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An Analysis of Electronic Intermediaries in the Shipping Business

by

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Abstract

Over the past decade, there has been on and off, success and failure of efforts bringing electronic intermediaries to shipping business. People were in high hopes that electronic intermediary can reduce the searching time and cost, lower the transaction friction and improve the market efficiency same in shipping. Unfortunately most electronic intermediaries failed to live long. From a different perspective, this graduate work thrives to answer a question: “how do electronic intermediaries fit in shipping business?” To start with, it looks at the different roles of intermediaries and the added value of an electronic intermediary. Afterwards, in order to exam those in the shipping market, the market features and the current application of electronic intermediary in shipping have been carefully studied. This research culminates in a simulation model of electronic intermediary in ship chartering brokerage, developed from a mathematic model and through three scenarios creation. The simulation result shows that electronic intermediaries can offset its weakness by relying on a definite large searching scope and/or to team with current intermediaries. To provide a comprehensive answer to the research question, the second methodology consisting of two case studies is employed: TradeWinds and Steminorder. Guided by the results from quantitative model simulation, these two cases are anatomically researched to reach the conclusion of four strategies for electronic intermediaries in shipping: human intelligence imitation, critical mass, positive network externality concept and large searching scope. At the end of this graduate work, recommendation and strategy advice in line with our conclusion are presented, for the business entrepreneurs in this field.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

AC	Agent Cargo
AS	Agent Ship
C	Cybermediation
COA	Contract of Affaightment
D	Distermediation
EDI	Electronic Data Interchange
Elec	Electronic Intermediaries
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure
FT	Financial Times (Magazine)
I&C	Information and Communication
ICT	Information and Communication Technology
MAVCM	Internet-based Virtual Chartering Markets
PD	Per Day
PMT	Per Metric Ton
R	Reintermediation
S&P	Ship Sales and Purchase
Trdt	Traditional Intermediaries
TCT	Time Charter on Trip Basis

1. Introduction

1.1. Research Background

"70% of shipping transactions will be conducted online by 2005 and worth of US$ 1.3 trillion in 2003."

- Forrester Research, 2001 -

This outlook speaks out a common thought a decade ago –how E-commerce would rock the very core of the shipping business. The term "E-commerce" does not do justice to all that the internet can do to shipping. E-commerce is merely one category of the electronic intermediaries (OECD, 2010). Amazon is, PayPal is, Twitter is and Facebook is. These companies are among the most successful businesses in the ICT segment. By the latest Forbes (2013) ranking, Amazon won No.1 in online intermediaries for retail and service with a swooping revenue of US$ 61 Billion. Facebook has secured a position shortlisted in global top 500 across all industries. It is envious. It is exciting.

Shipping, the virgin land where ancient business traditions retained, logically had become a prime pray for e-business entrepreneurs. In line with the American research firm - Forrester Research's forecast, once ambitious venture capital matched into shipping business, in a bright hope that they could reap the same as in other industries from the applying of electronic intermediaries to the shipping business. Similarly, as the Economist magazine puts it "If you are engaged in any form of commerce, from a humble market stall to a gigantic department store, the internet is lurking, ready to blow up your business. And if you are not prepared to embrace change, to cannibalize your own sales, and disintermediate your own intermediaries, somebody else surely will" (The Economist, 2000).

All seems to be promising at the beginning. Big players in the commodity trading and the leading broker joined hand. An electronic intermediary Levelseas was backed by BP Amoco, Cargill and Royal Dutch/Shell Group and operated by Clarkson, in order to bring dry bulk ship chartering online and eventually to reach full "cybermediation" – a status that electronic or the wires replaces the traditional and manual market intermediaries: in this specific case, the ship brokers. Unfortunately it folded within two years. For many others it is the same old story: LogiGo, online freight matching intermediation for inland transport in the Continental Europe, ShipDesk, a fully automatic shipping platform and Strategic Software, technical companies aiming to provide such expertise in related fields. None of them existed for a long time. But, there are indeed few survivors, i.e. the FFA platform of Baltic Exchange, the "broker assistant" AXSMarine, and Chartering Platform Steminorder. These intermediaries have managed to wade through the ebbs and flow of the economy last decade, in which the economic boom and IT bubble formed interesting interaction. In recent years, new plays got itchy to try: shipping online news TradeWinds has incorporated an online ship S&P platform, Bunker broker LQM Petroleum Services cloned themselves an electronic version-Bunker Vision, in an effort to adapt themselves to new electronic intermediation environment and possibly pre-empted the competitors. The outcome is still uncertain.

This landscape of electronic intermediation application in shipping has formed the background of our study.

1.2. Problem Identification

Indeed, electronic intermediaries have changed the traditional way of doing business. It is not new. But, it is relatively new for shipping. It has been very successful in many industries, but not yet for shipping. Noticeably since the IT bubble burst over the new millennium, most shipping electronic intermediaries had faded away. But coincidentally that period also witnessed one of the most booming eras in the shipping history. Recent years there has been resurgence in shipping electronic intermediaries. Shipping business is such an information-intensive business in huge geographic span, in which the business components - market intermediaries play a crucial role, e.g. the agents for ship supply, vessel ETA and ETD, and crew recruitment, middlemen for bunkers and commodities and brokers for ship chartering, sales and purchase (S&P) and demolition. Some of these are said to be ideal to go online. For instance, in bulk shipping, chartering transactions are a prime candidate to go on-line; for liner shipping, we will see IT cost as a bang (Stopford, 2002). Some also predict the disintermediation as a potential consequence with the creation of an electronic freight market (Clements, 2001), but as depicted in the background, the wide adoption of electronic intermediaries has not taken place.

The primary economic role of an intermediary is to reduce the total cost of production and delivery through improving transactional efficiency (Carroll & Cotes, 1998). Electronic intermediaries are advantageous in their reduction in search time and cost (OECD, 2010), but probably arguments based on the efficiency, cost and time cannot give a compelling explanation of the slow adoption or nonoccurrence of "creative disruption"[1] of electronic intermediaries' application to shipping business, considering both ironically represent the strongholds of the electronic intermediary. There must be an explanation of why electronic intermediaries work well in other field but not in shipping. Considering this, we approach this subject by looking at this issue from a different perspective: what the features of shipping business are and what the information flow looks like? Possibly the problem is the business nature and environment that render the role of electronic intermediaries behave differently, but it is unknown the reason and to which extend such torsion goes, which is what we may need to exam in this study.

Research Question:

In line with the identified problem, this study is guided by the following main research question:

"How do electronic intermediaries fit in the shipping business environment?"

[1] Creative disruption is a term coined by Joseph Schumpeter in 1942 to denote a "process of industrial mutation that incessantly revolutionises the economic structure from within, incessantly destroying the old one, incessantly creating a new one."

Basically, this question conveys meanings of three folds. An electronic intermediary is backed by fast information change and advance technology of ICT, so it must have its advocacy to compare traditional market intermediaries. There are plenty of researches done in this area. The second layer of the question contains the element of the shipping business environment - how it varies from a traditional business environment. The third layer is how electronic intermediaries' advantage display in such an environment.

- SQ1: "What is the added value of electronic intermediaries in comparison to traditional market intermediaries?"
- SQ2: "What are the issues arising from asymmetric information of intermediation in an electronic context?"
- SQ3: "What are the features of shipping market that affect the application of electronic intermediary, either pro or con?"
- SQ4: "In what way does an electronic intermediary create significant network externality and improve the information dispersion in shipping?"

1.3. The Research Methodology – a Mixed Approach

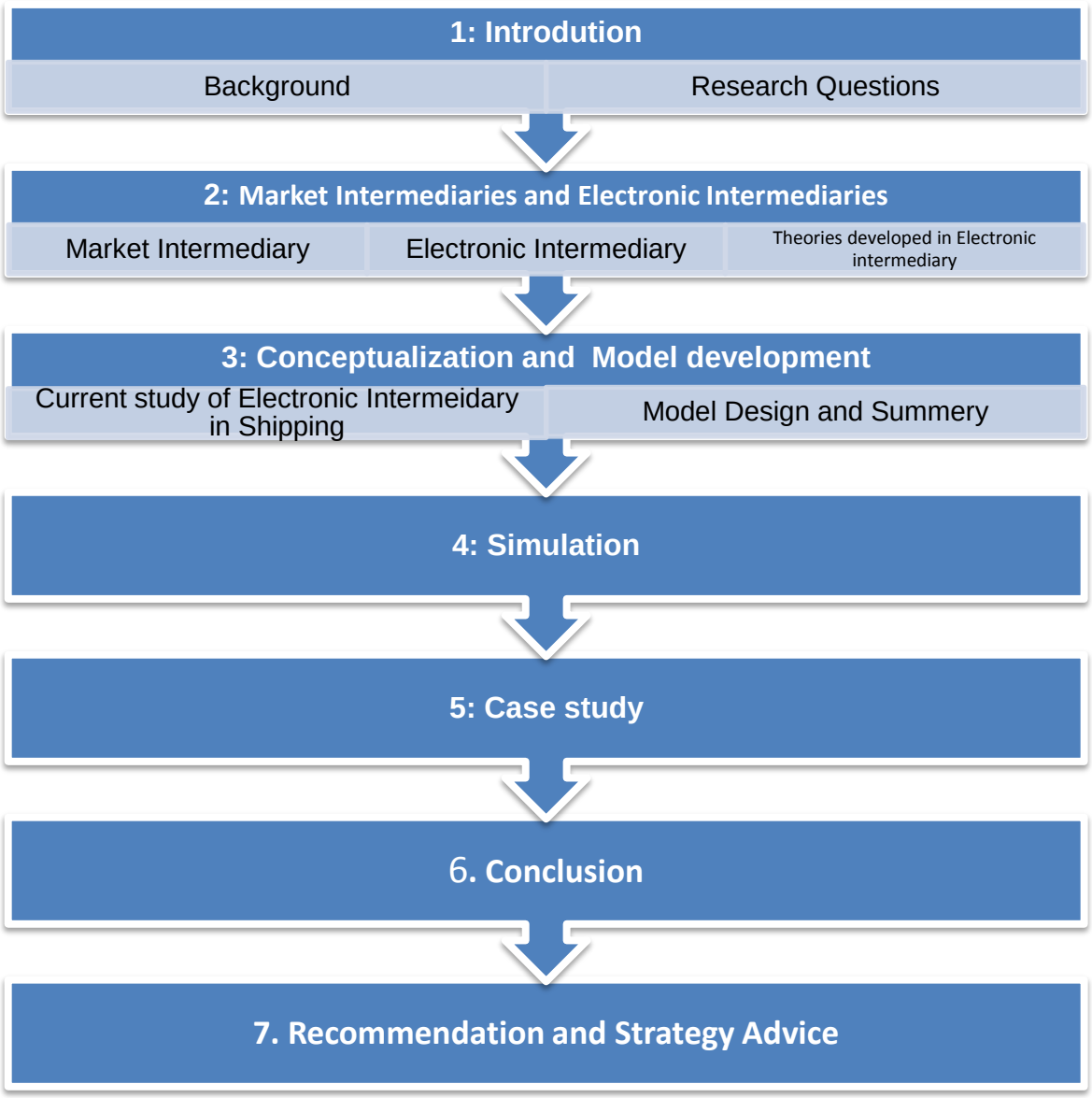
Methodologies in academic research are divided in "qualitative" and "quantitative" approaches. In early years there were even heated debates of "paradigm wars" (Gage, 1989) to steer clear one from another. However, over the last decade, the methodology of mixed method started to gain popularity in academic research, in light of its advantages in complementing the results of each other. Quite a few scholars concluded that to combine quantitative and qualitative methods are for these purposes (Kella, 2006; Bryman 1988):

- Combination of two approaches bridge the "Macro" and "Micro" levels and complementing each other's weakness.
- Quantitative methods can generalize findings from the case "n" in qualitative study.
- Qualitative methods interpret quantitative result into more comprehendible conclusions, especially for readers/audience out of the exact domain.
- Qualitative research helps to understand relationships between different variables.
- Quantitative research seizes the structure and qualitative methods often look at the process.

The two methods cannot substitute each other but are to provide interpretations of the research questions from different angles and to echo the result of each other or identify heterogeneity in the other result (Kella, 2006). Especially when a research is an investigation of a hardly known area, qualitative results can be partial, for which complement from a quantitative approach is needed to corroborate. Furthermore, the

research question also affects the methods to be used. Sometimes a research question is of such complexity that a quantitative method can only fulfil part of it or of the sub-questions or for some topics there are no substantial empirical and quantitative data are available. This can also be the situation calling for a qualitative approach to supplement. Specifically in our case, on the “macro” level we try to capture the nature of the issue in generalization; on the “micro” level we rely on a qualitative approach to study life real cases addressing the aspects of our research question which is impossible or difficult to do from a quantitative way. The case “n” we will study in this paper mirroring the finding of the model simulation; the model simulation will seize the large picture of the issue. The result of the qualitative research also entails practical recommendation for our host company, which adds practical implication of this study. The reasons why we opt for model simulation and case study (including interviews) will be respectively explained in chapter 3.1 and chapter 5.1.

1.4. Research Design



2. Market Intermediaries and Electronic Intermediaries

This chapter presents the current studies concerning the topic and the theoretical foundation for the analyses in the following chapters. Part. 2.1 defines the market intermediary, its market function and its roles. Part 2.2 introduces the electronic intermediary and clarifies its different role and added value in comparison to a conventional market intermediary. Part 2.3 is particularly geared towards the theories in electronic intermediary studies which we use in later chapters to analyse the electronic intermediary in the context of shipping business. These theoretical foundations are the cost and time saving, "lemons" theory, moral hazard and trust model and scenarios of disintermediation, re-intermediation and cyber-intermediation.

2.1. Market Intermediaries

Current studies give no universal answer to the question of what a market intermediary is. Various researches thrive to capture it but in a wide spectrum.

In a wide sense, an Intermediary is defined by the American Economist Dr Spulber (1999) as an agent who either helps the buyer and seller to reach a deal or purchases from suppliers to resell to buyers. Sarkar, et al. (1998) identify the market intermediaries as agents who support the market exchange between the producer and consumer, by aggregating the trade so to create economies of scale and/or scope and to improve the market efficiency. Bailey (1998) describes the market intermediaries as transaction participants who support and coordinate the transaction, in order to reduce the market transaction cost. Intermediaries are also identified as market-making firms (Spulber, 1999). They contribute significantly to the economy: the data of 1999 show that the intermediary business activities account for around one quarter of the American GDP (Spulber, 1999). In a narrow sense, market intermediaries refer only to market brokers or middlemen (Resnick et al., 1995), typically the realtors in real estate market and the ship brokers for ship building, chartering, S&P, and demolition, to name but a few.

2.1.1. Existence of Market Intermediaries

The traditional theory of markets assumes that market participants have complete information about the underlying economic variables and the market adjusts the price to reflect the difference. However, this is hardly the case in reality: in common, information in markets is mostly asymmetric. For instance, in the labor market the applicants have more information about themselves than the recruiters do (Löfgren, et al., 2002). It was the studies about the markets with asymmetric information done by George Akerlof, Michael Spence and Joseph Stiglitz that won them the Nobel Prize in Economics in 2001.

Cost that incurs from intermediation itself is market friction. However, intermediaries can be an indispensable "value moderator" to clear the market (Datta, 2005). In financial world, financial intermediaries exist because they can reduce information and transaction costs that arise from an information asymmetry between borrowers and lenders (Clause & Grimes, 2003). Similarly, in other segments, the increasing

awareness of the sellers and buyers to have symmetric information and to coordinate the separated tasks require a role of intermediary, which is also because of the need to coordinate tasks arising from the constraint imposed on the individuals for each tasks (Janssen & Verbraeck, 2005).

Resnick et al. (1995) argue that brokers and middlemen, the typical market intermediaries, exist and are important because the search costs, lack of privacy, incomplete information, contracting risks, and pricing are better managed by brokers. They collect information about the characteristics of suppliers and the patterns of consumer's demand. This information is used to facility the transaction, for instance to help the seller or buyer with the pricing, product design and product ordering. Such information can be signals passed through an intermediary. Signalling is a practice by sellers in markets with asymmetric information, in many cases to allow the market to function effectively than it would otherwise. The quality is better reflected by the price signalled than the price paid (Stiglitz, 1987). However, price signals may speak for the quality but is far less as a reflection of the complex in the transaction such as the contract terms negotiation and case follow-up. That is why even though market intermediaries are frictional and costly to the market transaction, they still exist. This is largely attributed to their value added and a crucial role in market clearance.

2.1.2. How Market Intermediaries Make Money

"Market-making" is an economic term referring to creating money-making opportunities. As market-makers, intermediaries can create their own profit by leveraging their certain market power on either side or provide value-added services. Intermediaries and their principles are in relationship model described as the principle-agents model. Market intermediaries search information for their principles. Also with this information, the market intermediaries or market makers coordinate between the consumer and the market-taking firms.

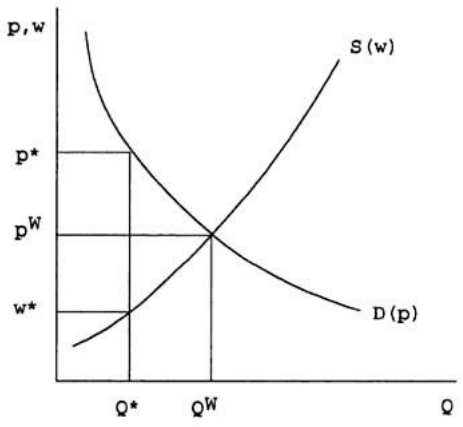


Figure 1: the Bid-ask Model in Intermediation (Spulber, 1999)

A simple way to interpret the market intermediary can be seen in below figure 1 (Spulber, 1999). An intermediary with certain market power can set price with the seller and buyer of the products and gain profit from the difference of the two. $D(p)$ is a demand curve showing the residual demand of the buyer. *S(w)* is the supply curve for the intermediaries' suppliers willingness to provide at various prices. A bid price *w is* tendered to the sellers and the asking price is *p* from the seller side. Under profit-maximization, firms set prices at which its marginal cost equals to its

marginal revenue. As shown in figure 1, the product of $(p^* - w^*)Q^W$ depicts the profit made by an intermediary under a bid-ask model, whereas p^* and w^* are the ask-bid price respectively. The transaction volume is smaller than the Walrasian equation. There is a deadweight loss visible from the figure. However, one may argue that without the mediation, the seller may never find the buyer: the equilibrium will not be met. In another word, the market is not to be cleared. An intermediary firm does more than just arbitrage. There are other methods that intermediaries make a profit, for instance by charging certain percentage of the transaction value as the commission, a common practice in real-estate, issuance and shipping intermediation.

2.1.3. The Role of a Market Intermediary

There are few theories about the main roles of a market intermediary: the primary economic role of an intermediary is to reduce the total cost of production and delivery through improving transactional efficiencies (Williamson, 1981). Hence, the efficiency of an intermediary depends on whether the total transaction or coordination cost from using an intermediary is more or less than not using it. Spulber (1999) concludes the function of a market intermediary is to figure out ways clearing the market, price matching the purchase to sell so to speak. In addition, a market intermediary is to provide liquidity and mediation, to coordinate activities between buyers and sellers, and guarantee quality and monitor performance. In general, market intermediaries can balance the supply and demand and reduce the market friction. Bakos and Bailey (1997) suggest that an intermediary can reduce coordinating cost, address problems of asset specificity, and promote standardization. Resnick et al (2005) suggest four roles of market intermediaries: aggregation, pricing, trust protection and searching. Cosimano (1996) argues “matching” is another role of a market intermediary. OECD (2010) adds two more roles: to provide infrastructure and to collect, organize and evaluate dispersed information.

