modern ships induce lower operational risk, and have lower voyage cost due to lower fuel consumption).

The analysis is limited to VLCC (160 000 - 320 000 DWT) and Aframax (80 000 - 120 000 DWT) vessels in the tanker segment.

Building year

The influence of the age of the vessel on freight rates combined with the high importance of age indicated by charterers in former research (Tamvakis & Thanopoulou, 2000), is a strong reason to compare the two pools of vessels on this metric. Research on freight rates indicate that there is a cut of point at about 15 years of age, where rates fall significantly (Tamvakis & Thanopoulou, 2000). Hence, we compare the fleets by the proportion of old (older than 15 years) and new (newer than 15 years) tonnage. The tables below show the proportions of old and new ships in two tanker classes.

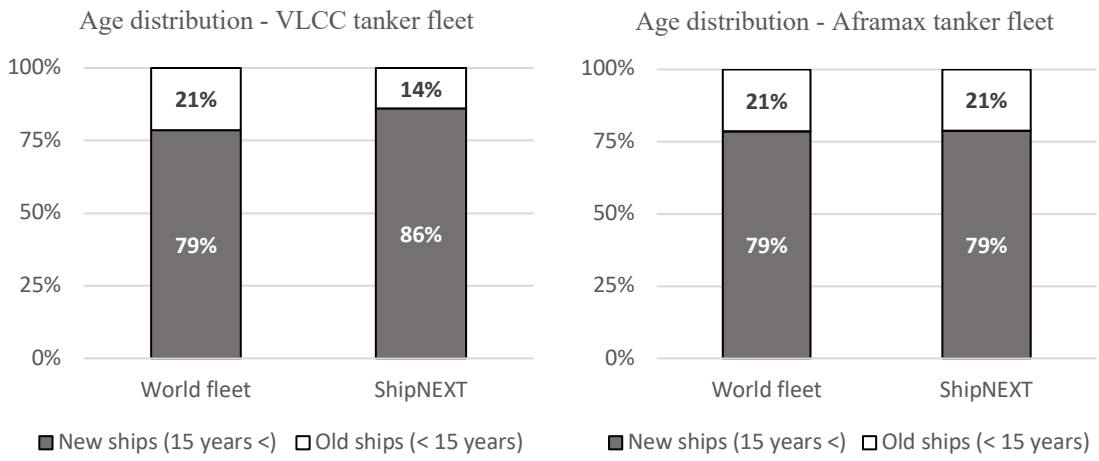

Figure 8 - Age distribution in the tanker market

From the tables on age distribution above it seems "at face" like there are little or no difference in age between the two populations. To control this, we statistically examine whether there are any significant differences in the proportions of old and new ships. This is done by performing a two-sided z-test to test if two proportions are significantly different. The test is performed under the null hypothesis that there are no differences between the two proportions.

Two-sided Z-test				
H_0: $p_1 = p_2$ versus. H_A: $p_1 \neq p_2$				
Segment	Tanker			
Vessel class	VLCC		Aframax	
Sample	World fleet	ShipNext	World fleet	ShipNext
n_i (sample size)	731	86	997	71
y_i (number of old vessels)	156	12	213	15
Z-Value	1.6033		0.0472	
P-value	0.1096		0.96012	
Significant at p < .05	No		No	

Table 3 - Two-sided Z-test of differences in vessel age

From the two-sided z-test we cannot claim that there are differences between the proportions of old ships in the segments we examined with a 95 % confidence level. Hence, we cannot infer differences in quality.

4.1.2 Cargoes

From ShipNEXT we have only obtained 50 open cargoes, when reviewing the cargo data "at face" there seem to be evidence supporting a hypothesis that the cargoes on digital platforms

are cargoes the traditional broker do not want to deal with as the cargoes are too small or located at too remote ports. Of 50 cargoes on ShipNEXT only 6 cargoes have a weight above 60 metric tons, and most cargoes are located at remote ports. However, the limited sample size does not enable us to perform any meaningful statistical analysis. The table below shows an example on how cargoes are listed on ShipNEXT.

Port of Laycan	Port of delivery	CARGO	WEIGHT (MT)	LAYCAN	
Marmara Sea	Newport (South Wales)	Hot Rolled Coils	45689	20.10.2018	03.11.2018
Icdas Port	Uusikaupunki	Wire Rod	43136	19.10.2018	02.11.2018
Fredrikstad	Jorf Lasfar	Steel Scrap	5	15.10.2018	20.10.2018
Fredrikstad	Jorf Lasfar	Steel Scrap	4	15.10.2018	20.10.2018
Nikolayev	Umm Qasr	Steel Rebars	30	18.10.2018	28.10.2018
Nikolayev	Umm Qasr	Steel Rebars	23	18.10.2018	28.10.2018
Gabes	French Atlantic Coast	White Cement	4	11.10.2018	18.10.2018

Table 4 - Example of cargoes listed on ShipNEXT (ShipNEXT, 2018)

When reviewing open cargos on OpenSea we find that they are mainly relatively small cargoes, when comparing them to the average cargoes transported by the global fleet. However, we see that the cargoes listed on OpenSea are generally larger than those posted at ShipNEXT. The table below shows an example of cargoes listed on OpenSea.

Region of Laycan	Region of delivery	CARGO	WEIGHT (MT)	LAYCAN	
East India	North-East India & Bangladesh	Indian Stone Chips	19000	29.11.2018	11.12.2018
West of South East Asia	Maldives & British Indian Ocean	Sand and cement	14500	19.11.2018	24.11.2018
Chile	East of South-East Asia	Iron Ore	50000	13.11.2018	31.12.2018
Chile	Northumberland Strait	Grains	40000	13.11.2018	29.01.2019
East Mediterranean Sea	West Mediterranean Sea	Glass in cases	3187	19.11.2018	20.11.2018
Marmara Sea	Biscay Bay	Glass in cases	1880	26.11.2018	27.11.2018
North-West India	French Atlantic Coast	Indian Stone Chips	50000	29.11.2018	04.12.2018

Table 5 - Example of cargoes listed on OpenSea.pro (OpenSea.Pro, 2018)

4.1.3 Findings

Comparing the tanker fleet on ShipNEXT with world fleet we did not find any significant differences in quality. This, however, do not exclude the possibility for quality differences between the vessels traded by traditional brokers and digital platforms. BHP Billiton's platform for example have preset conditions to be a member of the platform, potentially hindering low quality vessels access to the platform. Another potential reason that there could be quality differences between the platforms is that the vessels of the lowest quality is harder to fix so that traditional brokers charge a very high commission, in turn forcing the ship owners

to list their vessels on the cheaper digital platforms. Also, many of the early platforms adopters seems to be parties that already has limited access to the market because they are small players, have limited reputation or their business seem less attractive as their vessel or cargo have unattractive attributes. Initially making the digital platforms a market place for the least attractive vessels and cargoes.

Finally, even though we cannot claim any statistical inference from the sample of cargoes we have obtained, it is a paradox that the average bulk vessel listed on ShipNEXT is relatively large (40 750 DWT), and the average cargo is relatively small (4 727 metric tonnes). This may do the matching of available vessels and cargoes hard to perform as large vessels rarely would go to remote and small ports (this job is usually done by smaller feeder vessels), to pick up unattractive cargoes.

4.1.4 Limitations of the data comparison

The comparison has its limitations regarding measuring the quality of vessels on digital platforms. The quality parameter we include in the comparison may not be representative for the segments the digital platforms operate within, and the charterers using the platforms may not be concerned about the same quality parameters as the rest of the market. Furthermore, we do not have data on fixtures, hence we cannot know if ships listed on ShipNEXT are traded on the platform as well. This can potentially make the sample we are reviewing non-representative for the sample that are traded on the platform. Furthermore, there are a chance that the digital platforms handle both charterers and cargo owners with low reputability. In that case there may be no compliance between the quality parameter we assess and the relevant quality parameters charterers and ship owners using the digital platforms care about.

4.2 Conceptualization of the searching and matching function

This section provides a conceptualization of how a digital platform can perform the matching of charterers and shipowners. Additionally, we create a simplified matching model and simulate the matching function. By this we aim to address sub question 1 in section 2.6 above.

4.2.1 Value proposition of digital platforms

In the searching and matching function there are two main ways digital platforms can improve shipbroking. Firstly, digital platforms introduce the possibility of marginal searching cost

close to zero *(the relevance of lower cost is discussed in section 4.4)*. Bakos (1997) show mathematically that increased searching cost induce lower searching scope. Logically a ship owner or charterer would always opt for a larger searching scope if the marginal searching cost is close to zero. Examining many potential cargoes for a vessel or vice versa increase the probability of finding the best possible match. Hence, digital platforms can provide ship owners and charterers with larger searching scope. Secondly, digital platforms introduce the possibility of mathematically more complex matching models by utilizing a larger number of quantitative searching conditions. The platforms matching models can also possibly be more consistent in quality than traditional brokers. Traditional brokers are able to conduct complex searching and matching based both on formal and informal information, but may vary in quality over time and among the individual brokers.