We can conclude from these studies the roles of a market intermediary in below bulletins:

- Aggregation: aggregation is most representative role of a market intermediary in terms of the economies of scale and scope. It is the aggregation of the products and moreover, it is the aggregation of the demand and supply. In the maritime business, a “pool”, the intermediary who manages pool members’ ships and via for cargos together, is an example of aggregation.
- Pricing: a market intermediary has valuable information of the market and the information of both the supply and demand. And this is how a market intermediary can match the supply and demand. It is by the more complete information an intermediary has in comparison to the supply and demand, that it can practice price discrimination and have market power over either side. Sometimes, a market intermediary negotiates the price for his client.

- Trust: a market intermediary can resume a role as an agent of trust, to protect the buyer and sellers from the opportunistic behaviour of other participants. A ship owner may never deal with the same charterer again, but most likely he will have to find cargo or charterer via the same group of intermediary. Naturally over time, those brokers can distinguish the good names from the bad ones.
- Search: Intermediaries search. This can be a search requested initiated from either the demand or supply side, be it price of goods or the feature of the goods. Searching doesn't end when the target is found but goes further to collect and disperse the information.
- to provide infrastructure;
- to facilitate social communication and information exchange;
- to facilitate market processes;
- To take into account the needs of both buyers/sellers.

2.2. Electronic Intermediaries

Internet is penetrating the social and economic sphere from many aspects. The inception of the Interne has unprecedentedly fastened the information exchange worldwide. Firms and individuals are doing business under electronic environment in various roles, e.g. the suppliers, customers or intermediaries (Bakos & Bailey, 1997). Our study objective - market intermediaries on the internet or electronic intermediaries are an emerging concept, bringing significant changes to the economy by interposing themselves between suppliers and consumers (Lee, 1997). The Electronic intermediary is named in some researches as the Internet intermediary (OECD, 2010) or the cyber intermediary (Sarkar, et al., 1998).

Sarkar et al. (1998) propose that a cyber-intermediary is the information service providing intermediation which is based on the Internet. Janssen and Verbraeck (2005) define it the intermediaries providing information architecture supporting the trade between sellers and buyers in an electronic environment. OECD (2010) gives its definition in such accuracy:

> Internet intermediaries bring together or facilitate transactions between third parties on the Internet. They give access to, host, transmit and index content, products and services originated by third parties on the Internet or provide Internet-based services to third parties.

OECD categorizes electronic intermediary in the following terms (OECD, 2010):

- Internet access and service providers (ISPs): the companies which provide internet access to the government, companies and households. They can be the cable service providers - AT&T and telecom business- Vodafone, Verizon, and many other national telecom companies.
- Data processing, web hosting providers and content delivery: they boost a business likely to be driven by need of outsourced IT service, lower price but faster processing, broadband diffusion. Internet search engines and portal service: search engines have become so important in assisting the “netizens” to

gain the desired info entries. It is a business sector with high Herfindahl-Hirschman Index, where few companies dominate: Google is the most visited site among all websites for many consecutive years and by far the largest, dominating 66.8% of the market as early as in 2009. It is followed by Yahoo! Baidu and Bing in a global scale.

- E-commerce intermediaries, where these platforms do not take title to the goods being sold, are increasingly integrated to companies' sales strategy. Examples are eminent E-bay and Amazon.
- Internet payment systems are overall dominated by credit card but alternative payment is gaining momentum like Google Checkout and PayPal, the latter holding over 150 million accounts worldwide by 2009.
- Participative networking platforms, which include Internet publishing and broadcasting platforms that do not themselves create or own the content being published or broadcast. The first of such platform coming to one's mind may be the social networking platforms, e.g. Facebook and Twitter. Other than these, online games and online community such as Wikipedia and Student Room are also examples of this category.

An electronic intermediary can possess all main roles that a conventional intermediary has, i.e. aggregation, pricing, searching, trust, facilitation and matching (Resnick et al., 2005). An electronic intermediary is powered by advanced Information Technology to act essentially the same role as of a traditional market intermediary, with increased efficiency and reduced transaction costs (Klein et al., 1999). However, Luo and Donthu (2007) in their research about the cybermediation suggest that even cyber-intermediaries will continue to create added value to the value chain of the producer consumer, benefiting both parties, they may be more useful in the low cost but frequently purchased product categories.

2.3. Theories Related to Electronic Intermediaries

As a sprouting new item brought by the explosive revolution of the Information Age, electronic intermediation study is also a new subject, as one may see most citations in this section are from recent years. There are studies that make effort to apply current theories of management, economics and other social science to electronic intermediaries and there are also researches in which the authors try to identify completely new phenomena. We have summarized some main findings in this field related to our study.

2.3.1. Disintermediation, Re-intermediation and Cybermediation

The inception and the rapid development of the Information Technology have provoked fundamental changes in organisation and the market structures. Malone et al. (1987) propose that due to an Electronic Brokerage Effect, disintermediation would envisage in the on-line market, resulting lower friction in transactions. The advent of Inter-Organisational Information Systems (Johnson & Vitale 1988) and the Internet has conjured new ways to conduct business previously unconceivable, e.g. the eruption of

electronic marketplaces and E-commerce (Morton, 1991). Such progress is continuously transforming the organizational systems and the value creation (Porter, et al., 1985). Furthermore, such advances reach out to the individual consumers, from areas of the organisation. This has provided an unprecedented opportunity for the originally business entities to conduct business directly where a market intermediary used to present.

In shipping world, intermediation was and still is widely practised, be it new shipbuilding, chartering or S&P. Many specialists predicted that Information Technology would render intermediaries non-existent. They had their reasons. Studies done by Malone et al. (1987) determine that such direct transaction "bypassing" will increase along the development of Information Technology and eventually lead to the phase-out of the market intermediaries from the value chain. Below figure depicts an initial expectation of the disintermediation, in which market intermediaries are bypassed then eventually phased out.

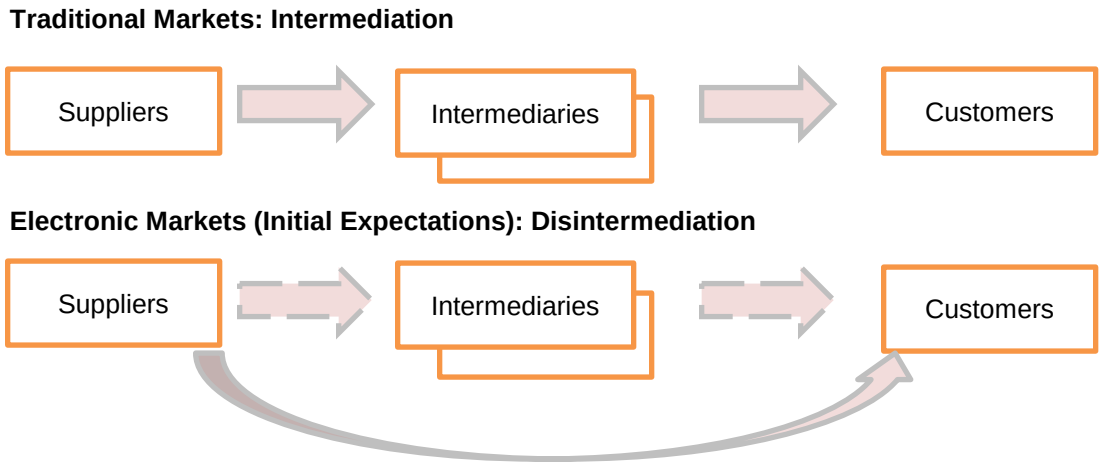


Figure 2 Traditional vs. Electronic Markets: the Disintermediation Hypothesis (Giaglis et al., 1999)

Accordingly, three scenarios are developed by Giaglis et al. (1999):

a) *Disintermediation Scenario*: The function of the market intermediary- to clear the market (Spulber, 1998) will be rendered useless because electronic markets decrease the transaction costs for both buyers and sellers and allow them to trade directly in business they had to resort to intermediaries. The market clears itself. This trend threats the existence of market intermediaries and thus it is called "disintermediation". For instance, air tickets now are sold by many airline companies directly online, in comparison to a dealership system a decade ago.

b) *Reintermediation Scenario*: Traditional intermediaries may find opportunities to leverage their expertise and economies of scale, and continue to play an important role in facilitating commercial transactions, but mainly as contractors to sellers. Furthermore, traditional intermediaries may also find opportunities to differentiate themselves (through price, service, augmented products, etc.) and/or concentrate on niche markets.

c) *Cybermediation Scenario*: Finally, the advent of electronic markets will create unprecedented opportunities for new types of intermediaries that will provide the necessary public infrastructure support for those market functions that will be restructured in the electronic commerce world (for example, navigation and selection assistance, rating services, etc.) These cybermediaries may be sponsored or even owned by sellers attempting to get 'next to' customers. Some of these cybermediaries may even assume public roles, assisting legal and regulatory bodies in providing institutional support for electronic markets.

Table 1:Opportunities and Threats of Intermediaries in Electronic Markets (Giaglis et al., 1999)

Market Function	*Electronic Market Influence*	*Likely Effects on Intermediation*
Determination of Product Offerings	➢ Personalisation of Products	➢ Disintermediation (especially in digital products)
	➢ Aggregation	➢ Cybermediation (aggregators)
	➢ Disaggregation	➢ Disintermediation (pay-per-use)
Searching	➢ Lower Search Costs	➢ Disintermediation
	➢ More Complex Search Requirements	➢ Cybermediation
	➢ Lower Barriers to Entry	➢ Cybermediation/Re-intermediation
Price Discovery	➢ Redistribution of Mechanisms	➢ Cybermediation/ Re-intermediation
	➢ New Markets	➢ Cybermediation
Logistics	➢ Lower Logistical Costs	➢ Disintermediation
	➢ Economies of Scale	➢ Re-intermediation
Settlement	➢ New Cost Structures	➢ Re-intermediation
	➢ New Payment Mechanisms	➢ Cybermediation/ Re-intermediation
Trust	➢ Increased Protection Requirements	➢ Cybermediation/ Re-intermediation
Legal and Regulatory	➢ Institutional Support for Electronic Markets	➢ Re-intermediation

2.3.2. Asymmetric Information and Electronic Intermediaries

As discuss in 2.1.1, in reality the market is more often than not a market with asymmetric information. The seller of a product often knows more about the quality of the products than a potential buyer (Löfgren et al., 2002). In shipping market, Ship owners know better of his vessel than the charterer. The cargo owner knows better the cargo condition than the operator. One of the functions that we discussed earlier for intermediaries is the information dispersion: to reduce the information and transaction cost that arise from information asymmetry (New Zealand Treasury, 2003), to further help clearing the market (Spulber, 1999). George Akerlof, Michael Spence, and Joseph E. Stiglitz in their Nobel-Prize-winning study of "analyses of markets with asymmetric information" identified issues related to asymmetric information. Their pioneering

contribution has empowered the economists with tools to analyse issues related to asymmetric information.

Many scholars studied the problems associated with electronic intermediaries arising from asymmetric information. The famous "Lemon" issue can be summarised in below (Akerlof, 1970). Hypothetically there are several potential sellers and buyers, and the seller knows the quality of the products (Value: θ), but the buyer doesn't know the value V, however the buyer knows the function of V: F (θ); If buyer offers price P so P is the expectation of θ.
The seller can decide to accept or decline the offer. If he accepts, then the buyer gets total utilization of V (θ) at the price of P, so the buyer's net utilization is:

$$\boldsymbol{\pi_b = \mathbf{E}(\theta) - \mathbf{P}} \qquad \textit{Equation 1}$$

For the seller, if he accepts, then the seller gets money P but he has forsaken the utilization U (θ), hence the net unitization of the seller is:

$$\boldsymbol{\pi_s = \mathbf{P} - \mathbf{U}(\theta)} \qquad \textit{Equation 2}$$

If either side decline to trade, then either side utilization is 0, or $\pi_s = \pi_b = 0$.
Here π_b is the buyer's utilization and π_s is the seller's utilization. V (θ) is the evaluation from buyer towards the goods (price willing to offer). $U(\theta)$ is the seller's evaluation or price willing to take. All are subject to below constraint:

$$\boldsymbol{\frac{\partial V}{\partial \theta} > 0, \frac{\partial U}{\partial \theta} > 0, V(\theta) > U(\theta)} \qquad \textit{Equation 3}$$

2.3.3. Moral Hazard and Reputation

Moral hazard, as conveyed by the meaning, is negative. In economic terms it refers to the undue risks that people are apt to take if they don't have to bear the consequences. In an electronic transaction, the business is usually done between strangers, which make the seller's reputation vulnerable (Ba et al., 1999). The information and transaction flow in an electronic transaction are often unsynchronized, which makes the information even more asymmetric compared with a traditional market (Varian, 1999).

As it is indicated in previous chapters, in a traditional business environment, market intermediaries safeguard the reputation. In addition, different parties more often than not use real identities. Same seller may not deal the same buyer again but still have a great chance to encounter the same market intermediary (Ba et al., 1999). This deterrence keeps the seller "well-behaved". In contrast, to do business on-line is uncertain about the identity. People believe more in "seeing is believing." This is especially true in business like shipping, where transaction volume is huge and the stakes are simply too high to risk even once. Several scholars have tried to make suggestions of the reputation mechanism for electronic intermediaries.

- Choi et al., (1997) propose an mechanism for the electronic intermediaries. In brief, the mechanism requires the seller to deposit certain amount at the intermediary, and conclude a renewable short contract. In exchange, the

electronic intermediary guarantees the buyer reputation of the sellers. Between the seller and the intermediary, they can set a basic line for performance, if the seller fails to meet the minimal standard, then the deposit will not be returned, but as compensation to the intermediary. This process repeats itself in every transaction.

- Dellarocas (2003) proposes an online binary feedback system to regulate the moral hazard. This in fact has been adopted by many electronic intermediaries with e-bay leading the road from middle 1990s. Since the feedback system is openly viewable comments, sellers will need to be really careful and even possess an "awe" attitude towards customers, as long as they want to conduct business in a long term.
- Real Identity: This is applied now to almost all electronic intermediation that involves money transaction. For example, Electronic intermediaries like E-bay and Amazon, all requiring real identity if one registering as a seller. Same goes to the payment system (OECD, 2010), such as Paypal, Visa and Entropay.

Reputation, in an economic sense, has always been deemed as an import mechanism for contract completion. Li et al., (2005) quantifies reputation by using a decision-making model. In this model, she argues that under optimization, if the risk can be reduced to a level than the marginal cost slash marginal profit, then reputation risk control is desired. Pavlou and Gefen (2004) propose to build effective online marketplaces with institution-based trust. The development of economic models for reputation was developed in 1980s by employing the game theory. Melnik and Alm (2003) study the relationship between the seller's reputation and the willingness of the buyer to pay in online auctions for heterogeneous goods. They find a seller's overall reputation has a positive and statistically significant impact on a buyer's willingness to pay in online auctions, an impact larger for that of homogeneous goods.

2.3.4. Additional Value Created by Electronic Intermediaries

There are indeed strong economic incentives for both producers and consumers to drive intermediaries out of the value chain for the fact market intermediaries have been known to add costs to the value chain (Benjamin and Wigand 1995), but they also add value in the process. This has been discussed in earlier chapters.

Electronic intermediaries can also create such value similar as a traditional one. But, what can they offer more? At first, in the context of electronic environment, information systems can serve as intermediaries between the buyers and the sellers, lowering the buyers' cost to acquire information about product offerings and seller price by creating an "electronic marketplace". As a result, the search cost inefficiencies is reduced, furthermore it helps better allocation of resource by reducing the sellers' ability to extract monopolistic profit. As shown in Figure 3, searching cost is of such importance that significant increase can result in market breakdown (Bakos, 1997). Secondly, Jullien (2005) creates model proves that in two-sided markets, electronic intermediary business model involves an indirect network externality between consumers: even each

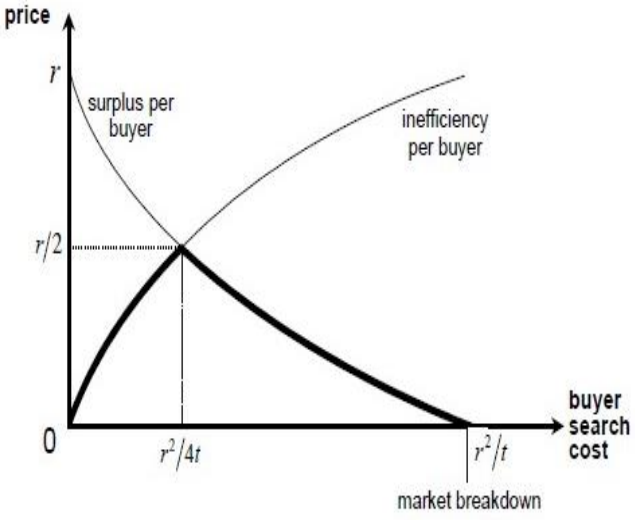


Figure 3 impact of increasing searching cost of the buyers (Bakos, 1997)

consumer's participation doesn't affect each other directly but the equilibrium indicates each consumer creates positive externality with outcome reflected on the producer' participation, which is essential a network externality model. Rochet and Tirole (2003) rebrand it as "membership externalities." Info-mediation requires different sides to be on board using such service, making an electronic intermediary also a platform for various business parties to interact. Network externality is crucial to the survival (Jullien, 2005). In this research, we specifically study the market intermediaries and its online version of electronic intermediaries in shipping, where over two hundreds of year the ever evolving information and communication modes have been playing a crucial role in the business (Stopford, 2000). The need to obtain more information in shipping world is particularly acute, which may explain why intermediaries like brokers and agents are a common business formation since the very infancy of this business.

Main findings I:

SQ1:

- Electronic intermediaries assume most of the roles of traditional electronic intermediaries: market clearance, supply and/or demand aggregation, pricing, information searching and dispersion, matching. Moreover, they have some advantages compared with traditional market intermediaries.
- Reduction of searching time, information and transaction cost entails less friction in the market and more efficiency, and furthermore to prevent market breakdown.
- Because of better information transmission, the resources are better allocated and seller's monopolistic profit is reduced.
- Positive network externality is created by electronic intermediary indirectly on new customers by encouraging participation of the producers, vice versa.

SQ2:

- "Lemon" problem can deteriorate the appetite of E-intermediary users which leads to adverse selection.
- The reputation is more vulnerable and less dependable in an electronic context, and therefore moral hazard and trust issue is a problem which deters the wide diffusion of the technology.

3. Conceptualization and Model Development

Wijnolst and Wergeland (2009) mention that generally there are two ways of studying a particular industry or market segment: formal modelling and industry analysis. Most literature we have reviewed indicates modelling is the way to study issues related with the agent- principle relations. Enlightened by them, we opt to develop a simulation model to dig further to answer our research questions. To build a defendable model, this approach is followed: in section 3.1., explanations are given why simulation is chose for our study; in section 3.2., effort is made to provide a clear picture of intermediary activities in shipping and its information implication; Section 3.3. is dedicated to what has been done and studied on application of electronic intermediary in shipping and different models developed, for us to learn lessons from; in section 3.4., by using a model, I check how searching, matching and the searching cost are related; and in the last section 3.5., three different scenarios are developed which will form the base of our model.

3.1. Choose of Simulation Method

One may wonder why simulation model is a fit methodology design for this study. Explanations are given both from literature and historic studies. Dooley (2002) argues that simulation is an increasingly popular methodology for research to assume the inherent complex as given. If other methods help researchers with questions like “what happened and why?”, then simulation is particularly a gear to answer “What if” questions. Simulation encourages the study in greater complex, because it observes/simulates the phenomenon of unknown and in the future whilst other methods eying on the historic events. Gilbert (1996) studies the scope and potential of computer simulation and he thinks that simulation is neither variable-centred nor case-based but it is to explicate the mechanisms of social process so probably more of “process-centred” method it is. The most different features between simulation and other methodologies identified by Gilbert is: to study the mechanisms which connects individual actions usually in two ways, i.e. “macro-level processes affecting micro-level processes and micro-level processes generating macro-level relationships”

The purposes of simulation are changing in time, Axelrod (1997) states the purposes of simulation in the social sciences are in seven categories: performance, training, entertainment, prediction, proof, education and theory discovery. By setting up different rules and governing the structures and output, simulation models help researchers to infer what may happen in a real situation. Moreover, simulation may uncover phenomena that can lead to new theoretical findings.

To come back to this paper, for the reason that the academic and practical area where it is investigating has very little existing findings thus it is exploratory in nature. Studies like such often require more flexible assumption, to predicate what would happen under different scenarios and to discover new area of theories. Essentially, this study is cross disciplinary and forward looking, where no historic data exactly match the expectation. Furthermore, this study attempts to identify something in theory but not tested in real life, and similar experiment is almost impossible to carry out in light of cost, technology and

time limit of this study, as how Dooley (2002) puts it: simulation makes predication, to substitute what can be done by experiment intervention.
Moreover, seeing from the studies similar to our research scope, simulation is often chosen: Pisanias and Willcock (1999, 399-413) develop agent simulation model to study the application of electronic intermediaries in transport, defining agents in ship intermediary activities, as the ship brokerage, ship owners and charterers. Sardis and Vouros (2008) propose e-chartering system which is essentially a simulation model to imitate electronic intermediaries and in the study done by Gudmundsson and Walczuck, (1999) on-line brokering simulation for logistics is also deployed.

It is because of the argument above that simulation has been designed for this part of analysis, to address the research and sub questions.

In general, there are three main simulation categories (Dooley, 2002):

- Discrete event simulation: built upon the triggering of events as well as the availability of resources, to model the organizational system as a set of entities but changing over time.
- System dynamics: to find out the decisive variables that affects the system behaviour, through equations to link those variables one another.

- Agent-based simulation: agents that try to maximize the utility functions by interacting with the organization and also the other agents; its behaviour is determined by the pre-set rules and schema.

It is the same study done by Dooley (2002) that argues system dynamic and discrete event put a focal point on event and variables, whilst agent-based simulation models eye on the participants in the organization (employees, companies, etc.) and the collective behavior of theirs. Previous scholars opt for agent simulation to study electronic intermediary and relevant behavior and indeed our study is about the participants (ship owners, brokers, agents, charterers and headhunters, etc.), hence here we can judge with confidence agent-based like simulation is suitable for our study. Simulation follows such process: conceptual design, code development, validation, experimental design, implementation and analysis (Dooley, 2002). These steps guide the following chapters for simulation.

3.2. Intermediary activities in Shipping and the information implication

Shipping business by nature is international and information intensive (Pisanias and Willcocks, 1999, 399-413). However, studies combining both electronic intermediaries and the shipping business seem not in large availability. Within this chapter, essence from those studies is shared to cash light on our research.

Because of the business reality - shipping sailing around the globe, there has always been an issue with the time lagging between the information arrival and the actual event. This is the nature of shipping. The industry since long time ago thrived to find ways

improving the information and communication flow. People don't see very often in other industries that various business parties are so keen on news. This may partially explain why there are dedicated shipping news media and fixture report aiming to provide first hand and sometimes exclusive shipping information in high frequency. In addition, intermediation for those shipping business mentioned with no exception fall in the category of two-sided market, where 1) Two sets of agents interact through an intermediary or platform, and 2) The decisions of each set of agents affect the outcomes of the other set of agents, typically through an externality (Raysman, 2009). For instance, if a ship brokering company has more information about the chartering, then most likely more owners are willing to do business with this company. To the contrary, in case no chartering is interested in this broker, then no owners will take this broker seriously, either. This is even truer for electronic platforms where network externality is decisive (OECD, 2010). Not just the information, shipping as a business is of high complexity: new shipbuilding, chartering, crewing, market analysis, capital, demolition and repair, to name but a few.

Ship owners have more information of the ships, and for a charterer it's difficult to get hold of all the ships with different designs and purpose. Even within the same segment, say the bulk shipping, "goods" - the ships are truly heterogeneous: just picking a ship from the similar tonnage may sound easy, but comparing the ship consumption, age and speed can be a task like seeking a needle in the haystack. There are even more: her position, laycan and tradition limits, etc. Even the same tonnage of vessels can have very different fuel consumption and were built under different spec. Even more, it is not uncommon that same series of vessels with the same spec built by the same shipyard achieve quite different performance, which has something to do with the construction quality control (for instance, unstable paining techniques result in different vessel friction resistance.) maintenance and trading area. Such trivial information is best known by the owner or operator of the vessel but also shared with close brokers. Two hundred years ago that letter was the only means to communicate the information, so little was heard of a ship until she returned (Stopford, 2002, 55-67). Intermediaries in shipping play a role to endorse the reputation of the principle they represent and they pass on the information onward.

As the human civilization and technology progressed, the means of communication have also leaped in big steps. The asymmetric information always exists in shipping. Pisanias and Willcocks (1999) use an information-communication and product flows to successfully identify the information nature in ship broking:

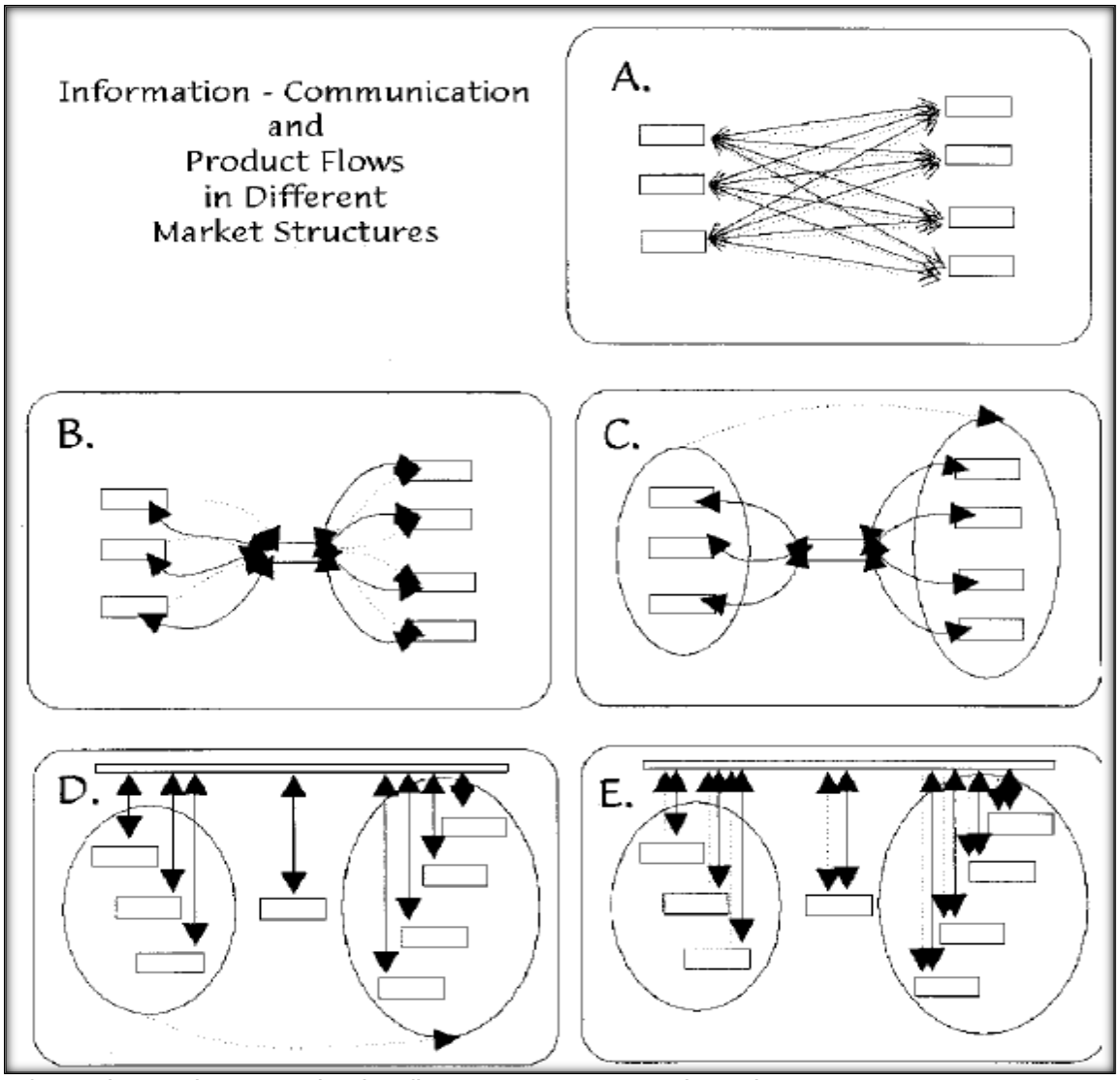


Figure 4: I&C and Product Flow in Different Market Structures (Pisanias & Willcocks, 1999)

(a). Non-intermediated market; (b) intermediated market – aggregated information and product flows; (c) intermediated market- disaggregate information and product flows; (d) internet market –with physical products; (e) internet market – digital products (Pisanias and Willcocks, 1999)

Within our study, the situation resembles structure (e) in which the Internet can potentially accommodate all flows related to the offering. Information-broking markets like the ship broking and stockbroking fall into this category. One to look at the information flow can notice the information and the actual transaction of goods are not synchronized.

3.3. Electronic Intermediaries in Shipping Business

Nikitakos and Lambrou (2007) identify that e-intermediaries are nascent types of intermediaries for shipping, to providing info-mediation, on-line negotiations and electronic auctions for chartering or maritime integrated marketplace. The previous Clarkson Director Stopford (2002, 55-67) dedicated some research on E-commerce implication for the shipping business. Since the invention of container transport in 1955, the shipping market segment has largely remained the same: bulk shipping (dry and wet raw materials), usually in large parcels and only transported once. Crude oil, iron ore and coal are the perfect example of dry cargo transport. The industrial shipping which often aims at the intermediate goods, prepared to be further processed. Liners mostly transfer the end-user goods, like the electronics and home appliance. E-commerce is among one form of electronic intermediaries (OECD, 2010). He also identifies that over the past two hundred years, five phases of shipping information exchange and communication evolved, from early Lloyd's Coffee Shop News Bulletin to 21st Century communication via the World Wide Web, that information plays a very important role in shipping business. One of the roles of electronic intermediaries is to collect, organize and evaluate dispersed information (OECD, 2010). Another finding Stopford (2002, 55-67) highlights in his paper is the information intensity of the shipping business: Bulk shipping carries raw materials and bulky semi-products in large parcels. Liner at the lower right ships manufactured and semi-manufactured goods in small parcels. Industrial shipping lying in between is specialized in shipping large consignments of all kinds of cargoes like chemicals, motor cars, gas, forest products and steel products. The three sectors of the business have different information requirements.

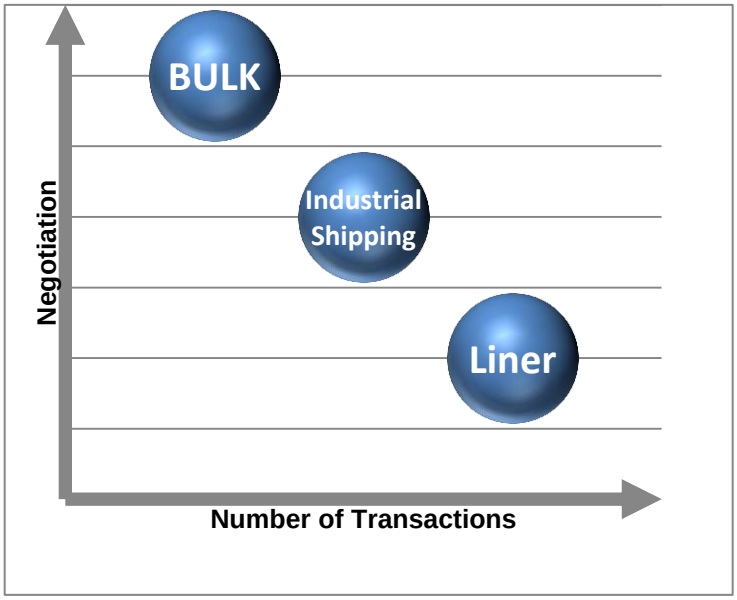


Figure 5: the Information Matrix in Shipping (Stopford, 2002)

In Figure 5, it is argued that bulk segment requires high level of negation. Taking the ship brokerage for instance, the market is very competitive. Broker as a vocation, is very knowledge- intensive where no such advance electronic intermediary can replace. In the liner area, where it could have been "dis-intermediated", it has already been done so. Industrial shipping lies in between.

3.3.1. Existing Findings on Electronic Intermediaries in Shipping

As introduced earlier, market broker or middleman is one very representative form of intermediary (Resnick et al., 1995). Pisanias (2001) studies the Internet application to ship broking and finds that in order to diffuse such an innovative technology in a relationship governed business like shipping, people shall focus on the process of informing and getting informed or how to integrate the technology with the existing business structure and to reflect the relationship of the agents. This is essentially an idea of reintermeidation, in which incumbents have to embrace new technology but new technology also has to adopt to somehow the structure of praxis.

Batrnica (2008) puts all the success and failure of e-chartering together and he finds out over the years there were 35 web based platforms featuring e-chartering services and most of them did not live up to the expectations of the market. Main reasons are: some portals did not meet the industry's needs, some had a product and no market, some had a market and no product, and for those who have both in hand was not able to adjust as swift as expect to the business requirement. He further argues more information related to chartering will be integrated into portal and adoption of online intermediary will contribute a more transparent shipping world.

We can also refer to the studies in the logistics, a parallel field to shipping. Gudmundsson and Walczuck (1999) study the application of a global e-platform for logistics by developing an all-inclusive system – Logistics Brokerage System. They find out with this electronic intermediary service, buyers can benefit from more reliable supply chains because of reduction of cost in integration but the seller may suffer some profit margin evaporation because of lower search costs of buyers. Importantly, it will not cause disintermediation as long as the mediator is performing value-added service. They argue that for logistics services the creation of an electronic marketplace will have an effect on sellers, intermediaries as well as buyers. On the equation of the buyers' side, access to a nearly perfect information source will empower them to reach an optimization of their own, constrained by the physical limitation of the service. The costs of obtaining the information will be reduced. The gap between nearly perfect information and imperfect is widened depending on the complexity of the task.

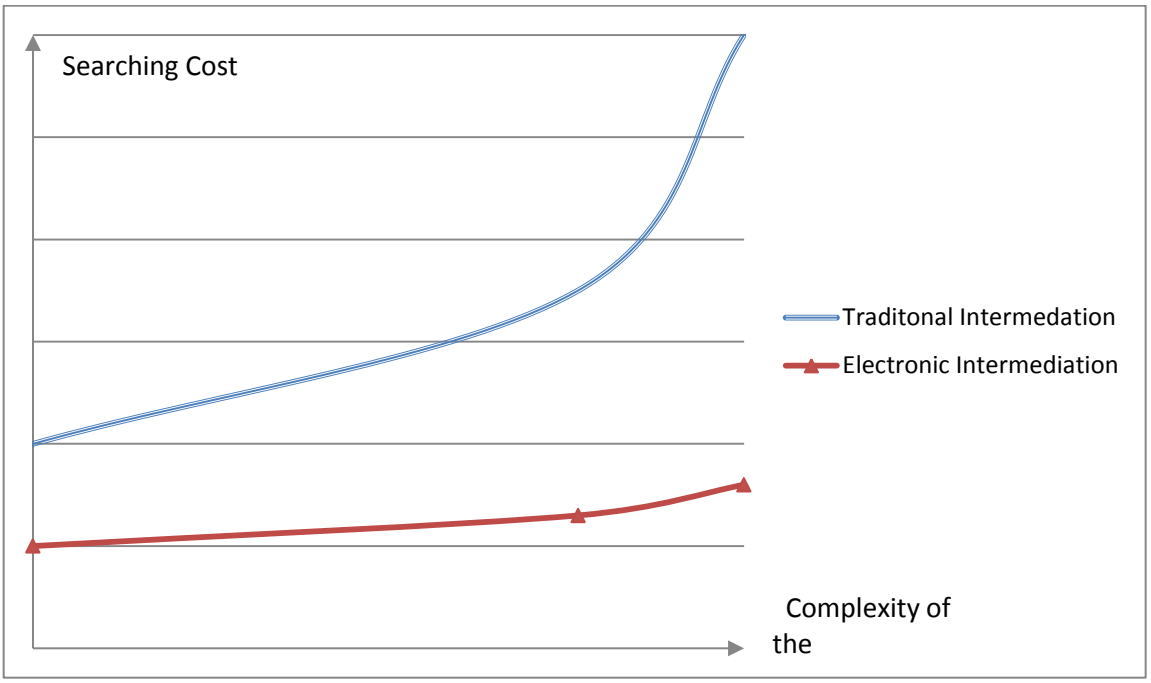


Figure 6: Comparison of the Searching Cost in Shipping Intermediation (Gudmundsson & Walczuck, 1999)

They are certain that in logistics the costs added to the transaction are lowered in case the forwarders, the traditional market intermediaries, have been cut out of the system. However, the buyer's lacks of experience and routing complexity makes a forwarder/broker with in-depth knowhow still needed, thanks to their functions and roles (OECD, 2010).

3.3.2. Designs of Electronic Intermediaries in Shipping

Even though this study is from an economic perspective, the nature of the study target-internet, electronics and IT make it necessary to give brief explanations on their actual "look" in shipping world from an engineering point of view. Fielt et al., (2004) carry out a case study on a Dutch maritime intermediary platform – SEAQUIPMENT, a platform for sellers and buyers to trade ship equipment. They analyze the design of an electronic intermediary in the maritime sector, and how this design relates to the voluntary acceptance of the intermediary by buyers and sellers. Theme, role linkage and fun are the main identified factors. Furthermore the intermediaries have to balance the interests of buyers, sellers, and their own when considering such designs.

Sardis and Vouros (2008) propose an electronic institutions infrastructure for e-chartering. They develop methodologies and software tools for electronic institutions of multiple agents, under which the tasks for agents to and not to perform are defined. An infrastructure for Maritime Internet-based Virtual Chartering Markets (MAVCM) is proposed. They coin the term Electronic Institutions, de facto an Electronic intermediary.

Such institutions allow the description of the roles and interactions of both human and software agents in a specific setting and make explicit the relationship between the computational framework by MAVCM and the existing maritime transactions for e-Chartering. The fundamental concept behind their design is agents and roles, dialogical framework, scene, performative structure and normative rules. Agents are named the players in an electronic institution, interacting by the exchange of illocutions. Roles are more in rigidity, being standardized patterns of behaviour. Agent is required to adopt certain roles, to whom dialogical schemata are associated to. Dialogical framework is an idea in the semantic realm, in which the language employed for communicating are fixed and ontology is defined by illocutions. This enables heterogeneous agents to exchange knowledge with others. Scene is interactions between various parties, by using protocol to delineate the possible dialogues. The performative structure allows scenes to connect and hence the agents can also be set in different scenes. The last notion is the normative rules: regulating the limitation of the path of agent in performative structure. The core of the complex is how investigation and negotiation to be interpreted in MAVCM. The system is an information engineering work which is out of the scope of this study but the rationale diagram (Figure 7) is conducive to understanding of how the relationship between the intermediaries and other various parties.