4.2.2 Matching models in shipping

A matching model in the shipping market can be conceptualized in many ways. In the auction-based markets there are a preset description on the matching condition (i.e. the highest bidder) and there may be preset conditions to be able to participate. In the negotiation- and market based matching models the searching and matching function is based on many parameters such as freight rate, vessel classification, size, reputation and position.

Charterers			
	Many	Auction	Market
	Few	Negotiation	Reversed auction
		Few	Many
		Vessels	

Figure 9 Matching models in the shipping market (Janssen & Verbraeck, 2008) (modified by the authors)

The main advantage of digital platforms in the searching process is the potential large searching scope and the ability to perform searches based on mathematically complex conditions. Hence differentiated markets with many players on both sides of the market has the most to gain from implementation. Therefore, we focus on shipping segments with many cargoes and many vessels when modelling a searching model.

Attributes

A digital platform introduces the possibility to search with a large number of conditions, with the help of optimizing algorithms the platforms can find the optimal vessels or cargoes in few

seconds. Former research based on interviews of traders in the land-based freight industry propose nine objective attributes to match shippers and carriers (Janssen & Verbraeck, 2008). Interviews with platform providers indicate that the matching model proposed by Janssen & Verbraeck can be expanded with additional attributes to fit the seaborne chartering market.

Attributes – Objective (Janssen & Verbraeck, 2008)	**Potential additional Attributes** (Based on interviews and industry knowledge)
Pick up time	Age of vessel
Delivery time	Reputation (score based on historical data)
Freight rate	Credit rating
Start location	Review score
Delivery location	Classification
Weight	Position/proximity
Volume	
Type of cargo	
Additional services needed	

Table 6 - Potential attributes in a matching model

A digital platform can include the attributes above when creating a matching model to solve the searching and matching function of ship broking.

Setting up a multi-attribute matching model in the ship broking market

The matching model of an electronic brokering platform is set up with three main optimization objects according to Chen, Zhi-Ping, & Chen (2016), Sellers matching degree, buyers matching degree and a trade volume function for the match maker (*broker*). The model used is developed by Chen, Zhi-Ping, & Chen (2016), Le, Zhang, & Ren (2018) give further insights on the economic aspects of the model and propose some minor improvements. The computability of the matching model is outside the boundaries of this thesis; hence our focus is the economic functions and equations of the model, and the computer engineering functions is excluded from this analysis.

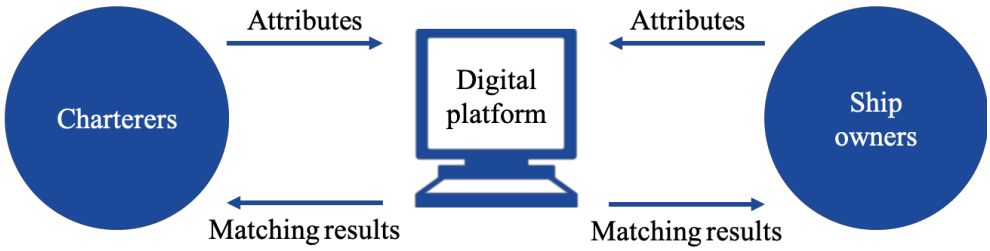

Figure 10 - Process of a multi-attribute matching model (Le, Zhang, & Ren, 2018)

Figure 10 show how the matching model work. First, the digital platform obtains the requirements for a deal from both parties. Second, the platform utilizes its model to match the parties, and third, the matching results are sent back to the parties for their consideration. The results can be interpreted as both concrete matches and matching proposals, all depending on the set up of the platform. Research from the land-based freight market indicate that the parties prefer matching proposals as it give them the opportunity to have humans taking the final decision (Janssen & Verbraeck, 2008).

Mathematically the matching model can be set up as follows:

Indices:

I: Set of charterers {1,2,,,m}

J: Set of ship owners {1,2,..,n}

K_c: Set of matching attributes for charterers {1,2,..,k_c}

K_s: Set of matching attributes for ship owners {1,2…,k_s}

C_i: Charterer i

S_j: Ship owner j

A_k: Attribute k

Parameters:

CMD_{ijk}: Charterers matching degree of A_k between Ci and S_j

SMD_{ijk}: Ship owners matching degree of A_k between Ci and S_j

W_{ik}: Weight of A_k for C_i

W_{jk}: Weight of A_k for S_j

Decision variable:

X_{ij}=1 if C_i is matched with S_j, otherwise, X_{ij}=0

$$\max f_1 = \sum_{i \epsilon I} \sum_{j \in J} \left[\sum_{k \in K} W_{ik} \times CMD_{ijk}) \right] X_{ij} \quad (1)$$

$$\max f_2 = \sum_{j \epsilon J} \sum_{i \in I} \left[\sum_{k \in K} W_{jk} \times SMD_{ijk}) \right] X_{ij} \quad (2)$$

$$\max f_3 = \sum_{i \epsilon I} \sum_{j \in J} X_{ij} \quad (3)$$

Equation 1 and 2 above constitutes the matching degree of respectively charterers and ship owners in a search performed by the matching model. Equation 3 maximizes the number of matches the matching model obtain in one run. This equation aims to optimize the output for the platform owner, as he makes money when the platform manages to connect the parties. Optionally, in the case of a platform basing its commission on the monetary value of a deal, this could be switched to maximizing the total volume in monetary terms to optimize the platforms revenues. The model can be solved using linear programming and the simplex method, however that would require some additional computer engineering functions that we do not consider in this analysis as mentioned above.

Creating and testing a matching model based on the formal model above could be an adequate way to evaluate the potential efficiency in the searching and matching function of a digital platform. However, the nature of shipbroking and the lack of commercially successful digital platforms limits the access to good data sources. Hence, empirical studies of the intrinsic potential of digital platforms are hard to perform. Instead simulation of a simplified model is chosen as a methodology (section 3.23.2) to compare the potential efficiency of digital and traditional brokers and to illustrate some differences. Other research methods answer questions like “what happened, how and why”, simulation give us the possibility to answer “what if” by using own assumptions as input (Dooley, 2002). This is especially useful as one can test different ideas on how technology and the market will develop. Therefore, we introduce a simplified matching model and run simulate the model.

4.2.3 The simulation model

The intent of this model is not to show case how an optimal matching model work, but rather to create a framework that enable us to compare the results under different assumptions on the

differences between traditional brokers and digital platforms. We conceptualize the ship broking market by setting up a simple spreadsheet model using Excel, which intend to mimic the actual behavior of the market players. The model examines the matching of cargoes and vessels in a space with a number of open ships and many cargoes available.

Codification

The initial model is set up with ten open vessels which are assigned values, $S_{i,}$ normally distributed with mean 0.5 and a standard deviation of 0.2. This distribution is created as a proxy of how the quality of vessels may be distributed, and do not represent a distribution found in empirical data. Likewise, cargoes are initially assigned a number, C_i, with the same distribution as assumed for the vessels, that do not represent findings in empirical data.

Matching function

The matching model in this simulation is highly simplified. The matching function is based only on one condition, namely that the difference in the quality of a ship owner and the quality of a charterer is lower than a given threshold (matching factor). The idea behind the model is that high quality charterers prefer to deal with high quality ship owners and vice versa. There are many other variables that can influence a potential match (see 4.2), but they are not included the model to be able to showcase some differences between digital platforms and traditional brokers.

For a traditional broker or a digital platform to obtain a match in the model he/it must find a vessel that has a value that is closer to the cargo value than a matching factor, F_k. Hence the squared difference between the vessel value and the cargo value should be less than the matching factor, F_k. This factor can variate between the different broking platforms to mimic the difference in ability to match the parties.

$$\left(S_i{}^2 - C_j{}^2\right) < F_k^2 \qquad (4)$$

Parameters

Matching ability

One aspect of the traditional broking function is the ability to negotiate between the parties. Long relations and human relations can give the traditional broker abilities to fix vessels and cargoes that would not be concluded via a digital platform. However, by time and data collection this may change in favor of the digital platform. If matching models become as

sophisticated as proposed in the conceptualization above digital platforms may be able to predict the probability of an actual match based on many attributes and include this in the model. The difference in matching ability is included in the model by using different matching criteria for traditional brokers (F_{tb}) and digital platforms (F_{dp}).

$$\left({S_i}^2 - {C_j}^2\right) < {F_k}^2, \qquad k = dp, tb \qquad dp \neq tb \tag{5}$$

Searching scope

Digital platforms can assess a large number of potential combinations of vessels and cargoes at a marginal cost close to zero, while the traditional broker must assess a more limited number of potential matches. This is included in the model by the ability to have different searching scopes for digital platforms and traditional brokers.

Vessel quality

After examining the vessels and cargoes listed on ShipNEXT and the world fleet (section 4.1) we found no significant differences in age between the two pools of vessels. However, as discussed there may be quality differences between other digital platforms and traditional brokers that we cannot observe in the data set like the ship owner's reliability, maintenance of vessels, former incidents and other variables the charterer care about. Hence, we include potential differences in vessel quality in the model by the possibility to change the mean of the normal distributions which are the basis for the vessel value in the model. Decreasing the mean for the vessels in one of the pools lead to an average decrease in the value of all vessels offered by the platform, in turn making it harder to match cargoes. The figure below shows the two distributions we use in the simulation.

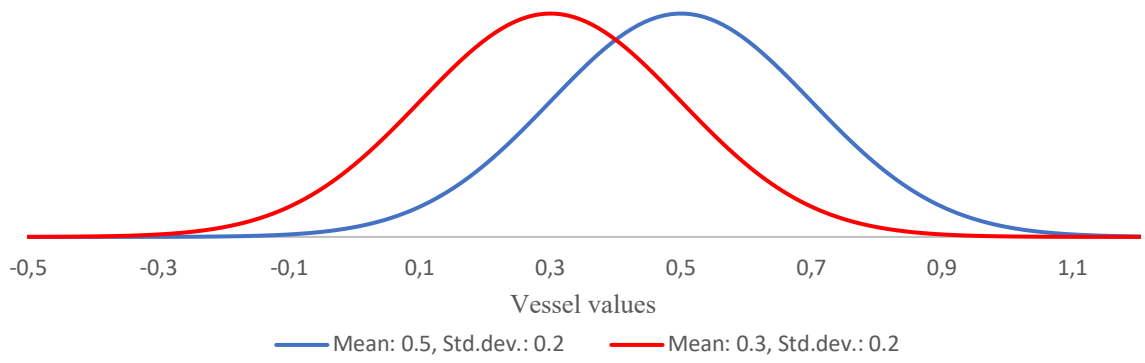

Figure 11 - Vessel distributions (by the authors)

Validation

According to Dooley (2002), a simulation may be technically without errors, but also without validity as an imitation of the simulated object. The validity of the model must be examined to determine how close the computed behavior is to "real" behavior.

The distributions of cargo values and vessel values cannot be validated by comparison to actual data from ShipNEXT or Clarksons. We use age (older or younger than 15 years) as a measure of quality in the data comparison above, however this variable is binary and when assessing individual vessels, we need a quality variable that is continuously distributed. Hence, a normal distribution with a mean of 0.5 and standard deviation of 0.2 is used as it fit well with a concept that most of the vessels are of normal quality and that there are a few ships of very poor quality and a few ships of very high quality.

The differentiation of the matching factor cannot be controlled for validity as there are no former research on how the matching ability may differ between digital platforms and traditional brokers. It should therefore not be viewed as a representation of the real situation, but rather a measure to showcase the effect of differences in the ability to match the parties.

Simulation

The simulations are testing three scenarios, in which can influence whether one would prefer a digital platform to a traditional broker or not. As discussed above there are three parameters we aim to examine; matching ability, searching scope and vessel quality. We do this by changing the matching factor, the searching scope, and the mean of the normal distribution of vessel quality.

Scenario 1

Scenario one states the initial setting, both broker types have access to the same quality of vessels and cargoes. The matching factor of the traditional broker is set twice as high as the matching factor of the digital broker to showcase the effect of the traditional brokers ability to match parties with a larger difference in quality by the use of interpersonal relations, negotiation and persuasion. The number of cargoes a traditional broker can evaluate is set to 500. 500 cargoes are chosen as we assume that is a reasonable number of charterers a traditional broker can have interpersonal relations with. The number of cargoes the digital platform can evaluate is set to 1 000, this number is chosen to showcase the ability of digital platforms to evaluate more cargoes than a traditional broker.

Scenario 2

Scenario two introduce differences in vessel quality between digital platforms and traditional brokers. The reason for testing this difference is that some of the interviewed industry professionals claimed that such a difference may be present. This is introduced by decreasing the mean of the normal distribution of vessel quality for digital platforms from 0.5 to 0.3. As we have no empirical data to back such a difference, the change in the mean must be considered as a measure to study the effect of differences in vessel quality rather than a quantification of differences in quality.

Scenario 3

Scenario three is basically the same as scenario two, but here we increase the searching scope of digital platforms. This is done to showcase that the digital platforms may grow their networks, enabling increased searching scope.

Simulation design

Simulation design						
	Scenario 1		**Scenario 2**		**Scenario 3**	
All scenarios are run 10 times	Trad. broker	Digital platform	Trad. broker	Digital platform	Trad. broker	Digital platform
Number of open vessels	10					
Vessel distribution	Normal distribution					
Mean	0.5	0.5	0.5	0.3	0.5	0.3
Standard deviation	0.2	0.2	0.2	0.2	0.2	0.2
Cargo distribution	Normal distribution: mean: 0.5 Standard deviation: 0.2					
Matching factor (F_i)	0.1	0.05	0.1	0.05	0.1	0.05
Searching Scope (Cargoes)	500	1000	500	1000	500	2000
Results						
Average potential matches	168.88	172.58	175.68	111.06	176.05	262.74

Table 7 - simulation design and results (by the authors)

Simulation results

The results of the simulations represent the ability to find parties with differences in quality within the matching factor based on the set ups described above. The number of potential matches the traditional broker or digital platform obtain in a simulation represents how many cargoes he/it finds for the ten open vessels. A larger number of potential matches logically increases the probability of actual fixtures.

From scenario one we find that increased searching scope can counteract the effect of traditional brokers better ability to match the parties. Scenario two show that digital platforms do not have access to vessels of the same quality as traditional brokers they will not be able to match the parties in the same manner. Further scenario three show that a digital platform can outperform the broker by increasing the searching scope even though we assume that the broker has better access to a better pool of vessels and has a higher ability to match vessels and cargoes. Hence, large searching scope can make digital platforms outperform traditional intermediaries, but if matching ability and the vessel sample is poor, digital platforms will need to have a much larger searching scope.

4.2.4 Findings

Former research (Janssen & Verbraeck, 2008) show that digital platforms can include more attributes when performing searches for cargoes and vessels, potentially improving the searching and matching function relative to traditional brokers both by increasing accuracy and lowering searching time. The efficiency of such complex matching models is however highly reliant on access to data and it is critical for the digital platforms to build sufficient networks. There are also complex questions that must be addressed when creating the matching models that can impact the popularity of the platform among users. The main question is how the model should weight the utilities of the parties, charterers will prefer platforms that weigh their utility over the ship owner's utility and vice versa. Hence, a fair matching model can prove difficult to make, slowing the adaption of digital platforms.

Our simulations show that a digital platform can outperform the traditional brokers ability to match vessels and cargos. The relative efficiency increases with the number of available ships and cargos, making a digital platform truly efficient on a global scale. However, on a micro level shipping consists of many local markets determining the momentarily equilibrium. Making the number of relevant vessels and cargos limited. This characteristic of the market makes it possible for the traditional broker to keep track of all relevant vessels and cargos in many of these micro markets, making the practical difference between traditional brokers and digital platforms less obvious.

Furthermore, the potential efficiency gain from digital platforms is more evident in shipping segments where the potential searching scope exceeds the capacity of traditional brokers ("many to many" markets). Hence, successful introduction of digital platforms is more probable in segments such as the liner segment and partly in the industrial shipping segment

than in more specialized segments where the negotiation function is of high importance such as the bulk segment (Stopford, 2002). Further the ability to match the parties and the quality of the vessels traded on the platforms influence the platforms ability to create an efficient market between charterers and ship owners.

4.2.5 Limitations

Both the conceptualization and the model simulation assume that many charterers and ship owners make their market positions known to a digital platform. In the current chartering market however, there are lots of positions that do not go online at all, therefore the matching model we conceptualized and simulated may not be realistic.

Conceptualization
Even if one creates a flawless matching model with optimized searching algorithms the digital platforms rely on data which is hard to get access to. If the platforms do not get access to the data, they will not be able to provide the service we conceptualized in above, therefore the model may not be realistic. Further a model depending on many variables can be complicated to use and hard to maintain, hence the optimal model may be one with fewer attributes than the ones listed above. However, the development of artificial intelligence and constantly increasing computer power can make models with a very large number of variables and searching criteria more plausible in the future.

Model simulation
The differentiation of the shipping market makes the simulated results hard to transfer to other markets than the largest shipping segments. For instance, the offshore supply market, a more niche market, has a much more limited scope of vessels and charterers, hence a traditional broker will have little problem with keeping track of the market movements. (*i.e. Clarksons cover the entire Norwegian side of the North Sea OSV spot market with only three brokers*.)