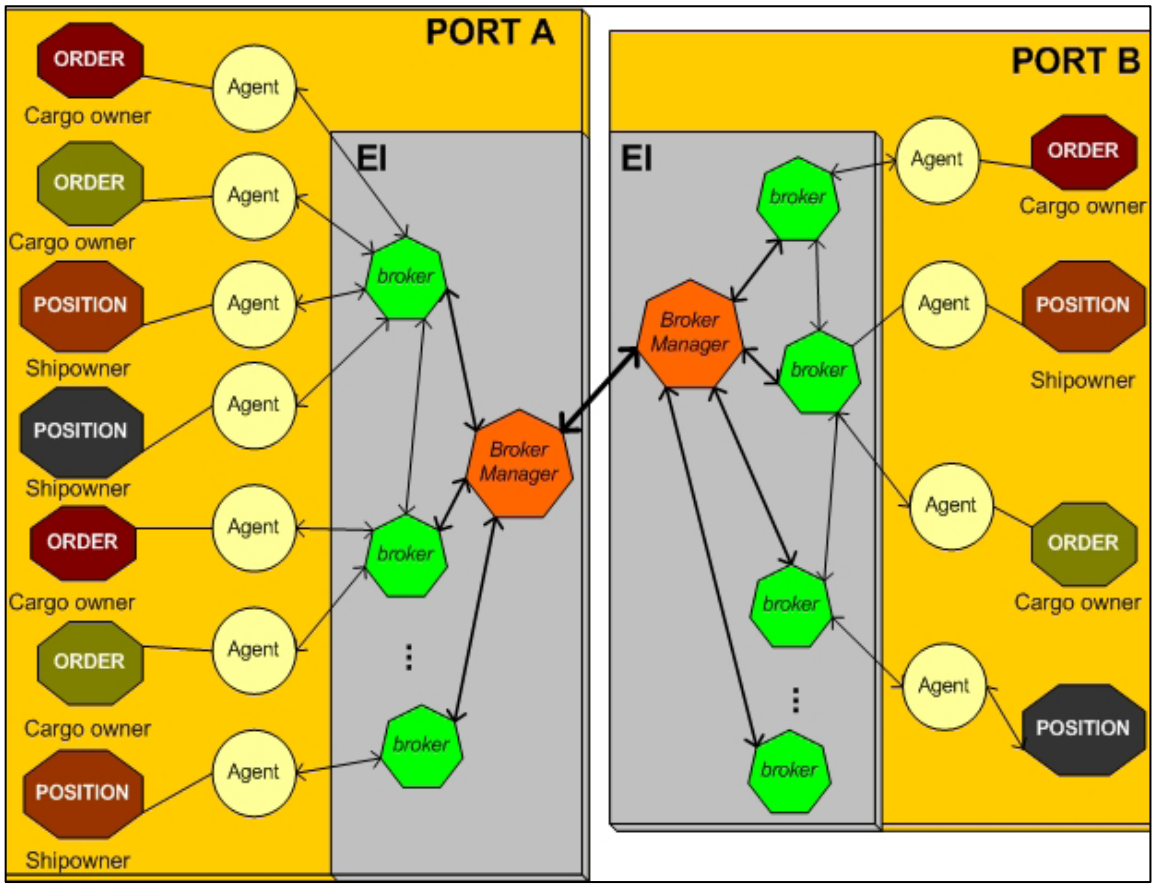


Figure 7: Screen Shot of the Agent Chartering System (Sardis & Vouros, 2008)

Apart from the Internet-based Virtual Chartering Markets (MAVCM), Yang, R. Li and W, Li (2004) suggest two auctions systems to tackle the lemon problem is an effort to create electronic intermediaries for shipping. One is a so called two-way bidding auction (Jayetta, 2003, 97-103), which refers an auction design for the carrier and shipper to bid similarly in a stock exchange. The transaction price takes into account of both the supply and demand. The existing system is the NTE Public Exchange. The other is customized bidding, aiming to provide tailored bidding for large commodity trading with flexible and multilevel pricing system.

3.4. Searching and Matching in Shipping – a Differentiated Market

Similar to other fields, information in shipping comes at a price. As identified by Nobel Economist Stiglitz (1979): the cost charged by market intermediary is largely attributed to information search. In shipbuilding and ship S&P, ship brokers charge 1% of the transaction value, and in chartering business, excluding the address commission to the charterer, the shipbrokers can bag 1.25% of the transaction value. Usually many headhunts in maritime sector also charge some commission on a potential employer. As mentioned earlier, indeed strong economic incentives exist for driving intermediaries out of market for the fact market intermediaries have been known to add costs to the value chain (Benjamin and Wigand 1995). This argument is especially true in shipping, in which transaction value is high. E.g., S&P transactions can easily pass 20 minion US Dollars, depending on vessel design, condition and age. Even 1% can be handsome. Chartering deals are less but higher in transaction frequency.

Then, why people still pay such big amount? What they have gained from the intermediation? To answer this, it is necessary to look at the market of shipping: it is a market characterized by differentiated products. The prevalence of differentiated markets is a result of the heterogeneity of buyer preferences and the profit opportunities these markets offer to sellers (Bakos, 1997). Johri and Leach (2002) propose that the gains for traders from intermediaries' matching of heterogeneous goods can be measured in three dimensions: the rate of production, the time-preference sacrificed in matching and quality of matching tailoring for customer's preference. A searching task in such a market, considering the differentiated goods, preference and offering, is sophisticated. Moreover, ship as a commodity is highly heterogeneous. From three shipping segments categorized by Stopford (2002), ships are in bulk carriers, tankers and containers. There are also more specific segments like ferry, cruise vessels and offshore vessels. Within each column there are further segmented: like in bulk there are handysize, Handymax, Panamax and Cape as four large categories.

This nature of goods in shipping differentiates the electronic intermediary from its searching function in a homogeneous goods market. In a homogeneous market, like IPhone or CD, the searching function of intermediary is only about price, like the website Priceline's slogan which cannot put it better "one part frugality, one part brutality". However, in a market like shipping, searching for goods does not only have implication of price but other factors like the feature of the goods, the suitability of specific trade and location. A perfect example is voyage chartering in shipping, looking

for cargo for next voyage. They consider the location of the voyage, if it's too far from current position of discharge port then the vessel has to ballast a long distance to catch next laycan; they also consider the volume of the cargo, the composition of it and the cargo owner's reputation; moreover, the operator has to consider the discharge location ideally close to a possible cargo after next voyage, etc. Such heterogeneity makes intermediation work not with a single facet but multiple.

Bakos (1997) and Ke (2004) both argue that another distinction between different searches is: to search in sequence in the data base, and the quest ends till the searching matches or to search in a definite sample and the search is for the optimal sample. Hanchen and Ungern-Sternberg (1985) argues that sequential searching and sampling searching don't differ much in terms of result. This distinction is existent between various ship businesses. For instance, it is evident between ship chartering and ship S&P. In ship chartering business, a house broker or a 3rd party broker receives information about the cargo circulated and by careful examination he narrows down to several cargo candidates likely to fix. Then he may start to negotiate for the deal. Once he can fix one "sub" with a cargo interest then he will not bother to start negotiating with other candidates. As a matter of fact, it is also a commitment of the transport capacity to the cargo interest already, making other efforts superfluous. However, in ship S&P, excluding "off the market" deals, the search is for a group of potential buyers of the vessel, and then they are invited to inspect the vessel before making a bid. The deal ends with the best offer on the bidding day, subject to certain preset conditions. About differentiated products or information, Salop (1979) develops a circular city model which is widely used. Because in shipping the transaction flow and information flow are not synchronized (Pisanias and Willcocks, 1999), the asymmetric of information is even worse than that in many other industries. The market is also highly differentiated. What is here to be examined next: an electronic intermediary, advantageous in searching time and cost in a large sample, makes a difference or not in searching in heterogeneous markets like shipping. Since no model has been developed specifically to shipping, we refer to and restructure the model that Bakos (1997) and Ke (2004) have used to study search cost in electronic environment – here specifically used for ship chartering markets.

Model Assumption:

- The ships are distributed in a round unit, perimeter as 1.
- In total *m* ship are equally distributed along the circle, so the distance between any two makers is $\delta=\frac{1}{m}$. The maker is neutral in risks and has an aim of profit maximization. The marginal cost *MC* is fixed here we put it 0 for the sake of simplicity.
- In total *n* units of cargo owners are the same alongside the circle and they request different ships to ship the goods from A to B. these cargo owners have same quantity of cargo to ship in same period of time with a utility value of *U**. When the cargo owner cannot find a ship to his satisfaction, they incur loss of utility tx, x is the distance between the ship and cargo, and t measures the how different the cargo owner wants a ship or in another word his tolerance in case

the ships are homogeneous goods. The cargo owner will only consider to book or charter a ship under condition the total cost will be small than the utility *U*.*

- The ship won't be able to differentiate the cargo owners but can locate the vessel and asks for a price to charter or transport the cargo.

According to the hypothesis, a charterer charters in a ship at a price of p and at a distance of x. This is mathematically noted as a function of (p, x). . Hence here the net utility can be expressed as:

$$\mathbf{S}(\mathbf{p},\mathbf{x}) = \boldsymbol{U}^{*} - \boldsymbol{tx} - \mathbf{p} \qquad \textit{Equation 4}$$

When the information is perfect and no searching cost is incurred, and all ship owners are willing to charter out the ships at an equal average price of $\overline{p}$. Under this condition, each ship owner charters out vessels to charterers on a radius of *δ/2.* The total transaction value is$\delta n = \frac{n}{m}$. if the ship owners are only willing to charter out the vessel at a price of p_i as in Figure 8. Therefore for charterers located within the radius of $x \in (0, \delta)$.

$$\boldsymbol{U}^{*} - \boldsymbol{tx} - \boldsymbol{p_i} = \boldsymbol{U}^{*} - \boldsymbol{t}(\boldsymbol{\delta} - \boldsymbol{x}) - \boldsymbol{p_i} \qquad \textit{Equation 5}$$

By a simple restructure of the equation, we get the result that no difference for transaction between a charterer with a vessel in the nearest or from one at p_i.

$$\mathbf{x} = \frac{\overline{p} + \boldsymbol{t\delta} - \boldsymbol{p_i}}{\mathbf{2}\boldsymbol{t}} = \frac{\boldsymbol{\delta}}{\mathbf{2}} + \frac{\overline{p} - \boldsymbol{p_i}}{\mathbf{2}\boldsymbol{t}} \qquad \textit{Equation 6}$$

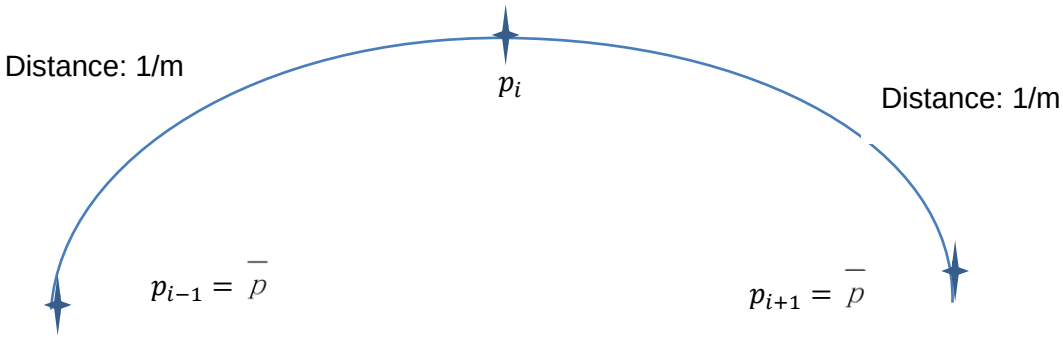


Figure 8: Searching and Distance in Chartering (Bakos, 1997, redesigned by author)

Additional assumption:

- A charter to obtain additional information (relevant to the vessel) incurs searching cost of c. The customer searches within a sample of R.
- The ship owner doesn't know the unique preference of charters so there is no possibility to practice price discrimination.

It can be inferred that the distance between the ship and charter is within ½ unit. Then a ship within the searching range of x is distributed in compliance with the below function:

$$\mathbf{F(x)} = \begin{cases} \mathbf{0} & \boldsymbol{x < 0} \\ \mathbf{2}\boldsymbol{x} & \mathbf{0} \leq \boldsymbol{x} \leq \mathbf{1/2} \\ \mathbf{1} & \boldsymbol{x > 1/2} \end{cases} \qquad \textit{Equation 7}$$

In the sample the possibility of ship and charters being separated by larger distance of x is:

$$\mathbf{G(x)} = \{\mathbf{1} - \mathbf{F(x)}\}\mathbf{R} = (\mathbf{1} - \mathbf{2x})\mathbf{R} =, \mathbf{0} \leq \mathbf{x} \leq \frac{\mathbf{1}}{\mathbf{2}} \qquad \textit{Equation 8}$$

The possibility density function is expressed as:

$$\mathbf{g(x)} = \boldsymbol{R}\{\mathbf{1} - \boldsymbol{F(x)}\}^{\boldsymbol{R-1}}\boldsymbol{f(x)} = \mathbf{2}\boldsymbol{R}(\mathbf{1} - \mathbf{2}\boldsymbol{x})^{\boldsymbol{R-1}} \qquad \textit{Equation 9}$$

When all the ships are hired at a price of $\bar{p}$, the utility function of a charter is:

$$\boldsymbol{E(U)} = \int_{\mathbf{0}}^{\frac{\mathbf{1}}{\mathbf{2}}} \mathbf{2}\boldsymbol{R}(\mathbf{1} - \mathbf{2}\boldsymbol{x})\left(\boldsymbol{U}^{*} - \boldsymbol{tx} - \bar{p}\right)\boldsymbol{dx} = \boldsymbol{U}^{*} - \frac{\boldsymbol{t}}{\mathbf{2}(\boldsymbol{R}+\mathbf{1})} - \bar{p} \qquad \textit{Equation 10}$$

The optimal sample is given as R_C^*. We can conclude the maximal unity after search cost is:

$$\max_{\boldsymbol{R}} \boldsymbol{U}^{*} - \frac{\boldsymbol{t}}{\mathbf{2}(\boldsymbol{R}+\mathbf{1})} - \bar{p} - \boldsymbol{Rc} \qquad \textit{Equation 11}$$

Furthermore the optional sample for search is:

$$\boldsymbol{R_C^*} = \left(\sqrt[2]{\frac{\boldsymbol{t}}{\mathbf{2}\boldsymbol{c}}}\right) - \mathbf{1} \qquad \textit{Equation 12}$$

From the above equation, on one hand, it is mathematically evident that the optimal sample R_C^* is a deceasing function of the searching cost c, and hence a charterer will decrease its searching sample as the cost increases; on the other hand, R_C^* is an increasing function of preference function t. To put it in a plain sentence, when a charter has a strong preference towards a vessel specification, he is bound to expand the searching sample. This does have some practical implications:

- For the fact that electronic intermediaries' marginal searching cost is merely zero, it is then understandable that a charterer will be happy to oblige to increase the number of the searching candidates. As the number of candidate increases, the charterer has a better chance in finding a better deal.
- Whist in the situation of a market intermediary- a ship broker cannot search in such big scale in comparison to its electronic counterpart, for the fact each search will have to incur cost for a broker company, labor cost, time consumption and profit per employee to name but a few. A well-networked broker will have direct contact with principals and the right contacts with serious

partners (Pisanias and Willcocks, 1999). Successful brokers have exclusive channels and tight connections to obtain information, even before it is officially released, rather than having vast searching options. This is an illustration of how "in-season" market information is import to a ship broker because of the limited resources especially considering the fact that each search costs.

3.5. Three Scenarios - Electronic Intermediary Adopted to Ship Brokerage

In the previous chapter, we proved that when the searching cost is increasing, charters will decrease the sample volume to acquire information. However, if a charter has a strong preference, he will need to expand the searching scope. Then here we have an interest in knowing under bigger sample, whether an electronic can outperform the traditional market intermediary. Before doing this, it is necessary to give out the scenarios of electronic adoption in shipping.

3.5.1. Ship Brokerage – a Complex Intermediation

Ship brokering is a knowledge intensive intermediary work. This often requires ship brokers to be sensitive to the market information and generate useful entries. They play chameleon roles: (1) relevant information acquisition and dispersion, (2) role of advisory through knowledge of the market, (3) negotiations and representation and (4) informal arbitration/facilitation. These tasks are in line with the roles of a market intermediary has to perform, and aggregation, matching, pricing and trust. Being able to build up a specialized knowledge or expertise in a specific field is crucial for a broker to set fame in the market, which is highly related to carrying out negotiation, to advise the principles and to follow up a contract. Trust is built up in time or closer pedigree. In order to successfully strike a deal, brokers or these middlemen are highly target oriented and the senior brokers are the experts of their own field, with highly intertwined skills combining all those items mentioned above. More than such, being specialized is prerequisite from an organizational point of view. The limitation of resources determines that work has to be divided (Vreede and Eijck, 1998, 60-87). There are many ways for a ship broker to be specialized:

- Ship brokerage market is a two-sided market, in which agent of each side in order to match, has to negotiate with the one of the other side who usually represents requests from their own principles (Niederle, Roth and Sönmez, 2007). That is why a broker often specializes in representing either the cargo traders or the ship owners. Because one broker cannot stand up for two conflicting interests, most of the time the case between the cargo and ship side. A broker doesn't usually act for both cargo side (the charterers) and the ship owners. There are mainly types that a ship broker to be engaged with a principal, exclusive, semi-exclusive or competitive (Pisanias and Willcocks, 1999, 399-413). As the name indicates, exclusive brokers are nominated by their principles be the sole brokerage channel for the ship or cargo; a semi-broker somewhat has a "soft commitment" from the principles, either in away doing

business frequently or among the few close brokers. Lastly a broker can also compete in the market with others who are more in search to strike an opportunistic deal after having obtained certain market information.

- Other than being specialized in customer and one side of the market, ship brokers often practice only in certain ship types and business segment. This is important to build up an intense connection and knowledge advantage. For instance, a broker in chartering doesn't go for ship building brokerage much; and a broker for "dry" knows much little for the "wet"; and a junior dry cargo broker often starts with Handysize then makes progress to larger tonnages.

These arguments in specialization helps us to interpret how a traditional market intermediary to compete with an electronic one in a model simulation.

3.5.2. Scenarios in adoption of electronic intermediary

Giaglis et al., (1999) propose three scenarios during emerging of electronic intermediaries. Under this section, in order to simplify our research we choose the ship-broking in shipping as the target of study, which is one of the most fascinating practices in shipping, dating back to the very infancy of the shipping business. For instance, the famous ship broker Fernleys started their business in 1869 and a handful of other brokers were born in the same period.

Chartering ship brokering is selected for study is because brokering is a reprehensive form of market intermediation (Resnick et al., 1995), and there had been efforts to bring electronic brokers into the business. The ship-broking market is similar to other market intermediaries, matching the deal, searching and dispersing of information and providing trust. For the fact that shipping is a diverse industry which concerns all forms of transportation by sea, as well as related activities, shipping business is highly segmented and same goes to ship broking. There are standards striding across different segments but also specific regulations applicable to specific fields. Most deals are done via ship brokers, so the shipping transport volume in a way represents the volume of ship brokerage business. In 2012 seaborne trade reaches 8.7 billion tons, a continued growth from 2011. Among it, container accounts for 1.5 billion tons, five major dry bulk and other dry cargo makes up more than 4.7billion tons and the oil and gas are the rest around 3 billion tons (UNCTAD, 2012). The tanker market is featured by fairly standard cargo, vessels and charter parties (contract between carrier and charterer) while containers are increasingly becoming even more concentrated in few big liner companies and these companies have formed big alliances. Sales and Purchase is another independent sector where deals are done in a different fashion. To study the intermediary activities we choose the most irregular dry bulk chartering sector because in this sector negotiation is highly required and it is identified to be perfect to go online (Stopford, 2002).