The quantification of the matching ability of the digital platform and the traditional broker is based on an idea that one of the players have a better ability to match the parties than the other. If the difference in matching ability is 5 %, 50 % or 100 % has not been examined. In the future this may also change as technology may develop in a way that make digital platforms improve their searching and matching function.

4.3 Additional services

In addition to searching and matching examined in section 4.2 and sales and purchase activity, brokers also provide value for charterers and ship owners in other ways (Strandenes, 2000). This value can relate to many different services, the most common being commercial- and legal advisory. This section aims to explain, in a qualitative manner, how a digital platform can provide these additional services, addressed in sub question 2.

4.3.1 Commercial advisory

Commercial advisory consists of advisory on all matters directly connected to the commercial activities ship owners and charterers undertake. The broker as an industry specialist and often well experienced player can provide the parties with useful insights on whom not to conduct business with, when to do business, when to secure future freight rates and other commercial matters.

Commercial intelligence

Many decision situations in shipping are reliant on high quality information, some of these situations are the timing of fixtures and the timing of sales and purchase (Lorange, 2005). However, to realize the most favourable rates or to sell/buy at the right time the market players are trying to influence the market perception of the supply and demand balance. Charterers are hiding the number of cargoes they have, and ship owners are hiding the number of open vessels to give the impression that the supply and demand balance is more constrained than in reality. The same mechanisms are also prevalent when ship owners are selling and purchasing vessels. Hence, information on the actual market balance is hard to obtain.

As the market dynamics make it difficult for the parties to obtain accurate information, the shipbroker plays an important role. The traditional broker as an independent third party can speak freely with all the involved players, combining market data and information from non-formal sources like rumours and comments. Because of this, the traditional broker can supply his clients with unique and exclusive information they cannot obtain on their own.

Strandenes (2000) introduces the concept of Type 1 and Type 2 information for shipbrokers. Type 1 information being formal information on market supply and demand that a shipbroker might have. In contrast Type 2 information is the assessment of market development and the quality of vessels, ship owners and charterers. Strandenes point out that brokering services

dependent on Type 1 information is most likely to be affected by the development of digital platforms. Strandenes argues that services dependent on Type 2 information will not easily be affected by digital services. Since Type 2 information is a result of relationships, experience and ability to compile informal information into a trustworthy analysis, while Type 1 information is a result of formal information gathering.

One example that highlight the abilities of digital platforms to provide services based on Type 1 information is VesselsValue. VesselsValue are with the help of big data able to provide good estimates of the vessel values, this service has traditionally primarily been performed by the traditional broker in order to help clients determining the value of vessels that are reported to stakeholders such as banks and the capital markets. When examining the reported sales price for VLCC transactions for 2017 – 2018, we have found that the valuations performed by VesselsValue two weeks before the transaction was reported are very close to the realized sales prices.

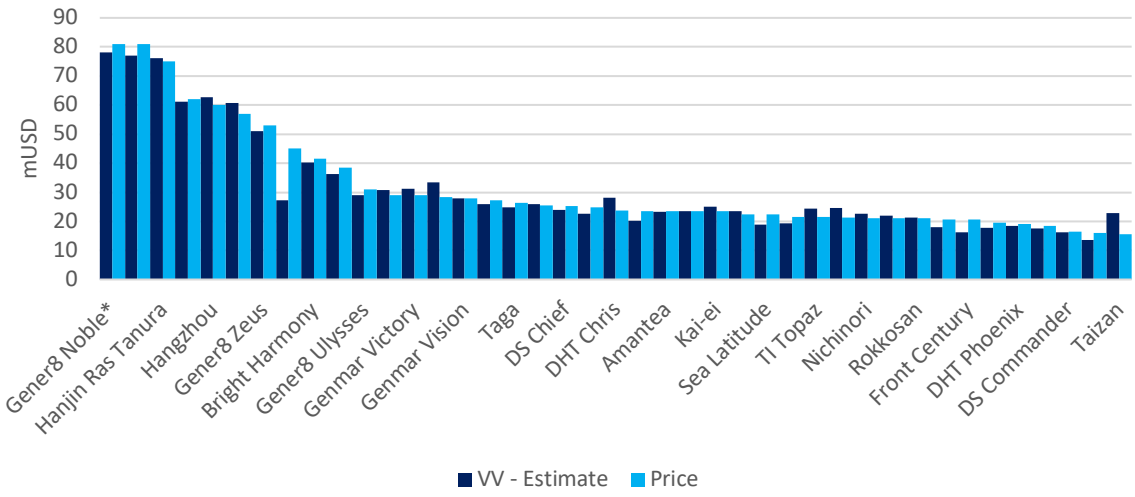

Figure 12 - VLCC transactions and value estimates 2017 – 2018, (VesselsValue, 2018) (Clarksons Research, 2018)

We also find the same results when examining the other major segments (Suezmax, Aframax, Capsize, Panamax and Handymax). This indicates that digital platforms now successfully can replicate this service provided by traditional brokers, supporting Strandenes' view that digital platforms can provide services based on Type 1 information. Since the mentioned markets are among the most liquid shipping segments, we see that valuations based on large amounts of formal data can provide trustworthy estimates on the real value of vessels.

An interesting aspect of this development is how it affect the value of the service. According to the efficient market hypothesis, market prices reflect all available information (Brealey, Myers, & Marcus, 2012). Hence, if everyone has access to the same Type 1 information, the value of this information will be limited. Therefore, if all players can access the platform that provide analyses based on Type 1 information, the services of the traditional broker will still be in demand as he currently is the only source for qualitative Type 2 information that are not known by the broader market.

Mitigation of counterparty risk

In shipping contract size and value at risk can be great, hence the ability to do effective screening of counterparts is paramount. Making this screening process time- and cost efficient for the parties has always been one of the main features of the traditional broker. As a trusted middleman, the broker provides both parties in a transaction with certainty on the contractual deliverance. The traditional broker fills this function by connecting with both charterers and ship owners, creating interpersonal relations by doing business over time, giving him unique insight into the business manner of numerous market players.

The digital platforms will have a hard time copying the interpersonal knowledge of the parties the traditional broker build by his day to day dealing with charterers and ship owners. However, digital platforms can build trust in other more tangible ways. Below we introduce two examples on ways digital platforms can build trust.

An common way of creating trust online that can be transferred to the shipping market is peer reviews. The well-known e-commerce platform, eBay is utilizing peer reviews to create trust between sellers and buyers. When a buyer receives an item bought on eBay, he is asked to review the seller on several metrics and vice versa. In this way the parties can over time obtain a reputable status by having positive scoreboards from the peer reviews. On a digital platform, one could imagine such a system to work well in the way that ship owners and charterers review each other after the contractual deliverance. VesselBot is an example of a services that already has implemented such a system.

A second system of creating trust among market players is pre-qualification. This system allows platforms to perform a due diligence of users before they are allowed to conduct business on the platform. Such a process could ensure that all platform members are of a certain quality, in turn reducing the counterparty risk. BHP Billiton are today using such a

system on their platform. The difficulty of such a system however, is that the platform must have sufficient resources to undertake proper due diligence of all new users.

The market maker role

The shipbroker often takes on the role as a market maker, actively finding, proposing and advising on business opportunities his clients can involve in. By finding interesting business proposals, he can create attractive business opportunities for his clients. In contrast to the digital platforms that takes on a more passive market role, leaving it to charterers and ship owners to find business opportunities. Unlike the digital platforms many traditional brokers operate a "one-stop shop" where all the needs of a ship owner are handled (new building, sales & purchase, chartering and scrapping). A traditional broker uses his interpersonal relations, knowledge and experience to understand when deals can be made, this ability enable him to provide added value that it is hard to imagine how digital platforms can replicate given the current stage of technological development.

4.3.2 Legal advisory

The traditional broker is not only assisting his clients on commercial matters, the broker is also assisting clients on legal matters. In particular, he is using his legal knowledge on the contractual side of chartering and sales and purchase of vessels, making his clients able to conduct business and solve disputes without involving the expensive expertise of lawyers.

Digital platforms have also entered this service space, providing solutions for auto generation of legal documents that make it easy for the counterparties to simply fill in terms and conditions for a specific deal. Additionally, the digital platforms argue that companies need more than just the legal formulations of the contract to reduce their legal risk. They argue that the shipping industry would have to comply with the demand from society on increased transparency, making legal compliance and digital traceability of communication more important. In this context the digital platform can act as a tool to achieve full visibility on the conducted business. According to a platform owner we have interviewed, about 20% of their customers are using the platform as a legal compliance measure. In many cases these users have been unintendingly involved in some sort of illegal activity and the use of digital platforms is implemented as a measure to prevent breach of legal compliance.

By keeping full track of all communication making it clear what has been agreed upon, in this way digital platforms can reduce the risk of legal disputes. However, from the shipowner

perspective we have found in our interviews that they do not think that risk will be reduced. Functioning legal binding contracts are already in place, potentially making the possible gains from digital legal advisory services less promising.

4.3.3 Findings

The main finding in section 4.3 is that that there are already examples of digital platforms that have managed to successfully replicate shipbroking services based on quantitative Type 1 information. Platforms are still unable to successfully replicate services based on qualitative Type 2 information, making the traditional broker able to provide value adding services that at the current stage of technological development cannot be replicated by digital platforms. We also find that digital platforms providing services based on Type 1 information will be of little value in terms of creating a competitive advantage, due to the availability of these services they might become parity factors. On the legal advisory function, it is hard to conclude if the advantages of adopting a digital platform are substantial enough to make it a differencing factor as the systems the traditional broker already has in place are well functioning.

4.4 Cost efficiency

As a part of their value proposal digital platforms argue that they can reduce total cost for ship owners and charterers. However, even though digital platforms are operating with lower brokerage rates, it is not obvious that the use of such platforms will have a positive effect on the total cost. Hence, we question whether the potential cost savings are significant enough to promote a successful market entry for digital platforms, addressing sub question 3 in section 2.6.4

4.4.1 The relevance of brokerage differences

The relevance of the brokerage cost under different cost schemes can be illustrated with some simple calculations. The calculations below are based on a voyage duration of 30 days and a spot rate equal to the ten-year average, the table below show a single voyage for the three largest tanker and bulker segments. The calculated brokerage cost is compared with OPEX (*note: brokerage cost is not a part of the calculated OPEX*).

Voyage brokerage costs												
	VLCC		Suezmax		Aframax		Capesize		Panamax		Handymax	
OPEX	354 000		300 000		270 000		217 500		189 000		174 000	
Brokerage	Brokerage cost	% of OPEX	Brokerage cost	% of OPEX	Brokerage cost	% of OPEX	Brokerage cost	% of OPEX	Brokerage cost	% of OPEX	Brokerage cost	% of OPEX
1 %	11 150	3,1 %	8 834	2,9 %	6 711	2,5 %	9 360	4,3 %	5 060	2,7 %	3 774	2,2 %
1,25 %	13 937	3,9 %	11 043	3,7 %	8 388	3,1 %	11 700	5,4 %	6 325	3,3 %	4 718	2,7 %
2,50 %	27 875	7,9 %	22 086	7,4 %	16 777	6,2 %	23 400	10,8 %	12 651	6,7 %	9 436	5,4 %
3,75 %	41 812	11,8 %	33 129	11,0 %	25 165	9,3 %	35 100	16,1 %	18 976	10,0 %	14 154	8,1 %
5,00 %	55 750	15,7 %	44 172	14,7 %	33 554	12,4 %	46 801	21,5 %	25 301	13,4 %	18 872	10,8 %

Table 8 - The relevance of difference in brokerage. (By the authors, based on data from Clarksons SIN and Drewry Maritime Research (2013))

In all cases the brokerage cost constitutes a small fraction of the operational cost and compared to the total transportation cost the fraction is even smaller. As Stopford (2002) points out, an 80% reduction in brokerage cost would only lead to a 1% reduction of total cost in the shipping industry. Lorange (2009) argue that crew cost and maintenance cost are the two most important cost components for a ship owner. Making technical management more important in a cost saving perspective, this is probably the reason why most technological development is seen within technical- and operational solutions such as autonomous vessels, smart ropes and maintenance performed by drones.

Lorange (2005) also points out that shipping is a margin business, the player that operate lowest on the cost curve will have an advantage compared to competitors. However, the potential savings from reduced brokerage rates seems insufficient to have a significant effect on the total costs. In addition, reduced brokerage cost would not affect the competition since all market players would have access to the same services, making the brokerage cost irrelevant for the competitive outcome.

Alternative cost

Shipping companies are today very lean organized businesses with little excess manpower capacity (Lorange, 2005). Strandenes (2000) point out that the shipbroker assists the charterer and ship owner with many of the practicalities with chartering vessels and arranging the voyages. A shift towards digital platforms could require the charterers and ship owners to increase their in-house chartering knowledge and capacity (Batrinca , 2008). When using a digital platform, the ship owner and charterer must undertake the work today executed by the traditional broker. Instead of using a traditional broker they may have to organize the he negotiation process, the contractual formalities and have a clear market understanding for

every single fixture they involve in. Which of these two alternatives that is most cost effective is not straight forward. One possibility is that increased labour cost in the commercial management eat up the gains from replacing a network of several hundred shipbrokers with a digital platform.

One could also imagine that digital platforms could increase the productivity of the commercial management, keeping the number of employees at an equal or lower level. The productivity could for example be increased by automation of work processes. In addition to productivity gains, we could also see that the overall labour costs in the commercial management could be reduced from lower wages. Today the commercial management of ship owners and charterers are people with in-depth industry knowledge and -experience, able to charge premium wages. If the digital platforms can provide a service that make chartering more transparent and intuitive for users, in turn reducing the complexity of chartering, they may reduce the need for expensive commercial staff with a high level of industry knowledge and -experience.

4.4.2 Findings

The digital platforms argument on reduced cost hold when we only look at the brokerage rate isolated. However, when we take the alternative cost of additional staff and platform upkeep into account, the effect of reduced brokerage is unclear. In our view the charterer will be the main beneficiary of reduced brokerage, because the shipping market usually is recognized as a market with perfect competition, hence, the price should equal the marginal cost. In shipping, brokerage is a part of the marginal cost component, the so-called voyage cost (*Fuel, port and canal fees and brokerage*). Reduced brokerage will therefore reduce the marginal cost, from microeconomics we can expect that a lower marginal cost induces lower prices. In shipping this would translate in to lower freight rates, and as freight rates are payed by the charterer, he will therefore be the main beneficiary of reduced brokerage.

4.5 Market entry

In this section we aim to answer sub question 3 in section 2.6.4, this is done by assessing the most prominent barriers of successful market entry, in particular we discuss network effects and the threat of aggressive response. We also discuss how market entry may change the competitive dynamics of the market and affect the digital platforms ability to enter the market.

4.5.1 Network effects

Both traditional brokers and digital platforms are network-based business, meaning that they rely on network effects as an important part of their strategy. In this section we show that the traditional broker and digital platforms are utilizing similar network strategies. Further, we highlight differences between the strategies, and discuss how these differences might affect shipbrokers and digital platforms, with a focus on barriers of entry for digital platforms. This is followed by a discussion on how the barriers of entry can be overcome.

Network strategies

Traditional brokers and digital platforms are both using network strategies and operate multi-sided platforms that rely on utilization of indirect network effects. Ship owners and charterers represent the two sides of the platforms. The attractiveness of the platforms for ship owners, increase with the number of charters the shipbroker knows or the number of charterers connected to the digital platform and vice versa. The complementarity between the ship owners and the charterers create self-reinforcing network effects, increasing the value of the network, making it more attractive to be connected to the network. The network effects utilized by traditional brokers and digital platforms are firm specific, making it possible to take ownership to, and capture the value of the network.

Similarities and differences

Creation and maintenance of networks

To build and maintain a critical network size the traditional broker and digital platforms are both using similar incentivizing systems. The clients of traditional brokers and digital platforms have free or almost free access to the network, and they are mainly charged brokerage on a “no cure, no pay” basis. The brokerage is usually paid by the ship owner, making the services freely available for charterers. This is a way of increasing the attractiveness for charterers, which in turn make the platforms more attractive for the ship owners. The ship owner is also usually the least price sensitive user of brokering services,

because freight demand is often more constrained than vessel supply *(this holds when the global fleet is not operating at full capacity).* In addition, the ship owner usually has few alternatives to find cargoes in the spot market. In contrast to charterers who often own or have additional vessels on long term time charters.

Further, free additional services (see section 4.3) provided by traditional brokers are making the network more attractive, increasing network adoption. Digital platforms are using free additional services in the same way.

Constrains

The network size of a traditional broker is physically constrained. There is only a limited number of people a traditional broker can have a relation to, and only a limited number of people he is able to contact within a searching period. Practically limiting the searching scope of traditional brokers. Traditional brokering firms has tried to compensate for this limitation by having presence worldwide and employing a large number of brokers. In addition, traditional brokering firms in some cases have developed data systems to keep track of the market movements to increase coverage. Ship owners and charterers are also compensating for the physical limitations of the traditional broker by contacting several brokers. It is not uncommon that a ship owner or charterer rely on a network of several hundred traditional brokers to undertake their business.