As identified in earlier chapters, more complex of searching, the higher the searching cost is, and the searching cost of by traditional one will increase very by steep slope at the end (See Figure 6). If one has talks with chartering desk of many shipping companies, they may hear them say looking for cargo, be it coal, cereal or bauxite

cargo. Searching is the daily business of a ship broker, and matching a vessel with a cargo is the priority, considering all information like the vessel position, next dry dock, draft and loading port condition, etc. Besides this, a broker has to conduct negotiation all times because the chances are the cargo and ship owners don't agree on every item at the first place. Here we consider all brokers are ship brokers, which means their principles are the ship owners. The brokers can represent multiple owners to seek cargo opportunities and one owner can work with one exclusively or to work with a group brokers. We refer to the contingency model developed by Giaglis et al., (1999) and exemplify with current and possible scenarios of the shipping market. Assuming this is a same shipping segment and they can only match within this model.

$S = \text{Ship}, C = \text{Cargo}$

→ Strong commitment ⇢ Soft Commitment

Because ship brokers (rather than) cargo brokers work more closely with ship owners that is why the S is more fixed whilst cargo is more random. To put in another way, ship broker have more information about the ship than about the cargo.

Scenario 1: Current Chartering Intermediation in Shipping

Broker A has exclusive commitment from five ship owners, and hence he has certain market power however it is not a preponderating mass that is inviting enough to have all cargo owners to commit to his channel. Broker B has soft commitment from S6 and strong one from S5. He has a median position in the market. Broker C is weakest with only one commitment from S6. Even though three brokers all have to search for the cargo, it can be imagined, in line with two-sided theory, broker C shall have difficulties. Broker A can be preferred by cargo owners because it is picked by many ship owners.

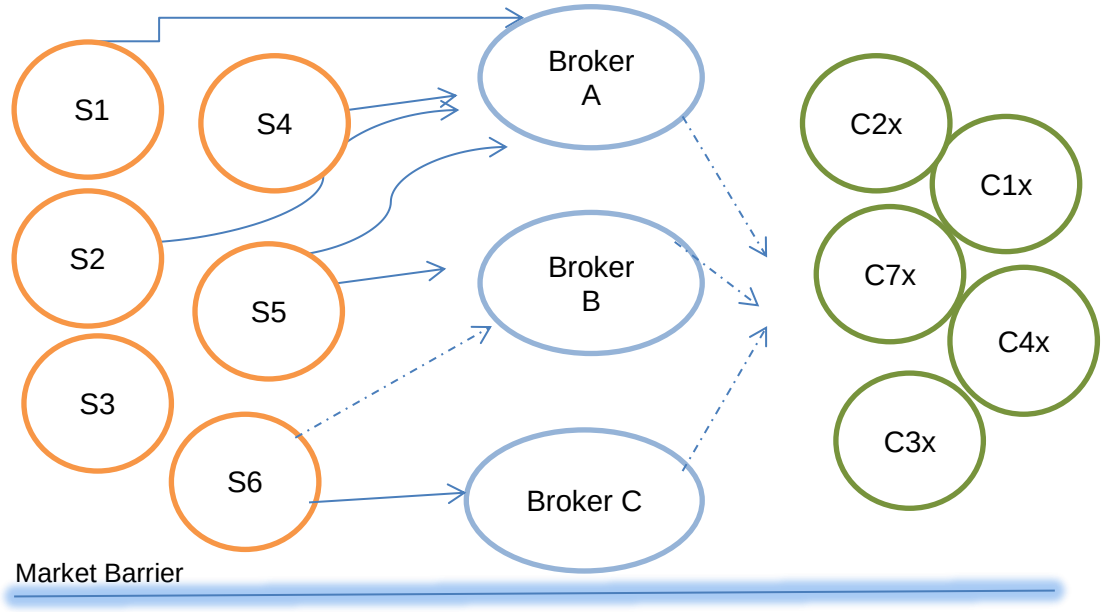


Figure 8: Scenario 1, Current Chartering Intermediation in Shipping (Source: Author)

Scenario 2: Re-intermediation in Ship Chartering Brokerage

Re-intermediation is a scenario to describe a situation that existing market intermediaries will need to differentiate themselves or to focus on niche market to compete with the increase adoption of electronic intermediaries. We developed below outlook that the median broker B in terms of market position, needs to find a breakthrough so he attaches himself to an electronic intermediary as a "disruptive creation"; he has successfully expanded the candidate cargo options.

Because of the network externality and decreased searching cost brought by electronic intermediaries, (OECD, 2010) owners originally who commit to Broker A and C are likely to shift to the team made up by the broker B and the electronic intermediary. Broker A can still maintain its position because of the established relationships and trust established for decades, comparable to those good names in the industries. Broker C, as mentioned, due to its weakness in adjusting in a re-intermediary scenario, customer's connection, and ability to maintain good information and disperse it, will have to drop from the game. As indicated below, it dropped out from the market. The barrier here to enter the market mainly refers to the capability of a broker to at least secure one side, either the owner or the cargo.

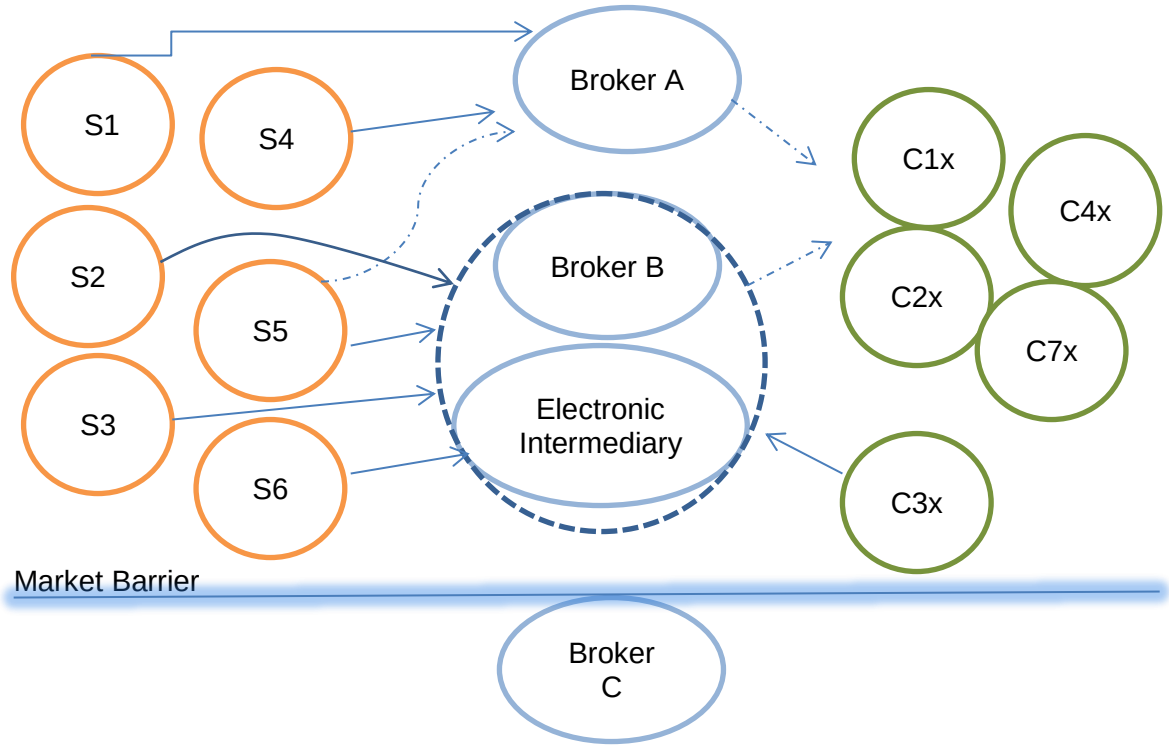


Figure 9: Scenario 2 Re-intermediation in Ship Chartering Brokerage (Source: Author)

Scenario 3: Cybermediation Scenario in Ship Brokerage

Development of electronic markets have created unprecedented bonanza for the business. Some ship owners may reach out to reap this. Because the infrastructure is

so well established and electronic intermediaries have access to all the market information available, and the search cost is merely fractional compared with the 1.25% charged by traditional brokers.

It has been argued that wider availability of information could reduce the asymmetry (Bakos, 1991). Because the highly variance of cargo, which tends never to be from a constant position and same clients in voyage chartering, ship owners are most likely to seek info still via intermediaries rather than going out to find them directly. In another word, disintermediation proposed by previous studies is not likely to realize in this business field, because intermediation is still adding value to the business. However, as indicated because of high technology the information is more symmetric between both and ship owner's monopoly profit is decimated, some ship owners and cargo owners may bypass intermediary to conduct business directly: S3 and C3x. Foreseeably, traditional market brokers cannot compete with the electronic intermediaries established in dry bulk chartering, the result for them of being rooted out from the business is then inevitable. The Broker A, B and C will run out of business and stay out of the game.

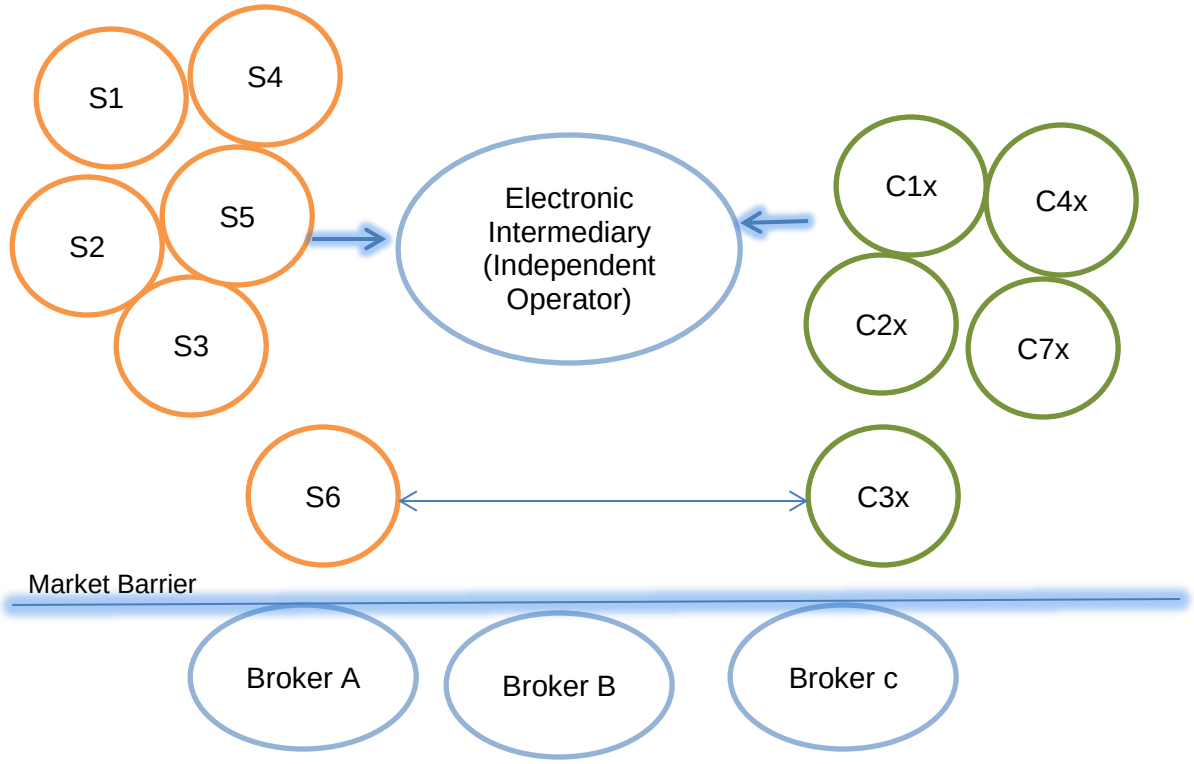


Figure 10: Cybermediation in Ship Chartering Brokerage (Source: Author)

3.5.3. Model Summary

In order to study how traditional market intermediaries utilize its expertise, experience and negotiation to "match the supply and demand" (Spulber, 1999), we conceptualized below model, based on our scenarios and in line with conduct of multi-agent simulation.

The “actors” in this model are the ships, intermediary, electronic intermediary and the cargo. Other parties irrelevant or less effective are left out.

A Handysize can run 12 or so voyages in a year. We assign 10 ships in a specific ship segment, in our case, Handymax for voyage chartering. They are different in locations but within same trade zone, for instance in Atlantic. The reason to assign them all in the same trading area is because usually Handysize bulk carriers compete in the same trading area. Handysize can be of below dimensions: 28,500 tons in deadweight, 169 meters in length, 27.2 meters in breath and 10 meters in draught. Most Handysize are geared, with cargo crane because Handysize vessels, unlike larger carriers visiting few fixed ports, often call poorly equipped ports where cargo has to be loaded on and off by the crane installed on board, Nevertheless, Handysize is teeming with new designs and geared with novel technology. Especially in view of the surging oil price, many designs have incorporated energy saving devices, like more efficient engines, streamlined hull design and optimized propeller. It was unconceivable some years ago a Handysize to brag fuel consumption at 18 tons of fuel but now this is what is written in specification and indeed it is the result after sea trial. Finnish designer Delta Marine is advertising their design B.Delta series with such achievement, and few Japanese designers and Chinese designers have similar products.

It is because such huge variance in the ship design together with restriction set by the ship owners (For instance, some many ship owners are unwilling to go to pirate-spawning areas even with premium offers.) and other specific circumstances, the ships, and the Handysize under our model here, are highly heterogeneous. Then we have to carefully balance such inequality which considering them in the model. It is difficult to quantify such inequality of heterogeneity in design, oil consumption, vessel trading limits as we just mentioned. but Handysize vessels exposed under the spot market more often than not, sail with a successful negotiated cargo contract thus we can assume in a certain trading area, 10 different Handysize vessels resemble a distribution, which we will calibrate from empirical data of shipbrokers. However, there is no actual data recording Handysize calling in a certain trade zone but it is not the issue for us since here we only have needs to differentiate the vessels but there is no need to obtain the actual difference.

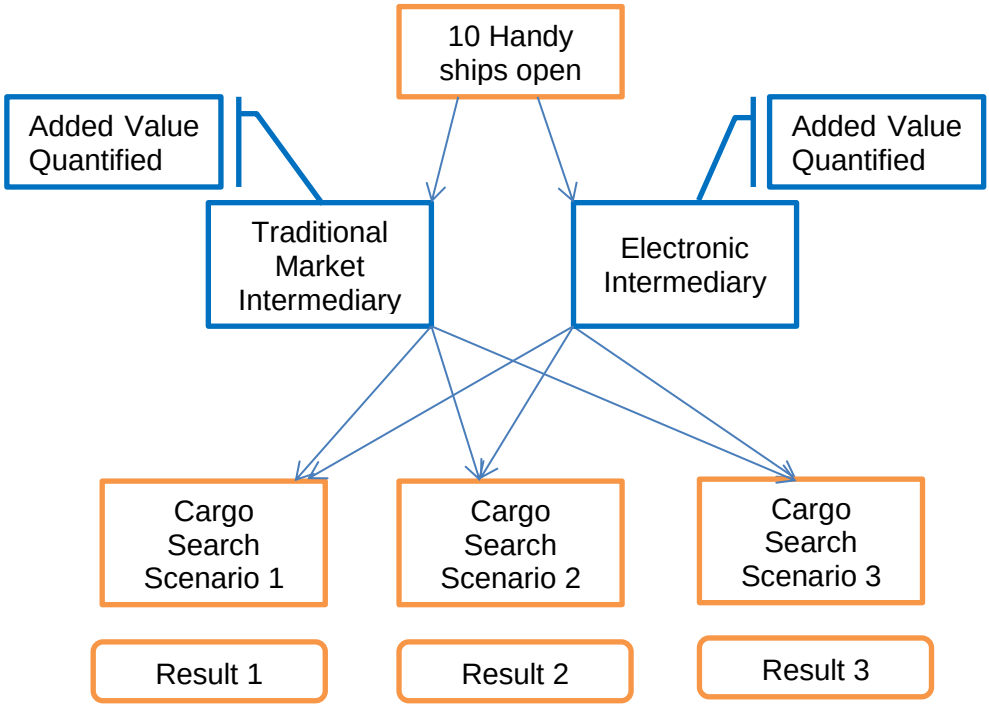


Figure 11: the Simulation Model Illustration (Source: Author)

Mainly Findings II:

SQ1:

- It is found out that in shipping and transport industry at large, existing design of electronic intermediaries are indeed advantageous in lower searching cost and time as well are conducive to market efficiency and resource allocation.
- More importantly, in transport field as the complex of the searching increases, the cost function of both two intermediaries increase but traditional market intermediaries display much more steep increase. And thus traditional intermediaries are more sensitive to searching depth and scope.
- Mathematically, it is proven in shipping the desire for searching activities is negatively correlated with the cost of searching. So electronic intermediary is advantageous when searching scope has to be big thanks to the lower cost.

SQ2-3:

- We exemplify with ship brokering, a typical mediation, that the traditional intermediary in this filed is human intelligence intensive, featuring trust safeguarding, negotiation, contact follow-up, interpersonal relationship and pedigree. No such function at full utilization electronically is at site.
- Shipping industries is highly differentiated and segmented with heterogeneous preference and goods. Meditation is with multi-fold meanings.
- Because in shipping the goods flow and information flow are not synchronized the asymmetric of information is even worse than that in many other industries.

SQ4:

- Information search in shipping is usually in sequential fashion, where searching ends where right candidate is found. Traditional intermediaries use experience and channel so there is no need for big searching scope. This hampers the application of electronic intermediary which build network externality on mass.

4. Model Simulation

This chapter simulates the model we have conceptualized and attempts to generate results from the simulation. It follows such process: coding and validation, experiment design, implementation and analysis (Dooley, 2002). To assess the added value of a proposed change, Janssen and Verbraeck (2005) deploy a model to simulate of business processes, one of the most used applications to identify the opportunities brought by changes. Specifically they develop a system that imitates the truck transportation and logistics in selected European routes but to trade directly. This is to compare with the Logigo, an online intermediary for the same business. By considering the "information role", "facilitation role", "matching role" and "trust role", they "code" such characteristics in their model. The multi-agent model is deployed in their simulation. They follow the conceptual design, empirical data collecting, implementation and analysis of the result.The model evaluates the added value of intermediaries, in the discussion of cybermediation or reintermediation. Only influential characteristics were reflected in the model but other details are left out. Their simulation approach was validated in a real-life situation. The LogiGo case study showed that the information architecture adds value for both the shippers and carriers, which rejects the notion advocating disappearance of electronic intermediaries. Their multi-agent model successfully supports such findings.

4.1. Empirical Data

The purpose of the simulation is to compare different results under different searching scenarios. The first step is to assign value to each agent. Such process usually contains random value but to reflect the real situation, the model to be simulated needs to be validated that fits the historical data in three ways: exactly, distributionally, or pattern-wise (Dooley, 2002). In the simulation in Janssen and Verbraeck (2005), they validate both the distribution and pattern.