Unlike the traditional broker, the network size of a digital platform is not physically constrained. There is no practical limit to the number of charterers and ship owners that could be connected to a digital platform, and there is no limit to the number of users that that could be offered to bid on a position. Due to the scalability of digital platforms, the platform has no limitations regarding the network size.

So far, we have argued that the traditional broker and digital platform operate similar networks, but with some key differences. They are both operating multisided platforms, utilizing indirect network effects created by the presence of ship owners and charterers. They are also using similar incentivising systems to attract users.

The first major difference is that the network of digital platforms is not constrained by physical boundaries, making the platforms able to build more extensive networks than traditional

brokers. Additionally, the ability to use big data, enables the platforms to increase the complementarity of ship owners and charterers.

The second major difference is the presence of functioning networks. Traditional brokers already operate established networks, in contrast to the digital platforms that are in the establishing phase. Among the traditional broking firms, we find several well-established networks. The only two major shipbroking firms that are listed on a stock exchange are Clarksons Platou and Bremare, which by November 2018 have a market value of respectively 922 million USD and 91 million USD (Bloomberg, 2018). Indicating the high value of a well-established network in the shipbroking industry. In contrast, none of the digital platforms have well-established networks of critical size and significant value. So far ShipNEXT seems to be the player with the largest network, ShipNEXT is covering somewhere about 15% of the world fleet. This is about what Betrinca (2008) estimated to be the critical network size. However, most of the vessels listed on ShipNEXT are not actively traded on the platform. The presence of the vessels is a result of ShipNEXT web-scraping for tenders and posting them, making the actual coverage questionable. Several ship owners we have contacted was not aware that their vessels are listed at ShipNEXT. Hence, we believe that no digital platform has managed to accumulate a critical network size at this point of time. Industry professionals we have been in contact with claim that BHP Billiton still is heavily reliant upon traditional brokers to undertake their chartering needs, and that their platforms so far have been insufficient. However, we have not been able to verify this by reviewing other sources.

Based on the discussion so far, we find that traditional brokers and digital platforms utilize similar network strategies, with two major differences. These differences are not so much a result of different strategies but rather the attributes of their technology (*digital broking vs. manual broking*), and the time of market entry. These differences may determine the competitive outcome in the competition between these two technologies and affect the barriers of entry in the shipbroking market.

4.5.2 Barriers of entry

The two main differences between traditional brokers and digital platforms described in section 4.5.1, make the digital platforms face several entry barriers. The lack of an established network poses a structural entry barrier. Additionally, the existing shipbroking firms have placed strategical entry barriers to deter entry of potential competitors. Among the strategical

entry barriers, we find the use of incentives, complementary services that create lock-in effects and the threat of aggressive response, making network accumulation difficult.

Network size

The strongest structural barrier of entry in the shipbroking market is the network effects due to their self-reinforcing dynamics. A dominating network impose great switching costs for the members, enforcing a stable competitive landscape, making market entry difficult. Hence, entrants must try to replicate the networks possessed by the established brokers and shipbroking firms. An entering platform can replicate the networks in three different ways: by acquisition, by alliance and by accumulation.

Acquisition

The digital platforms can buy an existing brokering house, giving the platform direct access to a network of ship owners and charterers in addition to data flows. The difficulty with acquiring an existing shipbroking network is that the attractive networks are very valuable, making them capital intensive to acquire. So far none of the existing platforms have tried this strategy, but we could imagine this to happen as it is a known practise in the shipbroking industry.

Alliance

Another method to get network access is through alliance. The difficulty is that traditional brokers are the only good alliance partners due to their established networks. These brokers are probably less willing to enter in to such an alliance as they may view the potential alliance partner as a threat.

A second alternative is to create an alliance by partnering with charterers and/or ship owners (*ShipNEXT and BHP Billiton have partly used this approach*). However, when interviewing ship owners, we have experienced scepticism towards digital platforms that are dependent of existing market players. In their view there is a danger that such platforms would disclose their firm-specific information to a competitor. Hence, a platform needs to be independent or owned by a consortium of market players to secure that the platform is perceived as a trusted middleman. This view is in line with Batrincas (2008) findings. Also, logically shipbroking firms that involve in ship owning activities can risk compromising their independence as conflict of interest may arise, in turn leading to client defection.

Accumulation

The third option is accumulation of a network. The process of accumulation is time- and cost consuming and depend on the ability to create superior consumer surplus for the platform users. Accumulation can be achieved by actively replicating the network effects of current networks using incentives, complementary services and big data. Our research show that almost all of the platforms have chosen accumulation as their network strategy (see section 2.4).

To efficiently accumulate a network, digital platforms are using similar incentives and complementary services as the traditional broker to neutralise the lock in effects his services pose. By proposing more efficient searching and matching (see section 4.2) and other additional services (see section 4.3) at a lower cost (see section 4.4) digital platforms aim to attract ship owners and charterers to their platforms.

Further, an important aspect of accumulating a sufficient network on a multi-sided platform is to offer an attractive value proposition for both sides of the platform. From our interviews we find that ship owners are concerned about adopting digital platforms due to the effect digital platforms might have on realized freight rates, these concerns can potentially make network accumulation difficult. Normally a more transparent market yields more competitive prices. If a platform like ShipNEXT or OpenSeas.pro where to become the norm, the market visibility of available vessels would increase, and in turn one could see rates drop. If the platforms only lead to a downwards price pressure, they will be unattractive for ship owners that can find cargoes via other channels.

In the period January 2007 to October 2018 VLCC vessels have been operating with negative net earnings for 64 of 142 months, constituting approximately 45 % of the time (Clarksons Research, 2018) (Drewry Maritime Research , 2013), illustrating the constant price pressure within the industry. If the platforms are to extend these periods of time the platforms will be perceived as less attractive alternatives for ship owners, potentially making accumulation difficult.

An example that can be a hindrance to network accumulation is the auction design of BHP Billiton's platform, which seems to create a downward price pressure. The auction is designed as a Dutch (reversed) auction, with sealed bids. In addition, both bids and bidders are undisclosed to each other. According to (Pindyck & Rubinfeld, 2013) these auction rules

should realize the lowest possible rates. When first tested by BHP Billiton the rates realised on the platform where 5% lover the market rate (Wallis, 2017). The auction design increases the ship owners' risk of running the winner's curse. A situation where the winning bid is lower than the actual cost of taking on the charter. This mechanism is further increased by the downward price pressure.

Initial investments

Another structural entry barrier for digital platforms is capital intensive initial investments. The need for investments in infrastructure, R&D and financing for maintenance of the platform in the establishing period with little or no revenues, make the access to risk capital pose a structural entry barrier. This barrier has been overcome by some of the existing platforms as they are being backed by financially strong players. ShipNEXT is backed by Varamar, a Ukrainian shipping company and BHP Billition is backing their own platform.

Aggressive response

The threat of aggressive response is a significant strategical entry barrier in place, potentially making the entry of digital chartering platform difficult. One should expect that several shipbroking firms already are preparing for a potential market shift from traditional broking to digital platforms. There are clear evidences that this is already happening in the market. The brokering firm Barry, Rogliano & Salles is today the owner of AXS Marine, a platform that could cover sales and purchases of freight more aggressively. The world's largest shipbroking firm, Clarksons, has already prepared for shift towards digitalization in the shipbroking industry. Their in-house IT team employs about 150 people, or about 10 % of their total staff. This team is already developing several digital solutions and should have no problem in developing a new digital chartering market platform based on their market knowledge, experiences from LevelSeas, and all the data possessed by Clarksons Research. If the market is to shift towards digital shipbroking one would probably see the incumbents start to roll out their own platforms, with their existing customer base and information, making it hard for "new" platforms to enter the market successfully.

Platforms can deal with the threat of aggressive response by targeting part of the market that traditionally has been to niche or invaluable for the traditional broker, where the competition is less fierce and build the platform and the network from that segment. Alternatively, a "new" digital platform can avoid aggressive response by offering a service that is substantially different from the value proposition of the traditional broker, reducing the threat of aggressive response. An example of such a substantially different service one of the digital platform

owners we interviewed that said that they aim to team up with ports and by combining AIS and block chain technology enable smart booking of port slots that enable optimal sailing, potentially saving bunker and limiting the idle periods waiting for loading.

4.5.3 Entry challenges

In addition to the barriers of entry, digital platforms might face some additional challenges related to their market entry. When entering the shipbroking market, digital platforms are not only facing competition from the traditional broker, they are also facing competition from other digital platforms. Potentially changing the competitive dynamics, making market entry more challenging.