We have obtained the empirical data from an experienced handy dry bulk broker from Joinocean Shipbrokers, a company headquartered in Shanghai (www.joinocean.com). Since its first day of establishment, JoinOcean has gradually grown into one of the leading ship brokering companies in Asia, with a special focus on dry bulk chartering business. We have tracked their half year transaction as seen in Appendix I. This shipbroker reveals 25 Handysize transactions in approximately 8 months. Because some deals are on TCT (Trip Charter on Time Basis) and some are hired on per tonnage basis and thus the hire is paid differently, therefore it is not easy to see the trend on the hire. Then we turned back to see the vessel size (for vessel size smaller than 10 thousand tons, they are round up to 10 thousand tons). It is interesting to observe the distribution of the vessel tonnage is similar to:

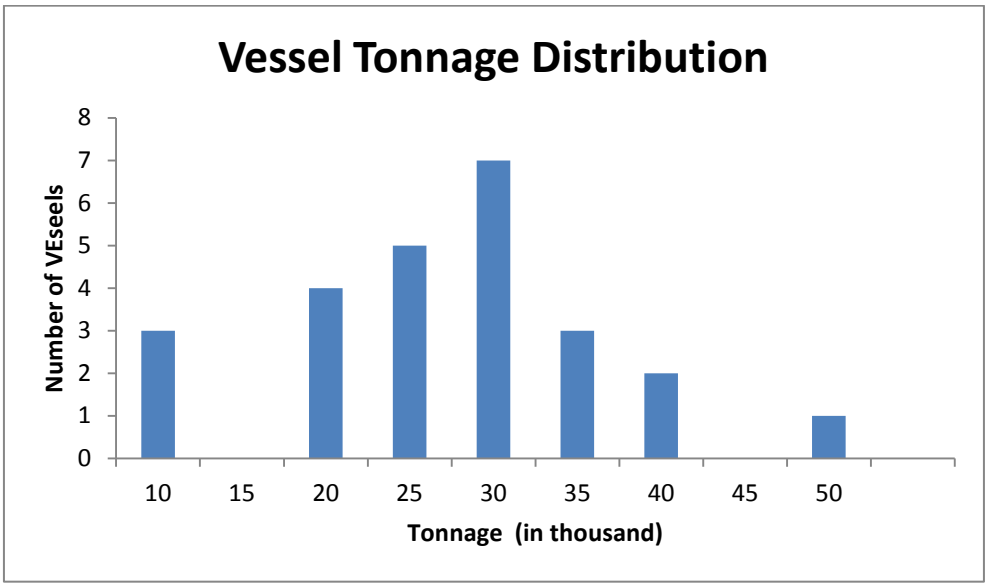


Figure 12: The Tonnage Distribution of Joinocean Recent Chartering Transactions (Source: Author)

Furthermore, the data can be found with below parameters generated by Excel:

$$\text{Average deadweight } \bar{X} = 25 \text{ t, Standard Deviation: } S = 9.2 \text{ t}$$

$$\text{Kurtosis } = 0.96, \text{ Skewness } = 0.35$$

The empirical sample is constraint by its size. It is merely enough (only 25) for us to interfere with the whole population. However, the empirical data histogram resembles lognormal (slight right skewness, kurtosis and non-negative), therefore it can be assumed in a large sample, the convergence outlines a normal distribution. Simulation allows research to assume inherent complex as given (Dooley, 2002). It is then a piece of useful information indicating a traditional ship broker tend to have better information about the ships, at least the distribution of the vessel tonnage is more or less given. Such information at the knowledge of an experienced ship broker can serve as his expert advice to the client and increase the successful matching thanks to targeted searching with knowhow and empirical lessons. With such data result, what we need to do is to find a way to incorporate them in the model.

4.2. Code Development and Validation

In this section, value will be given to different agents in the simulation and the value reflecting the comparative advantage of a traditional broker- the schema. Researchers being fond of a large simulation models shall go after basic software practices (McConnell, 1997). Simulation is used in computer software and also in simpler ways, like with Excel. Taknomo (2009) uses Excel to simulate horsing riding in a multi-agent model. Excel is also used to simulate diffusion theories. Our simulation will be built upon Excel functions.

4.2.1. Assign Value to the Ships

10 Handysize vessels appearing in a same trade zone, by which the vessel units to be allocated in a real number x and $x \in (0,1)$, . The overall distribution of the entire vessel simulated has to be in compliance with the empirical data. Again, the value does not give any specific meaning towards the vessel but imitate their relative similarity and difference in heterogeneity. The closer they are substitutable in trading, for example to vie for the same cargo, the closer their digits are. For example a ship assigned with a number $x = 1.0005$ can be more likely to be substituted by a vessel $x = 1.0205$ than one with 2.0205. By the same token, a vessel with larger ranking in 1-10 then is less likely to perform the same trade that a vessel with a smaller ranking can do. The value hierarchy presents no implication of the quality or superiority of the vessel.

In order to determine how many Agents for ship we need, we again speak with the brokers. According to our conversation with experience broker at Joinocean, one broker cannot follow too many clients and sometimes a client is followed by few brokers. Nonetheless, because when very unique cargo is released to the market, the candidate ships cannot be too many, considering position of vessel, laycan and vessel type, to say the least. To practice on the safe side, we have used 10 vessels as simulation for both the traditional and electronic intermediary.

$$\mathbf{AS} = \mathbf{10}, \boldsymbol{AS'} = \mathbf{10}, \qquad \textit{Equation 13}$$

$$Where\ AS\ is\ the\ quantity\ of\ ships\ to\ be\ simulated\ by\ traditional\ brokers$$
$$Where\ AS\ is\ the\ quantity\ of\ ships\ to\ be\ simulated\ by\ E-brokers$$

The ship brokers referred here are defined as the brokers for ship owner side. So they have more information about the ships, i.e. they know the what ships which are likely to be open in position in advance, whereas an electronic intermediary obtains such information passively when it is going online. To embrace this in the model, it is then necessary to differentiate the value for ships between them.

We perceive that all information that the ship brokers have more can be interpreted as the distribution over time. The distribution is known but an actual value for the ship open is unknown. We assume the ships that a ship brokers have information about in three years are in compliance with normal distribution of $\bar{x} = 0.5, s = 0.02$. However, as mentioned, the ship broker cannot be sure of what the value of the ship before it is actually released. Then we have to design a model to imitate this situation. To realize this, we resort to random function of excel.

For ship broker, ship value *(S*) is defined blow:

$$\boldsymbol{S_0} = \boldsymbol{NORMINV}(\boldsymbol{P_0}, \mathbf{0.5}, \mathbf{0.02},), \boldsymbol{S_1} = \boldsymbol{NORMINV}(\boldsymbol{P_1}, \mathbf{0.5}, \mathbf{0.02}) \ldots \boldsymbol{S_n} = \boldsymbol{NORMINV}(\boldsymbol{P_n}, \mathbf{0.5}, \mathbf{0.02}) \qquad \textit{Equation 14}$$

$$\mathbf{Possibility\ (P)} = \mathbf{Random\ real\ number\ between\ 0.05\ to\ 0.95} \qquad \textit{Equation 15}$$

For electronic intermediary, because the lacks of “in-depth” information, the ship from the ship owner side to be traded are even more random. There is no available platform to give history data, because those who operated in this field have already folded. Most likely they ships that are traded online shall resemble certain distribution but to highlight the different “knowledge-based” difference between the electronic intermediary and a traditional one- here as the ship brokers, we assign random value to the ship value (S’) for electronic intermediaries. By definition, a statistical distribution in which the variants occur with probabilities asymptotically matching their ‘true’ underlying statistical distribution is said to be random (Weisstein, 2013). Dooley (2002) further argues uncertainty associated with “real life” is enforced in a model by random variables. We here then implement the variable in a random fashion (Excel function “Rand” for generating pseud-random numbers).

$$\mathbf{S'} = \mathbf{RAND}() \qquad \textit{Equation 16}$$

4.2.2. Validation of the Ship Value (S and S’)

To test if such simulation will be compliance with the empirical data, we use 500 AS (agent ships) data and to generate a histogram with moving average.

Because one traditional broker shall have the same average ship tonnage traded with electronic ones in long run, simply because the vessels available in the market are eventually the same. The distribution of the ship value for electronic intermediary is denoted averaged 0.5. Here we need to assign 0.5 as the average for S value for the traditional. Standard Deviation is a trial and error because we need to make the value spanning from 0 to 1 and largely the same as electronic ones and within a reasonable significant level.

500 AS is decided because this is an acceptable number of ships that a broker likely view over 3 years, per conversation with ship broker at JoinOcean. We then observe below result.

$S_{Max} = NORMINV\ (P_{0.95}, 0.5, 0.02) = 0.828971\ and\ S_{Min} = NORMINV\ (P_{0.05}, 0.5, 0.02) = 0.171029.$

This histogram roughly resembles a normal distribution of $\bar{x} = 0.5, s = 0.02$.

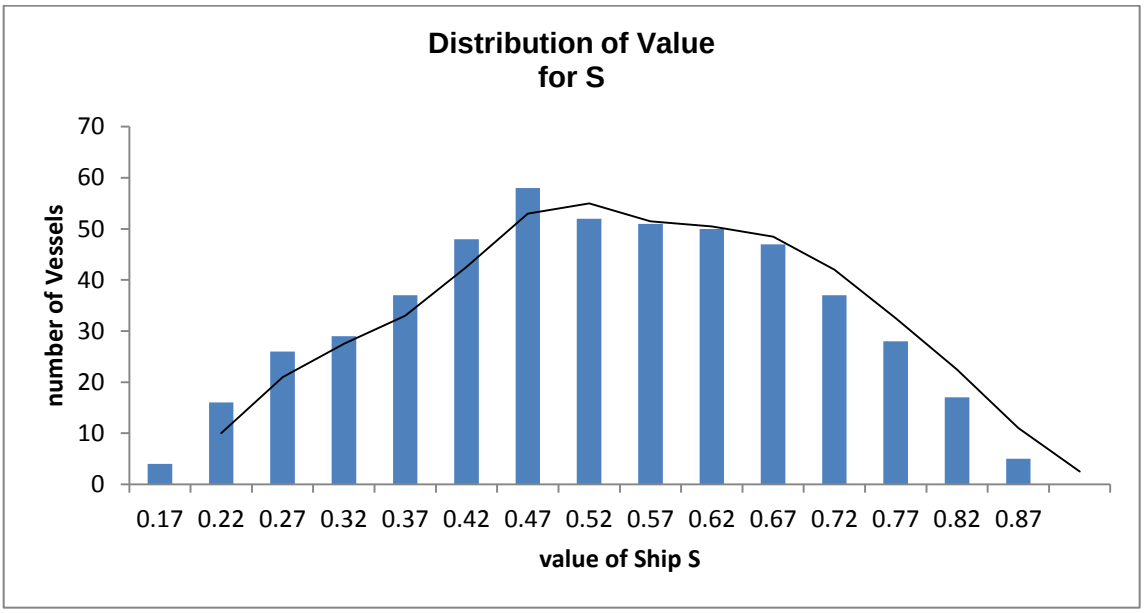


Figure 13: Value Distribution of "Ship (S)" by 500 Units Modeling (Source: Author)

Validation of simulation can be observed exactly, distributionally, or pattern-wise (Dooley, 2002). It then obviously our simulation of ship value does imitate the empirical data in terms of distribution pattern. The reason we can't use empirical data is the lacks of adequacy. However, as the sample grows bigger, the distribution is normal. Then from this we can say our distribution of value "S" corroborates with empirical data.

From equation 16, it is known the ship value S' for the electronic intermediary to process is random. Electronic Intermediary has no such in-depth expertise as the traditional brokers. To display the value visually, we have generate a histogram for 500 trial data. It shows the values are more or less equally distributed in each interval. This indicates under electronic intermediation, even there can be more entries of information, the interpretation of the information, unlike the traditional brokers, by experience, knowhow and expertise is weak. In another word, there is no knowledge of the distribution of the mediation target; here we let it be random generated data by Excel.

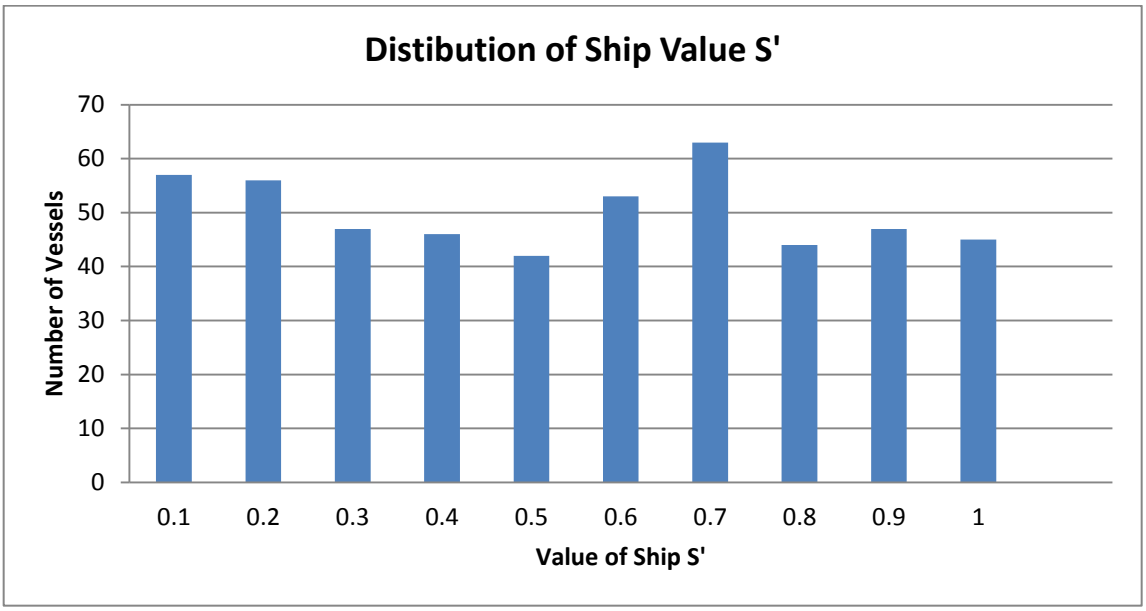


Figure 14: Allocation of Ship Value S' (Source: Author)

4.2.3. Assign Value to the Cargo and Matching (Schema)

As what is discuss in the previous chapters, being a ship broker is a highly specialized and knowledge intensive vocation, which requests interpersonal, negotiation skill and courage to act. They are not just information transmitter but also information processors and analysts. Focuses like these makes a ship broker usually concentrating on one segment and often has his or her unique knowhow on a single ship type. We have conversation with experienced brokers: Indeed each and every market intermediary in the shipping world may have its focus like on vessel tonnage, Handy or Panama, charter contract pattern, spot voyage, COA or time charter. Our empirical data are a list of chartering vessel in different tonnages and trading routes. Cargo difference can arise from the cargo difference in nature, be it thermal coal, cotton, cereal or fertilize, as well as the cargo location and laycan requirement. Because cargo is traded sometimes by long term sales contract or resold by speculators or simply for an one-off contract, it is more difficult to obtain the charterer or cargo information. Of course sometimes cargo traders don't charter vessel directly but the buyer charters in a vessel under FOB sales contract. We here then normalize the cargo or charterer information with a random value 0 to 1. Matching is defined in this model as a success deal to be concluded. It is one of the major roles of intermediation activities (OECD, 2010). Traditional ship brokers are highly specialized and often communicate through each other verbally to obtain pre-market information, and their trust and personal relationship are the extra guarantee of the deal, which also increase the efficiency. When a candidate ship is matched by a traditional market intermediary, if the numeral difference between the cargo and vessel is smaller than 0.1, the deal is met.

When a candidate ship is matched by an electronic intermediary, it has no comparable human intelligence, so lagging behind in negotiation, expert advice and experience, and

thus it can only match cargo with 0.05 differences from the ship. We assume traditional market intermediary can be quantified twice as much field expertise of non- searching related skills compared with an electronic counterpart. For example, a traditional market intermediary can talk the ship owner into accepting a cargo type which was originally not acceptable by the ship owner. And as we have proven in the beginning of this section, when the goods are heterogeneous, a buyer wants to have larger candidate pool to select from in order to have optimal solution. So in our simulation the electronic intermediary doubles the searching result compared with a traditional intermediary.

Traditional market intermediaries, as ship brokers, in our case have built up personal relationship with their principles, either the cargo or owner side. The relationship has gone through several good and bad times and if it has sustained such "tests", then the trust is forged, i.e. a broker in history successfully mediated between different interests and avoided possible loss or law dispute for the principles; or a broker was never detected lying to the principles and often help the principles to wind up preferable deals. Most likely these brokers are given preference being selected as the exclusive or semi-exclusive broker. Furthermore, because brokers have accumulated experience in certain field, this knowledge is likely to concentrate in a specific area. As shown in the beginning of this chapter, a ship broker can have a track record similar to a normal distribution or even transaction type. This can be interpreted that ship brokers will have a lot more information especially of one side, which is often not public or is obtainable without the personal relationship. However, this will not be what an electronic intermediary can present as an advantage for the time being. To integrate this fact into the model, we firstly have summarized below chart to compare intermediary activities in the shipping world. Our interview with experienced brokers shows that: mostly there are no deals that look totally a match at first glance and thus brokers have to negotiate to talk over either or both sides to make comprise to conclude a deal.

Table 2: Comparison of Traditional ship broker and E-broker (Source: Author)

	Traditional	Electronic
Interpersonal Relationship	Strong	Weak
Exclusive Channels	Strong	Weak
Information Processing	Strong	Weak
Legal/ Pro Advise	Strong	Weak
Concentrated expertise	Strong	Weak
Nonofficial (Pre-) information	Strong	Weak
Lower Searching Cost	Weak	Strong
Larger Searching Scope	Weak	Strong

Because lacks of empirical data and historic studies, we interpreted that all the roles that traditional intermediaries are equally strong at contributing to deal conclusion.

We give below equation to define deal conclusion between a ship and a cargo (or charterer) via a traditional intermediary.

When $(S-C)^2 < m^2$, a deal is done, where $\mathrm{S} = \text{Assigned value for the ship}$, $\mathrm{C} = \text{Assigned value for the cargo}$, $\mathrm{m} = 0.1 = \text{matching factor}$

For an electronic intermediary, for the reason it has no comparable "stronger" skills as a traditional one, we have below:

When $(S' - C')^{\,2} < m'^2$, a deal is done, where $S' = \text{Assigned value for the ship}$, $C' = \text{Assigned value for the cargo}$, $m' = 0.05 = \text{matching factor}$

4.2.4. Validation of the Agent Cargo

We previously resorted to equation 12: $R_C^* = \left(\sqrt[2]{\frac{t}{2c}}\right) - 1$ to prove that optimal sample R_C^* is a deceasing function of the searching cost c, and hence a ship owner will decrease its searching sample as the cost increases and when the cost is lower the searching scope is likely to be enlarged. Meanwhile, it shall be noted that lower cost is one main incentive for different stake holders to drive traditional intermediaries out of the market. The studies done by Bakos (1997), Gudmundsson and Walczuck (1999), and Janssen (2004) all conclude that electronic intermediary can reduce search cost and time as well as the administration cost. Their fields of study are either shipping or logistics field and they deploy models, which are relevant reference to simulation conducted here. In this case, buyers shall have no objection to search with bigger scope. It is expected that under electronic intermediation, the searching scope of the ship owner will be increased.

To determine the searching scope for ship owner or the agent of cargo, we spoke to some brokers known from before: usually the numbers of deals highly vary in years so there is no definite answer for an average and it also depends on the nature of the transaction: voyage charters tend to be more frequent than time charter. Again, we deploy trial and error to decide how many cargo entry we shall create.