Red ocean strategy

The market space for shipbroking is already explored and crowded with companies. It seems that the digital platforms are targeting an existing market and aim to utilize existing demand and aim to capture profits by outperforming the current players. This strategical approach is usually referred to as a red ocean strategy, which is considered a challenging way to enter a market. Since the entrants are targeting demand already served by existing market players, they have to outperform the current players which in itself could be challenging. Additionally, the current players have much to lose, in terms of profitable market positions. Making them willing to compete fiercely, protecting their market position. This competition may lead to reduced producer surplus. FreiXchange is by setting the brokerage at 0.25% of fixture value, if this brokerage is adopted by the broader market the reduction of the shipbroking industry's value capturing will be reduced by approximately 80%. Hence, we assume that the market players will react by fighting fiercely for the remaining profits, leaving a consolidated market with one or a few players (Belik, Knudsen, Lien, Pandey, & Timmermans, 2018).

4.5.4 Findings

Based on the discussion above, we believe the greatest challenges faced by digital platforms entering the shipbroking market is their ability to replicate the networks of traditional brokers. We have shown that the digital platforms are using a similar business model as the shipbroker. Generally, we should expect this to make it difficult to enter the shipbroking market, due to the lack of a network and the entry barriers in place. An entrant should therefore focus on developing a differentiated service, making the barriers of entry less prevalent. An entrant may also consider entering a market the traditional broker does not cover, where a network can be developed without fierce competition, before entering the broader shipbroking market.

4.5.5 Limitations

The discussion above and the conclusions drawn from it, has to be treated with caution as we do not have a full overview of the resources and activities of the “new” digital platforms. It is difficult to make accurate assessment of their ability to build networks and to determine the size of their network or the abilities of their technologies. Further, the analysis is considering the current level of technological development, future development can affect the digital platforms ability to enter the market considerably.

5. Conclusion

This thesis contributes with an overview of the market for digital platforms in the shipbroking industry and a typology to classify these platforms. Further, it examines the value proposition of digital platforms in the shipbroking industry and their ability prove commercially successful.

5.1 The big picture

If one takes all the potential efficiency gains, cost reduction and additional services a digital platform can provide into consideration, the value proposition seems promising. However, there are many hurdles a digital platform provider must overcome before he is able to efficiently challenge the market position of traditional brokers.

5.2 The brokering function

The above analysis makes us believe that digital platforms can challenge the traditional broker on both searching and matching and on some additional services.

5.2.1 Searching and matching

On searching and matching the platforms can potentially outperform the traditional broker, because modern technology has no constrains on the potential number of matches it can assess, and because of the ability to utilize mathematically complex matching functions. However, these features are dependent on a large network size to fully utilize their potential. Additionally, the geographical market characteristics of many segments determine the momentary market equilibrium. This make it possible for the traditional broker to keep track of relevant vessels and cargos, making the practical efficiency gains from digital searching and matching less obvious. Furthermore, there are various soft skills of the traditional broker the platforms cannot copy, potentially making the adoption slow and limited to the large and standardized shipping segments.

5.2.2 Additional services

Further, the digital platforms do provide many interesting and promising additional services for both ship owners and charterers. They however, cannot replicate all services provided by

traditional brokers, but the platforms can provide data- and block-chain driven services the traditional broker are not providing. We argue that digital platforms might have the potential to provide value adding services based on formal Type 1 information, but the competitive value of these services may be limited if they become widely accessible. Traditional brokers supplying services based on informal Type 2 information will still be able to supply value adding services that is not likely to be copied by digital platforms. These services will also be able to offer a competitive advantage due to the limited availability. Further, the digital platforms we have assessed do not provide the full spectre of additional services. Hence, the traditional broker's ability to provide a "one-stop shop" for all activities the ship owners and charterers are involved in make his business proposal hard to challenge.

5.2.3 Ability to enter the market

To enter the market successfully the digital platforms must provide a clear value proposition, that triggers adoption demand. The value proposition has to be two-sided for the platform to be endorsed by ship owners and charterers. If adoption of digital platforms is only beneficial for one of the parties the other party will logically not adopt it (*as long as both parties have market power*). The features that differentiate the digital platforms from the traditional broker may promote the platforms ability to enter the market successfully. However, the corner stone in a successful brokering operation is the ability to offer a commercially interesting network of the required size and quality and this is evidently key to successfully entering the market. We believe that there are especially two important elements in an efficient entry strategy. One, provide services that increases work flow productivity. And two, to enter a niche market that is not commercially interesting to the traditional broker, taking advantage of the difference in cost structure and technology.

5.3 Concluding remarks

The complexity of the shipping industry makes it hard to develop better alternatives to the current business methods. Even if a digital platform can outperform the traditional broker on one part of his value proposition, the platform can be insufficient on other parts, in sum making the value proposition of digital platforms less obvious.

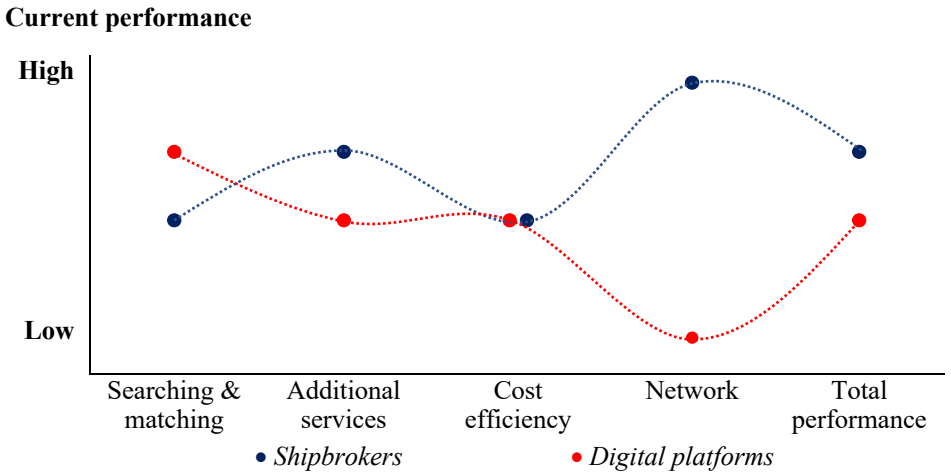

Figure 13 – The current performance differences

Based on our findings, we believe that digital platforms will be able to outperform the traditional broker on price and on the searching and matching process in the standardized markets. But they will have a hard time providing more valuable market intelligence, and for now, more interesting networks. Whether digital platforms can increase the productivity of ship owners and charterers, are to us not obvious due to the uncertainty around how the need for staff will be affected. From a business perspective we do not believe that digital platforms will provide ship owners and charters with an obvious competitive advantage. The ability of digital platforms to reduce the costs will in our opinion make the charterer the main beneficiary of digital platforms, as cost reductions in the shipping industry normally leads to lower rates.

Further, we argue that digital platforms are fighting an uphill battle against the established traditional brokers, due to their lack of attractive networks. But as we have shown the potential of digital platforms are promising, particularly in the most standardized segments of the shipping industry. And we may see that the traditional broker struggle in the transformation towards a digital market place, partly due to resistance to change as status quo is already a lucrative situation for him.

We believe the digital platforms have the potential to, over the next decade replace the traditional broker in the segments recognized by a high degree of standardization, high degree of liquidity and straight forward contractual terms and conditions. However, information will still remain paramount in the shipbroking business, and we believe that the traditional broker will not be fully replaced by digital platforms. But that we rather will see that the role of the traditional broker is changing from performing repetitive tasks such as searching for cargoes in standardized markets towards the role as a trusted advisor.

5.3.1 Further research

To the extent of our knowledge this study is the first to describe the current development in the market for digital shipbroking services. It is therefore not able to cover all aspects of the current market development in depth, or in width. Further studies may focus on broadening the understanding of the aspects we have addressed. Additionally, they may examine how the adoption develops and investigate the driving forces behind the adoption, in order to fully understand if and how digital platforms may change the market for shipbroking services.

6. Bibliography

Adland, R., Jia, H. J., & Strandenes, S. P. (2018). The determinants of vessel capacity utilization: The case of Brazilian iron ore exports. *Transportation Research Part A: Policy and Practice*(110), pp. 191-201.

AXS Marine. (2018, Oktober 4). *www.axsmarine.com*. Retrieved from https://public.axsmarine.com

Bakos, Y. (1997). Reducing Buyer Search Costs: Implications for Electronic Marketplaces. *Management Science, Vol. 43, No. 12, Frontier Research on Information Systemsand Economics, 43*(12), pp. 1667-1692.

Batrinca , G. (2008). E - Chartering web beased platforms between succsess and failure. *International Journal on Marine Navigation and Safety of Sea Transportation, 2*(3), pp. 293 - 296.

Belik, I., Knudsen, E. S., Lien, B. L., Pandey, S., & Timmermans, B. (2018). Stabilety in turbulent times? The effect of digitalization on the stability of competitive advantages.

Besanko, D., Dranove, D., Shanley, M., & Schaefer, S. (2017). *Economics of Strategy.* Hoboken: Wiley Custom.