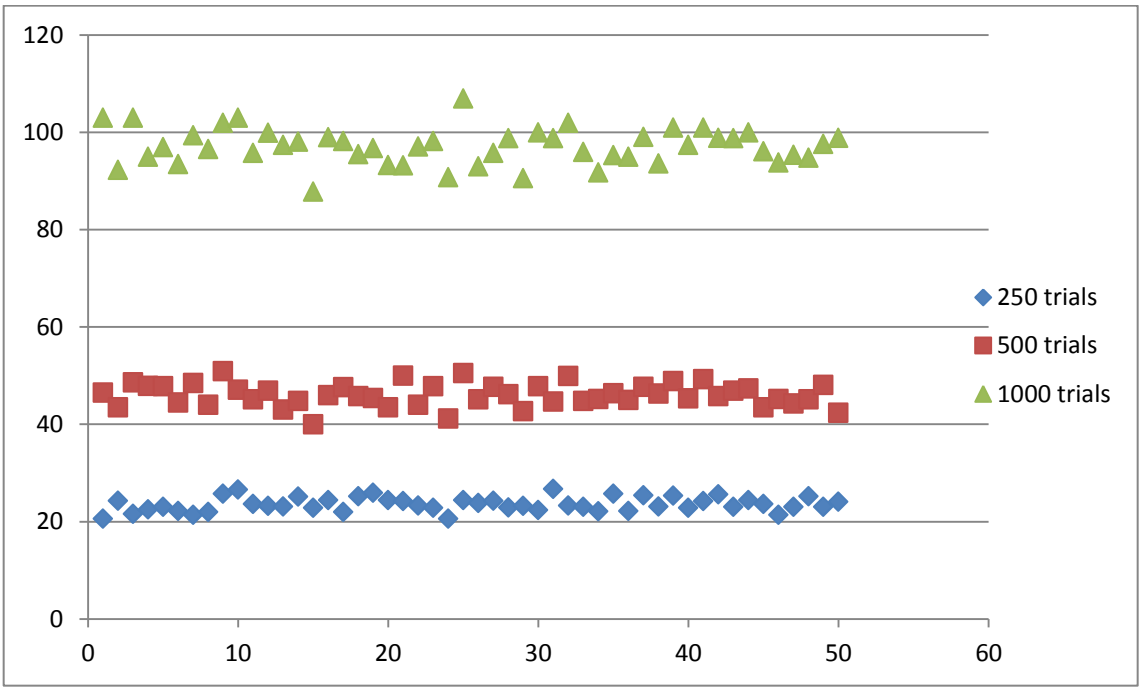


Figure 15: Scatter gram of "250", "500", and "1000" Times Cargo Search Trials (Source: Author)

In this figure, X-axis is the number of observations (50 in total) and Y-axis is the final matching counts for three years.

Observation results are shown below:

Table 3: Observation Result of "250", "500", and "1000" Times Cargo Search Trials (by Author)

	250 trials	*500 trials*	*1000 trials*
Average	23.572	46.052	97.128
Standard error	0.207572	0.333837	0.522264
Median	23.25	45.9	97.25
Mode	23	43.5	103
Standard deviation	1.467754	2.360581	3.692963
Variance	2.154302	5.572343	13.63798
Min	20.6	40	87.8
Maximum	26.7	50.9	107
Sum	1178.6	2302.6	4856.4
Number of observations	50	50	50
Average/3 (rounded)	7	15	32

The broker at JoinOcean suggests even it varies by different brokers and years, 32 transactions per year for a ship broker seems not very likely. A ship broker searches for cargo or charterer and conducts matching for the ship owner and this often comes with one success after many times of failure. Both 7 and 15 times of transactions per

year look feasible according to his opinion. We then here have no adequate reason to reject either, hence we choose to simulate under both scenarios.

4.3. Experiment Design

Each trial is the average of the matching (fixture) result for the 10 vessels (1 is assigned to successful fixture and 0 is assigned to failure), therefore 50 times of trials are 50 average results of matching for 10 vessels each time.

Table 4: Simulation Design (Source: Author)

	Traditional	Electronic
Vessel information	Standard Deviation (Mean 0.5, δ= 0.02)	Random (0 to 1)
Cargo Information	Random (0 to 1)	Random (0 to 1)
Matching Factor	0.1	0.05
Search Scope	250 cargo	500 cargo
Simulation (Scenario 1)	10 vessels x 250 cargo x 50times	10 vessels x 500 times x50 times
Simulation (Scenario 2)	10 vessels x 250 cargo x 50times	10 vessels x 475 cargo x 50 times
Simulation (Scenario 3)	10 vessels x 125 cargo x 50times	10 vessels x 250 cargo x 50 times

Each scenario and its hypothesis will help us to answer under what circumstance electronic intermediary can outperform the traditional ones in dry bulk handy chartering market. This again will contribute to answer our main research question: how it fits in shipping (or how it does not). The scenarios are developed in below:

A recap of signs:

$AS = \text{Agent of Ships (how many ships to be simulated)}$ for traditional brokers
$AS' = \text{Agent of Ships (how many ships to be simulated)}$ for E-brokers
S= Ship value for traditional brokers
S'= Ship value for E-brokers
AC= $\text{Agent of Cargo (how many ships to be simulated)}$ for traditional brokers
AC'= $\text{Agent of Cargo (how many ships to be simulated)}$ for E-brokers

Scenario 1:

$\text{Trials (T)} = 50 \text{ times},$
$\mathbf{AS} = \boldsymbol{AS'} = \mathbf{10}, \boldsymbol{n} = \mathbf{10}\ \boldsymbol{in}\ \boldsymbol{S_n};\ \boldsymbol{n'} = \mathbf{10}\ \boldsymbol{in}\ \boldsymbol{S'_n}\ \boldsymbol{and}\ \boldsymbol{AC} = \mathbf{250}, \boldsymbol{AC'} = \mathbf{500}$ *Equation 17*

H_0 =There is no difference in matching results, when electronic intermediary cargo search scope is 500 AC (agent cargo), two times of the traditional ones.

H_1 = There is a difference in matching results, when electronic intermediary cargo search scope is 500 AC (agent cargo), two times of the traditional ones.

Scenarios 2:

Trials (T) $= 50$ times,
$\mathbf{AS} = \boldsymbol{AS'} = \mathbf{10}, \boldsymbol{n} = \mathbf{10}\ \boldsymbol{in}\ \boldsymbol{S_n};\ \boldsymbol{n'} = \mathbf{10}\ \boldsymbol{in}\ \boldsymbol{S'_n}\ \boldsymbol{and}\ \boldsymbol{AC} = \mathbf{250}, \boldsymbol{AC'} = \mathbf{475}$ *Equation 18*

$H_0 =$ There is no difference in matching result, when electronic intermediary cargo search scope is 475 AC (agent cargo), almost two times of the traditional ones.

$H_1 =$ There is a difference in matching results in matching result, when electronic intermediary cargo search scope is 475 AC (agent cargo), almost two times of the traditional ones.

Scenario 3:

Trials (T) $= 50$ times,
$\mathbf{AS} = \boldsymbol{AS'} = \mathbf{10}, \boldsymbol{n} = \mathbf{10}\ \boldsymbol{in}\ \boldsymbol{S_n};\ \boldsymbol{n'} = \mathbf{10}\ \boldsymbol{in}\ \boldsymbol{S'_n}\ \boldsymbol{and}\ \boldsymbol{AC} = \mathbf{125}, \boldsymbol{AC'} = \mathbf{250}$ *Equation 19*

$H_0 =$ There is no difference in matching result matching result compare with traditional intermediaries, when electronic intermediary cargo search scope is 250 AC (agent cargo), much smaller but still two times of the traditional ones'.

$H_1 =$ There is a difference in matching results in matching result, when electronic intermediary cargo search scope is 250 AC (agent cargo), much smaller but still two times of the traditional ones'.

4.4. Simulation Result and Interpretation

Scenario 1:

Table 5: Result Simulation Scenario 1 (Source: Author)

50 Trial Average Successful Matching	
Ship Broker (traditional Intermediary)	46.62 (out 250 cargo search)
Electronic Intermediary	47.65 (out of 500 cargo search)

Wilcoxon Signed Rank Sum Test		
Difference		*Trd - Elec*
T+		318.5
T-		857.5

Observations (for test)	48
z-Statistic	-2.7641
P(Z<=z) one-tail	0.0029
z Critical one-tail	1.6449
P(Z<=z) two-tail	0.0057
z Critical two-tail	1.96

In the test result, we see Z (-2.7641) fall into the rejection region ($Z < -1.96 \text{ or } Z > 1.96$). Therefore we reject H_0 . Indeed under condition cargo search scope is 500 entries for electronic intermediary whilst 250 entries for traditional broker, Electronic intermediaries outperform traditional one with marginal edge.

Scenario 2:

Table 6: Result Simulation Scenario 2 (Source: Author)

50 Trial Average Successful Matching	
Ship Broker (traditional Intermediary)	49.39 (out 250 cargo search)
Electronic Intermediary	46.46 (out of 475 cargo searching)

Wilcoxon Signed Rank Sum Test	
Difference	*trdt - elec*
T+	1089.5
T-	185.5
Observations (for test)	50
z-Statistic	4.3633
P(Z<=z) one-tail	0
z Critical one-tail	1.6449
P(Z<=z) two-tail	0
z Critical two-tail	1.96

In the test result, we see Z (4.3633) fall into the rejection region ($Z < -1.96 \text{ or } Z > 1.96$). Therefore we reject H_0. And p-value is 0. It is overwhelming evidence that under the condition cargo searching scope is 475 entries for the electronic intermediary whilst traditional broker remains cargo 250 entries, traditional brokers largely surpass the matching result compared with electronic intermediaries.

Scenario 3:

Table 7: Result Simulation Scenario 3 (Source: Author)

50 Trial Average Successful Matching	
Ship Broker (traditional Intermediary)	25.142 (out 125 cargo searching)
Electronic Intermediary	24.524 (out of 250 cargo searching)

Wilcoxon Signed Rank Sum Test	
Difference	*Trdt - Elec*
T+	774
T-	402
Observations (for test)	48
z-Statistic	1.9077
P(Z<=z) one-tail	0.0282
z Critical one-tail	1.6449
P(Z<=z) two-tail	0.0564
z Critical two-tail	1.96

As the test result indicates, Z (1.9077) fall out the rejection region ($Z < -1.96$ or $Z > 1.96$). So there is not enough evidence to infer the matching results are different, when cargo searching entry is 250 for the electronic intermediary 125 for the traditional market intermediary - the brokers.

- Based on our scenario 1, it can be interpreted that in electronic intermediation, if searching scope is large enough, i.e. in our research 500 entries, traditional intermediary can be surpassed in matching success. Very large searching scope of electronic intermediaries can compensate their disadvantage of matters related to human intelligence (personal relations, knowledge and trust), where a traditional market intermediary get a strong hold. However, under out simulation, the difference is marginal. Such result echoes with study that electronic intermediary operators have to build up a formidable mass so to create the network externalities, which in our case it is the increasing more cargo entries that have created more chances for success so the utility for the users of such intermediary has increased tremendously.

- From scenario 2, we see that when cargo entries fall short a little of the point where electronic is supposed to surpass the traditional one, the performance compared with traditional one falls far behind. It again argues for electronic intermediary the mass of user is far more important than other factors.

- In scenario 3, we can observe when cargo entries for both are decreased by half, then it is not possible to detect the performance as we would expect in scenario 1. This means for electronic intermediary, the big user pool not only has to be relatively larger but has to be definitely large in order to outperform intermediary in a traditional market.

- Even though traditional broker have knowhow of one side, which is quantified as a normal distribution of the candidate vessel, they seem unable to utilize this to at least make a draw with electronic intermediary under large cargo searching range (as the result of scenario 1). This does have some practical meanings. In real world, information can be better dispersed by brokers of his principle side. One broker has little knowledge of the other side of the market, namely the cargo side but to rely on the cargo brokers or direct contact of cargo traders. But seeing from scenario 2, when absolute searching range is not that big, traditional broker can perform as good as an electronic one. Thus we can say traditional market brokers create less network externalities compared with an electronic one, because when user number is increasing, the matching result of an electronic intermediary is increasing faster. The matching result can be seen as utility for users in the system.

Furthermore, we can infer that the traditional market intermediary can differentiate itself by battling the weakness of the electronic intermediary, which are lacks of trust, negotiation skill and personal relations. This will contribute to a big difference to the value to determine a deal in the model. We see electronic intermediary marginally outperforms market intermediary if the searching scope is large enough than a traditional market intermediary. However the personal relationship, trust and negotiation skills can compensate the fact a traditional market intermediary has limited information compared with an electronic one, which has its advantage in searching time and cost. This has again echoed with previous studies that accumulative mass for electronic intermediary is crucial.

On the other hand, we can easily anticipate when a market intermediary and an electronic intermediary have similar negotiation skill and trust then an electronic one can outperform easily. For instance, if an electronic ship broker has built up its mass and has somehow resemblance of human intelligence to negotiate, then given it super searching and vast database (once certain mass has been accumulated), a traditional market intermediary most likely will end up being phased out. This is currently a strategy few companies in this field have adopted in an effort to bring chartering online.

4.5. Limitation of the Simulation

This model simulation is based on an assumption that many players in the market make their information available to electronic intermediaries. In reality however one not all information goes on-line.

Our empirical data is a small sample. Even our interference from it with the population holds water but is less rigid.

This model makes an assumption that all expertise and skills are quantified, to such extend an electronic intermediary is supposed to search in exact same folds quantity to compensate the weakness. However, soft skills are always very difficult to quantify, where such difficulty calls for assumption in research.

Usually ship owners have ample time to secure the cargo/contract before the end of the current voyage, and therefore the reduction in search time by electronic intermediaries may be less desired. Such limitation may be the direction for future studies.

Main Findings III

SQ1-2:

- Information of one side doesn't help either the information dispersion or the market efficiency in shipping, for the fact that the market of shipping business is mostly two-sided.
- The advantage of traditional intermediary compared to electronic one in human intelligence has its boundary, namely when a searching/matching task is very large.

SQ4:

- When searching scope is very large, taking chartering brokerage for example, electronic intermediary can outperform traditional intermediaries. Thus absolute rather than relative large mass is critical for building up the network externality in shipping.
- Very large searching task can offset the weakness of electronic intermediary

SQ3-4:

- For now Reintermeidiation is clear the strategy for shipping intermediation because in a field where human intelligence and relationship is traditional whilst no comparable electronic technology available, to combine both can generate the best result.

5. Case Study Analysis

The case study has been used in research for decades and has been recognized as one valid methodology. The advantage with case studies is that it allows studying complex and social units combining different parties to conclude an interpretation of an issue. It is practical and pragmatic, eye on real cases and substantial and holistic examination of real issue. Furthermore, the method is carried out in a style that gives readers interest to read further. However, even if the study aims at a rich and broad description, the weakness can be lengthy report and not preferable as academic publication. Case studies can furthermore exaggerate one finding of few cases (Merriam, 2002). Nowadays, case study method is used as a qualitative research approach across disciplines, such as anthropology, economics, education, history, medication, political science, sociology, law, psychology political science, urban planning, public administration, and management (Grünbaum, 2007; Yin, 1994).

I consider deploying case study methodology on the following ground:

- Maritime business and electronic intermediary are two independent domains where no current research data are quite available. The methodology of quantitative is “tied hands” for this reason. The simulation we present in the previous chapter has limitation which does not allow us to answer all the sub questions.
- Robson (2002) perceives case study as a strategy for doing research, which involves an empirical investigation of a particular contemporary phenomenon, within its real life context using multiple sources of evidence. The case study method is used when a rich understanding of the object and processes of the research has to be gained. This method has the considerable ability of generating answers to the questions of “why” and “how”. On the contrary, the questions “what”, “who” and “where” are likely to lead to the use of survey strategies (Yin, 2003).
- Case studies, in spite of its distant definition in various literatures, share similarity across its applications (Grünbaum, 2007), i.e., a case study is often about people in which the phenomenon, interaction between different social actors and reasons behind are examined. It is explorative and inductive with a focus on the analysis rather than the end result itself. This view implies in case study no manipulation by controlled variables, no defined hypotheses and no limitation of the end product. Instead, the researcher looks into the problem and collects data with intuition and then interprets the result in a rich and vigorous context (Merriam, 2000). Our study of electronic intermediaries in Shipping from a non-technical perspective fits in such.

In view of our research question aiming to answer a “how” main question and also given the limitation of methodology adopted in the previous chapter, this chapter aims to research the problem from a qualitative point of view by deploying case study method. The chapter is divided in to three parts. In first part the methodology of a case study research is presented; in the second part it is the chapter about the case itself and the last part result is written down.

5.1. Case Study Design

Case study design is categories in single-case (holistic), multiple-case (holistic), single-case (embedded), and multiple-case (embedded) design (Yin, 2003). So the first task in designing a case study is to determine number of cases to participate. Occasions where single case study is sufficient include: an intended when the case is critical for testing a well-founded theoretical suggestion and/ or the case it to investigate extreme or unique cases (Blumberg, Cooper and Schindler, 2008). Initially we considered only one case with empirical investigation showed that this choice was quite a unique case in terms of electronic intermediary in shipping. After extensive investigation of this filed, we summary the below table to give a brief glance of the application of electronic intermediaries in shipping:

Table 8: Cases of Electronic Application in Shipping (Source: Author)

Category (OECD, 2010)	Name	Field of Operation	Effort
Data Storage and Processing (Failed Triumphs)	www.levelseas.com	Chartering	C/D
	http://www.shipping-direct.com/	Chartering	C/D
	www.shipdesk.com	Chartering	C/D
	http://www.netshipbrokers.com/	Chartering	C/D
	http://maritimedirect.com/	Chartering	C/D
	http://sealogistics.com/	Chartering	C/D
Participative networking platforms	http://www.shippingonline.cn/sp/	Mainly S&P	C
	http://www.marinedigital.com/en/	Mainly S&P	C
	http://shipx.TradeWindsnews.com/	Mainly S&P	C
	www.Steminorderder.com	Mainly Chartering	R/C
	http://www.seaquipment.com/	S&P, spare part	C
	http://www.shippingonline.cn/sp/	S&P, spare part	C
Online Catalogue	Maritimesales	S&P	R
Data Storage and Processing, searching and analysis	Bunkervision	Bunker Trading	R
	AMXmarine	Chartering	R

D=Distermediation; R=Reintermediation C=Cybermediation

Chartering transactions are identified the prime candidate to be conducted on-line in bulk shipping, this is easy to do for bulk shipping because of the small number of parcels, and it brings practical benefits (Stopford, 2002). However as it indicates most chartering platforms failed. TradeWinds boosts a maritime portal congregation various maritime intermediary service on-line and its second-to-none accumulated readers entails great network externality. However, after carefully examination, we think our whole research is rooted from electronic intermediary and focus on one market player might not enable an impartial view of the whole landscape and thus this research would run the risk of giving inaccurate apprehension of the issue. Therefore, our design puts focal point on TradeWinds. In addition, we also include two alternative cases with presence in other shipping business fields. The selection of TradeWinds, for one reason, is because of largess vehement to get involved in this study and its leading position and innovation in applying electronic intermediaries online. Their service covers essentially all aspects of shipping. For another reason, their products include most of the possible application of electronic intermediaries (OECD, 2010) to shipping, so

hopefully they can help to give a general and holistic of the research question. For the broker's owner intermediary we have no access to the data and thus we cannot do extensive research. The selection of the other case is conceived to choose electronic intermediary either different ontologically or same electronic intermediary in different business presence. After careful selection from the candidates, it has been narrowed down to TradeWinds and Steminorder. In Study done by Batrina (2008), it is stated Steminorder claims to be the largest chartering intermediary counted by registered users and chartering happen to be a field where many attempted failed. It is then a rare case to explore the reason why electronic intermediary works under their design. Moreover, chartering intermediary is another field that TradeWinds has not yet touched upon.