BHP Billiton . (2017, February 6). *www.bhpbilliton.com* . Retrieved from BHP Billiton launches a shipping platform to buoy productivity: https://www.bhp.com/media-and-insights/news-releases/2017/02/bhp-billiton-launches-a-shipping-platform-to-buoy-productivity

Bloomberg. (2018, November 9). *bloomberg.com*. Retrieved from https://www.bloomberg.com/quote/CKN:LN

Brealey, R. A., Myers, S. C., & Marcus, J. A. (2012). *Fundamentals of Corporate Finance* . New York: McGraw-Hill/ Irwin .

Chen, Z.-Z. J., Zhi-Ping, F., & Chen, X. (2016). Fuzzy Multiobjective Modeling and Optimization for One-Shot Multiattribute Exchanges With Indivisible Demand. *IEEE Transactions on fuzzy systems, 24*(3), pp. 708-723.

Clark, T., & Lee, H. (1999). Electronic Intermediaries: Trust Building and Market Differentiation. *Proceedings of the 32nd Hawaii International Conference on System Sciences*.

Clarksons Research. (2018, November 15). *Clarksons Shipping Inteligence Network*. Retrieved from Clarksons Shipping Inteligence Network: https://sin.clarksons.net

Dixon, G. (2018, May 3). *www.tradewindsnews.com*. Retrieved from ShipNext moves beyond Bitcoin with shipping tokens:

https://www.tradewindsnews.com/finance/1484447/shipnext-moves-beyond-bitcoin-with-shipping-tokens

Dooley, K. (2002). Simulation research methods. In J. B. (ed.), *Companion to Organizations* (pp. 829-848). London: Blackwell.

Drewry Maritime Research . (2013). *Ship Operating Costs.* London : Drewry Maritime Research .

Fiotakis, D. (2005). The impact of information technology upon the Shipbroking profession. *Tulane Maritime Law Journal*(29), pp. 238 - 253.

FreiXchange. (2018, Oktober 7). *www.freixchange.com*. Retrieved from http://www.freixchange.com

Hagiu, A., & Wright, J. (2015, March 16). Multi-Sided Platforms. *Harvard Business School*, pp. 1 - 31.

Janssen, M., & Verbraeck, A. (2008). Comparing the strengths and weaknesses of Internet-based matching mechanisms for the transport market. *Transportation Research Part E: Logistics and Transportation Review, 44*(3), 475-490.

Le, D. T., Zhang, M., & Ren, F. (2018). An economic model-based matching approach between buyers and sellers through a broker in an open emarketplace. *Journal of Systems Science and Systems Engineering, 27*(2), pp. 156-179.

Lorange, P. (2005). *Shipping Company Strategies.* Oxford: Elsevier.

Lorange, P. (2009). *Shipping Strategy Innovationg for Success.* Cambridge: Cambridge University Press.

OECD. (2010, April). THE ECONOMIC AND SOCIAL ROLE OF INTERNET INTERMEDIARIES.

OpenSea.Pro. (2018, Oktober 6). *www.opensea.pro*. Retrieved from https://opensea.pro

Perset, K. (2010). The economic and social role of internet intermediaries. *OECD Digital Economy Papers No. 171*. OECD Digital Economy Papers. Retrieved from https://www.oecd-ilibrary.org/science-and-technology/the-economic-and-social-role-of-internet-intermediaries_5kmh79zzs8vb-en

Pindyck, R. S., & Rubinfeld, D. L. (2013). *Microeconomics.* Upper Saddle River, New Jersy: Pearson.

Pisanias, N., & Willcocks, L. (1999). Understanding slow internet adoption: "information" in ship-broking markets. *Journal of International Technology*, pp. 399 - 413.

Plomaritou, E., & Papadopoulos, A. (2018). *Shipbroking and Chartering Practice.* Oxon : Routledge.

Rimmer, P. J., & Kam, B. H. (2018). Consumer Logistics. In *Surfing the digital wave* (pp. 154-156). Edward Elgar Publishing Limited.

ShipNEXT. (2018, Oktober 1). *www.shipnext.com*. Retrieved from https://shipnext.com

Signal Ocean . (2018, Oktober 4). *Signal Ocean* . Retrieved from https://www.signalocean.com

Stopford, M. (2002). E-commerce-implications, opportunities and threats fro the shipping business. *International Journal of Transport Management, 1*(1), pp. 55-67.

Stopford, M. (2009). *Maritime Economics.* Oxford: Routledge.

Strandenes, S. P. (2000). The Shipbroking Function and Market Efficiency. *International Journal of Maritime Economics* , 17-26.

Tamvakis, M. N., & Thanopoulou, H. A. (2000). Does quality pay? The case of the dry bulk market. *Transportation Research Part E: Logistics and Transportation Review, 36*(4), 297-307.

The Ocean Freigth Exchange . (2018, Oktober 13). Retrieved from https://www.theofe.com

Van Alstyne, M., Parker, G., & Choudary, S. (2016, April). Pipelines, Platforms, and the New Rules of Strategy. *Harvard Business Review*, pp. 54 - 62.

VesselBot. (2018, Oktober 10). *www.vesselbot.com*. Retrieved from https://www.vesselbot.com

VesselsValue. (2018, Oktober 2). *www.vesselsvalue.com*. Retrieved from https://www.vesselsvalue.com

Vortexa. (2018, Oktober 12). *www.vortexa.com*. Retrieved October 10, 2018, from https://www.vortexa.com

Wallis, K. (2017). *Reuters*. Retrieved October 8, 2018, from https://www.reuters.com/article/bhp-billiton-shipping/bhp-launches-online-freight-platform-to-sink-shipping-costs-idUSL4N1FF2JW

Wijnolst, N., & Wergeland, T. (2009). Shipping Innovation. IOS Press BV.

Xeneta. (2018, Oktober 23). *www.xeneta.com*. Retrieved from https://www.xeneta.com

7. Appendix

7.1 Questionnaires

7.1.1 Questionnaire for platform owners

Introduction

1. What is your role in the company?
2. What kind of professional experience do you have?

Customers

3. Who are the users of your platform? (target group)
4. What kind of segments do you operating within?
    1. Do you intend to expand to other segments?

The platform

5. What is your value proposition for users of the platform?
    1. What is the problem you aim to solve?
    2. What services are you providing (i.e. market intelligence, negotiation support etc.)?
    3. What are the rational for using your platform?
6. What is your source(s) of revenues?
    1. What revenue model do you use?
    2. What are the cost drivers of your platform?
7. How are deals concluded
    1. How are negotiations concluded?
    2. What is the time frame for concluding a deal?
8. How does your platform keep the market players informed?
    1. In what way do your platform provide decision relevant information for the market players?

2. In what way is this information distributed among the players?

Competitive landscape and future

9. What are your experiences so far?

    1. What has been the main feedback form users?

    2. What has been challenging in developing the platform to an attractive market place?

    3. What type of business is concluded on your platform?

7.1.2 Questionnaire for platform users

Introduction

1. What is your role in the company?

2. What kind of professional experience do you have?

3. What platforms/ Brokers are you using (i.e. digital broking, traditional broking, direct contact etc.)?

4. What are you using shipbrokers for? (Fixtures, market information, other)

5. What are you using digital platforms for? (Fixtures, market information, other)

6. Have you made any changes in the use of brokers/digital platforms lately?

7. What triggered the choice of using digital brokers?

8. Do/did you have stable relations to your broker(s)? (i.e. do you shop around often?)

Transactions

9. For what kind of transactions do you use the different kinds of intermediaries (i.e. digital broking, traditional broking, direct contact etc.)?

10. Do the choice of broker/platform rely on the specific trading situation? (i.e. the ship/load/timing etc.)

11. Do the need for inhouse chartering knowledge/capacity change when using a digital platform compared to a broker?

Searching time

12. How long is the max, min and average searching time when using different broking platforms (i.e. digital broking, traditional broking, direct contact etc.)?

13. Do you experience any significant differences between the different platforms?

"Non-monetary" value added by the broker

14. How does the broker add value for your business?

15. Do you use your broker as a commercial advisor?

16. How do you perceive the risk(s) when using a traditional broker/digital platform? Do they differ? (Counterpart risk, information risk, etc.)

17. Do you use the shipbroker to other services the just broking? For example, information gathering, reports, analysis etc.

Cost

18. What is your cost of using a shipbroker?

    1. Do you perceive the commission as high or low?

    2. Do you think the cost is justified by the service they provide?

19. What is the cost of using a digital platform?

    1. Do you perceive the commission as high or low?

    2. Do you think the cost is justified by the service they provide?

Alternatives

20. What is your alternative(s) to the broking platform(s) you are currently using?

21. What changes do you expect in the near future regarding your use of broking services?