Embedded analysis focuses on the subject itself whilst a holistic method is researching a case from and only from a wholly and global view. The embedded technique has the weakness for putting focal point on a spot but possibly losing the large view of the analysis. A holistic view on the other hand has the disadvantage of generalizing the problem but without fundamental base built on specific and convincing components. Usually, holistic analysis is appropriate when relevant theory supporting the case study is of is holistic or in a situation no sub-unit could be argued. However, just by these notions, it is not easy to identify the pattern of our case study. Then it is better just to present our analysis and leave to the reader which pattern our study belongs to.

5.2. Theoretical Framework

Logically, the conclusion we draw from the model simulation and literature review form the main part of the theories, to guide us to exam phenomena through the case study. However, since case study is a qualitative approach and is about real business case, then it is necessary to debrief the audience the practical and qualitative theories related to our study object.

5.2.1. Fee Models of Electronic Intermediaries

For electronic intermediaries are in many forms (OECD, 2010), the profit model also differs a lot. It is defined that revenue models are mainly in these for categories: (OECD, 2010).

- Advertising models: it is an extension of the traditional broadcast model used in media, where the intermediary provides service and content by selling adverting slots alongside. It works best when the there is a large scale of viewers or search query that is very specific. Advertising model can be categorized in searching advertising, display ads, classified ads, E-mail ads, referrals and selling user data
- Fee models: as the name indicates it charges the users periodically. There are monthly subscriptions and with some price discrimination techniques like "basic" and "pro" accounts. In additional, usage charges and item charges are frequently deployed. It is also not rare that a service charge is levied for a dedicated project.

- Brokerage model: the market-makers create platforms to bring the seller and buyer together and they facilitate the transaction. For each transaction they charge a fee. There are mainly two kinds: commission model or membership fees.
- Voluntary donation/community models: in such models, open platform is created and financial support is often solicited by the operator. Wikipedia is such a sample.

From there it can be concluded the model of electronic intermediary as follows:

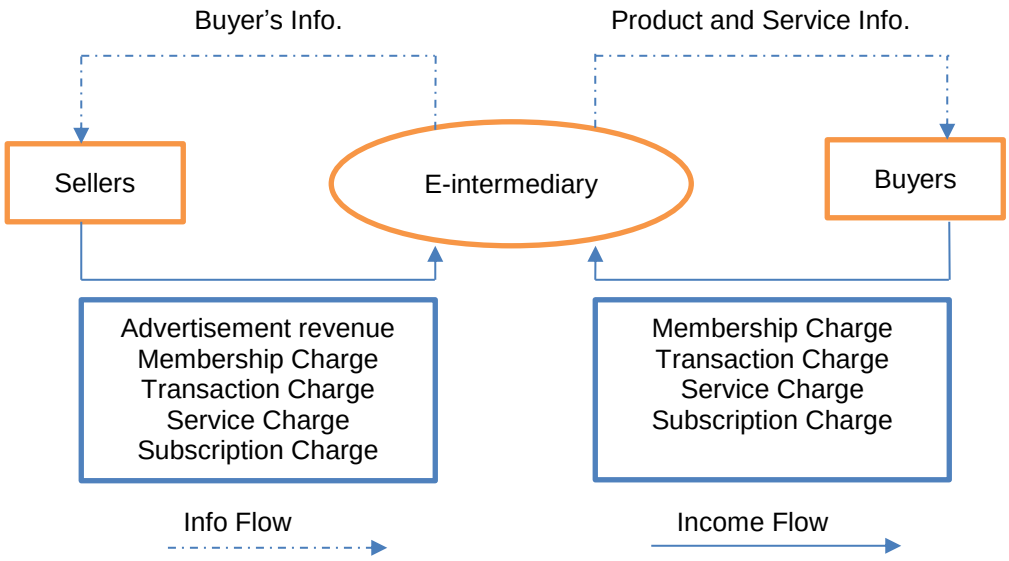


Figure 16: Information and Revenue Flow in Electronic Intermediation (Ke, 2004)

5.2.2. Business Models of Electronic Intermediaries

Paul Timmers (1998) proposes in an electronic context, business model consists of product flow, service flow and information flow. Peter Weil (2001) thinks an electornic business model is a description of the relationship between the company and its customers, alliances and suppliers. Such description can differentiate the flow of products, information and money and identify the benefit of the shareholders. Methlie (2000) conceive the model from network economy and value addition perspective and he proposes a heuristic method for model conceiving:

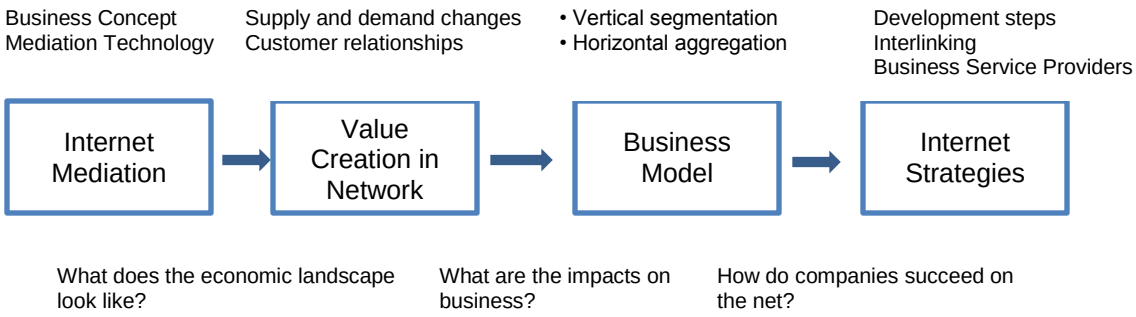


Figure 17: Electronic Business Model (Methlie, 2000)

The value creation as Methlie (2000) defines is the creation of value in network economy. As we discussed earlier, an electronic intermediary creates mostly positively network externality. A positive externality is the benefit or value of an asset not due to its value as such, but to the value of adding it to the network, i.e. adding one more asset to the network directly.

5.3. Case 1: TradeWinds

TradeWinds is one of the leading digital newspapers in the shipping industry, but now also serves as an electronic intermediary hub. It is under NHST Media Group, headquartered in Oslo, Norway. TradeWinds subscribers are from more than 100 countries. To service such diverse customers, TradeWinds has its focus: to debrief the global shipping community with high-quality, sought-after, and exclusive shipping news. According to NHST official website, 59% of TradeWinds readers are at boardroom level and 46% subscribers say that TradeWinds is the single source of shipping news for them. TradeWinds paper news is published every week and the on-line version is updated continuously from their offices in main shipping centres. TradeWinds covers the entire shipping sector, from shipbuilding, dry bulk, tankers, containers, offshore, finance to LNG and piracy and marine insurance. TradeWinds newspaper is published weekly and also available online as an E-paper edition. TradeWinds has also reached in to maritime events and shipping magazines.

5.3.1. Data Collection

In this section the data of TradWinds is obtained by observation, NHST annual report and in-depth interview with the experts in TradeWinds and in shipping business. Content delivery is among one of the intermediary activities which are defined by OCED (2010). Shipping is a special field where few media companies dedicate news coverage. The top players in English language are TradeWinds, Lloyd's List and Hellenicshippingnews. Lloyd's List is the one with the longest history. Hellenicshippingnews also reports globally with a special focus on Greek shipping community and a free fee model. TradeWind leads by the number of online users. TradeWinds' online services (www.TradeWindsnews.com) generate the biggest

volumes of online users in the global shipping industry with 327,000 page impressions weekly and with 46,540 unique visitors weekly. In 2012, TradeWinds made approximately 90mil NOK, or 30% of profit made by the “Global” five sections (IntraFish, Upstream, TradeWinds, Recharge and NHST Events) of NHST Group.

It seems different companies have different strategies. Lloyd’s List has cut back on its news report but focuses more on sales of “premiere information” and data supply. Hellenicshipping, on the other hand, puts more effort on creation of initial users and hence the network externality with accumulation of mass of users. There seem to be a difficult balance between companies treating advertisement revenue and subscription revenue, somehow in a subtle trade-off. TradeWinds reports 29mil NOK of advertising revenue and much higher in subscription/single-sale totalling at 51mil, for the fiscal year 2012 (NHST Annual Report, 2012).

In 2012, TradeWinds App was launched - available on both iOS and Android. Furthermore, to tap the Chinese shipping market, TradeWinds recently started its circulation in the Chinese language, a comparable strategy to FT Chinese service. In 2012 having rendered a significant web redesign, TradeWinds’ multi-channel and multi-media approach to information delivery were upgraded. Their digital platforms enable them to deliver breaking news globally. Browsing through Tradewinds website (as screenshot below in 2013/8/1), one can easily notice that news is still the main business of tradeWinds as most webpage space is taken up by updates of the shipping world. There are also dedicated areas for market index, historic news and ship trading platform. An emerging marketing role for digital newspaper is to become market intermediaries (Palmer & Eriksen, 1999). Not surprising companies like TradeWinds are trying to figure out what they can achieve with their vast user base besides information dispersion, i.e. how to step in acting as a maket-making intermediary. OECD (2010) defines electronic intermediaries mainly as ISPs, data hosting and searching, content delivery, E-commerce, online payment, participative networking platforms. By such definition, TradeWinds webpage consists of more than one kind of electronic intermediary services.

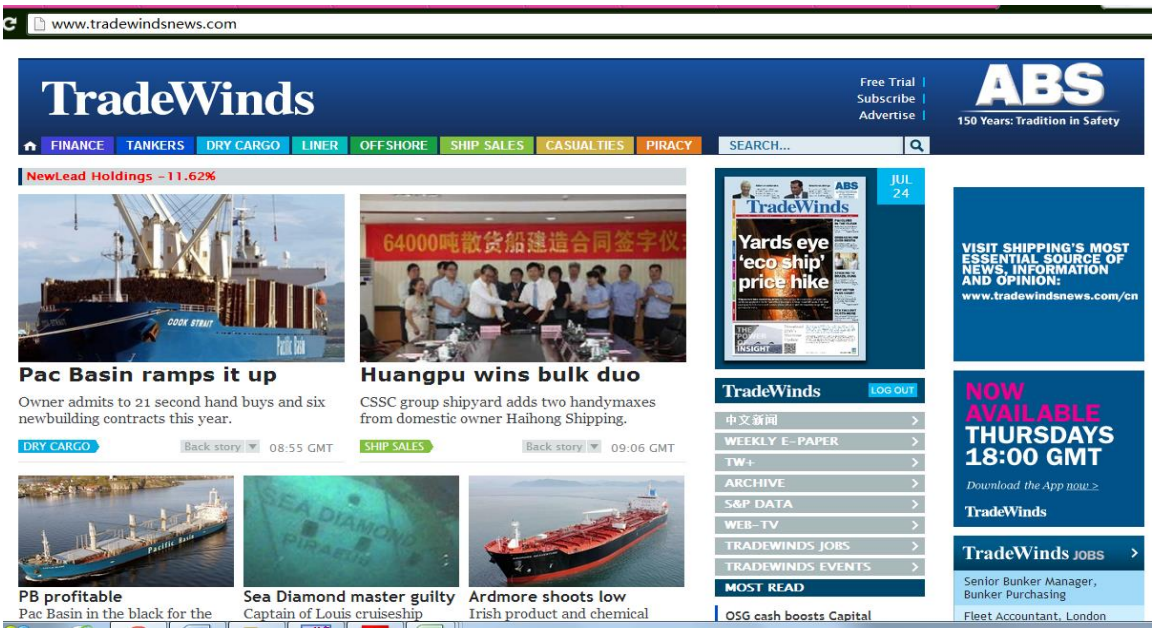


Figure 18: Website Snapshot- TradeWinds (webpage)

The follow table describes the intermediary technologies that TradeWinds employs:

Table 9: Summary of Intermediary Technology at TradeWinds (Source: Author)

Item (OECD, 2010)		Products	Remark
ISPs	N/A		
Data processing, web hosting	√	Achieve	Data of the historic maritime news
Content delivery	√	Real-time news, Chinese distribution, weekly, TW+	News covering tankers, dry bulk, shipbuilding, containers and more.
Search engines and portals	√	Built-in search engines	Searching engine to extract the desired entry from historic news data
E-commerce intermediaries	√	Ship-X TradeWinds Jobs	Ship-X is an E-bay like auction website for Ships, machinery and maritime equipment for S&P TradeWinds Jobs is a headhunt platform
Online Payment	N/A		
Participative Networking Platform	N/A		

TradeWinds News is arguably the most read shipping news in English, covering containers, tankers, dry bulk, shipbuilding, ship finance, offshore, insurance, ship casualties and beyond. Besides the online services through their website, TradeWinds sends out 21,500+ validated and 'solicited' emails to notify the daily headlines 5 days a week. Breaking news in shipping is renewed in a timely fashion. They are integrated in one front page listed hierarchically by their information value, but also segmented into different shipping business field.

TradeWinds Achieve is branded as a decision-making tool for those who need relevant historic information to refer to. Nature as electronic intermediary, TradeWinds Achieve aggregates the historic happening in shipping, providing searching engine in criteria like time, title and content and matching the desired entry with historic content. We attempt to search by "Erasmus" in TradeWinds Achieve and "Erasmus Shipping" in Google, (because in Google we have to specific we search in shipping related but in TradeWinds it is a default) . Interestingly, TradeWinds generate more unique results.

TradeWinds Jobs is a headhunt-like electronic intermediary bridging the supply and demand of maritime jobs online. This business section is a profit-making one of TradeWinds. Both shore-based and sea-going jobs are listed in wide geological locations. Besides the offers directly posed by the companies in shipping industry, jobs channeled by traditional intermediaries are also available on the platform. This is a phenomenon we have identified as re-intermediation, where traditional market intermediaries leverage their expertise or differentiate themselves in an electronic context (Giaglis et al., 1999). On one hand, traditional recruiters like Maritime Red, Oliver James and Executive Recruiters benefit the wider searching scope from wide establishment of TradeWinds' user network, to increase matching success odds. On the other hand, TradeWinds Jobs as a new electronic intermediary has less in-depth knowledge and expertise of a maritime recruiter, so it also benefits from such joint-hand effort. TradeWinds also work with a list of "blue chip" companies, a practice prevent opportunistic behavior by new market enters. It is presumably that the fact TradeWinds Jobs can work may attribute to both its global distribution of readers and the jobs listed, where the targets are likely to fall in a similar searching scope. Imagining that all the jobs are local whist readers remain largely global, the success of this re-intermediation is doubtful.

ShipX is an E-bay like trading platform featuring S&P as well as ship spare parts. However, according to our interview with TradeWinds, ShipX is no longer an active business entity. In their view the contact networks between brokers, owners and managers are often strong and on personal level - if TradeWinds is to offer something digitally and without the human contact element which will be of value added beyond what they currently have. It has to be more than a listing.

Chinese shipping news channel was launched in recent. It is currently free to read, same as FT Chinese. TradeWinds has followed a strategy to keep the channel open for the coming few months to increase the traffic/online access/readership growth, till the moment they have accumulated a respectable volume they will look at revenue model on charging for content, even to build up the site with vacant senior positions within the Chinese Mainland, and possibly also other services particularly tailored this market.

They foresee that some of the ads income for Chinese edition will come from companies in US and Europe wanting to position their services/brands in the mainland.

5.3.2. Data Analysis

Backed by our data, it is evident that TradeWinds is not merely a shipping news provider. It looks beyond the news and expects to make the market by interposing between the sellers and buyers, the producers and customer, the supply and demand side. “As stated in their annual report: NHST’s primary position is as a publicist, but with increasing levels of digitalization they will also see themselves offering services linked to the publicist side of the business to a greater extent.” (NHST Annual Report, 2012)

In line with the role of electronic intermediaries and our research questions, we have summarized features of TradeWinds intermediaries in below:

Table 10: TradeWinds Electronic Intermediation Roles (Source: Author)

	Aggregation	Pricing/Evaluation	Searching/Matching	Trust
Shipping News	√			√
TradeWinds Jobs	√	√	√	√
TradeWinds Chinese Distribution	√			
TradeWinds Achieve	√	√	√	√
Ship-X Platform	√	√	√	

Table 11: TradeWinds Electronic Intermediation Features (Source: Author)

	Information Dispersion	Positive Network Externality (two-sided market).	Mediation Concept (D/R/C)	Large searching enabled	Human intelligence needed
Shipping News	√		C		
Shipping Jobs	√	√	R/C	√	√
Chinese Distribution	√		C		
News Achieve	√		C	√	
Ship-X Platform	√	√	D/C		√

The two-sided market effect has a weaker implication to shipping news platform: naturally reader will be more interested if there is more exclusive news from TradeWinds. However constrained by physical limitation of page size and the nature of

“scoop” events, there is a cap on such news, or on the supply side. It is understood that TradeWinds wants to build up profit on its huge user base, many of whom are taking decision-making roles in shipping. Shipping News as fact based information is homogeneous goods, (In nature the report of one media is identical to the report from another.) which differs from our analysis in previous chapter of searching in a differentiated market, where lower searching cost by electronic intermediary can encourage more searching initiated by buyers. However, such effect shall prevail in TradeWinds Jobs and Ship-X. Both sides of the market (job seekers & employers; and ship owners & buyers) benefit from the increase of volume, a positive network externality.

Because network externality increases exponentially (One new entrant adds value to each and every incumbent.) and customers’ demand is stimulated by free offerings, a company has adequate reasons to provide free entrance to users to increase the network value, but to cash on those players who benefit from such network value increase, for instance, the advertisers. This is what exactly we have monitored at TradeWinds Chinese language channel, in which readers enjoy free subscription. The same network externality can be negative (Readers may loathe too many ads.).

Talking about the mediation concept, except Tradewinds jobs which incorporates traditional market intermediaries, hence reintermediation it is; others all aim to create a cybermediation or disintermediation. TradeWinds push-mail is one kind of cybermediation. By identifying registered interest of daily headlines or special market segment, TradeWinds works as an information hub to distribute on demand. Similar functions are shown in TradeWinds Jobs and Ship-X Platform.

In terms of the searching scope, Shipping News Achieve is an outstanding example where searching scope is enlarged by database buildup and the searching cost is almost zero (for the paid subscribers), a manifesto E-intermediary advantage in cost and time saving. Information seekers must have different preference on data, evidenced in their differentiated searching entry. This encourages users to search wider, identical to our conclusion in chapter 3.

In chapter 4 we identified a hybrid of E-intermediary and a traditional market intermediary shall have inherited advantages from both, therefore it can display human intelligence and features of E-intermediary, too. TradeWinds Jobs reflects such concept, where TradeWinds and the traditional headhunt share the cake and form a “business symbiosis” benefiting all stakeholders in this system.

5.4. Introduction of Case 2: Steminorder

Steminorder is a fast growing content hoisting and user participating electronic intermediary. The focus of Steminorder is on charter transactions for the dry bulk. The website boosts a free bulletin for the cargo listing. We have counted all cargo with Laycan from Aug 12 to Sep 12 (accessed on 11th of Aug, 2013) and have taken a note of their cargo type, tonnage, load and discharge region, we can get below result. To our surprise, the information available is extraordinary, with 1615 results for cargo ready in

Aug. It is easy to imagine how it will threat the traditional business of brokerage if the result can be 2600, 3600 and 4600… cargo entries for one month.

order.com/inside.php?sid=0925d5f1f1f9764f2d42fe5e966c7aab&pg=cargo_search&ex=do

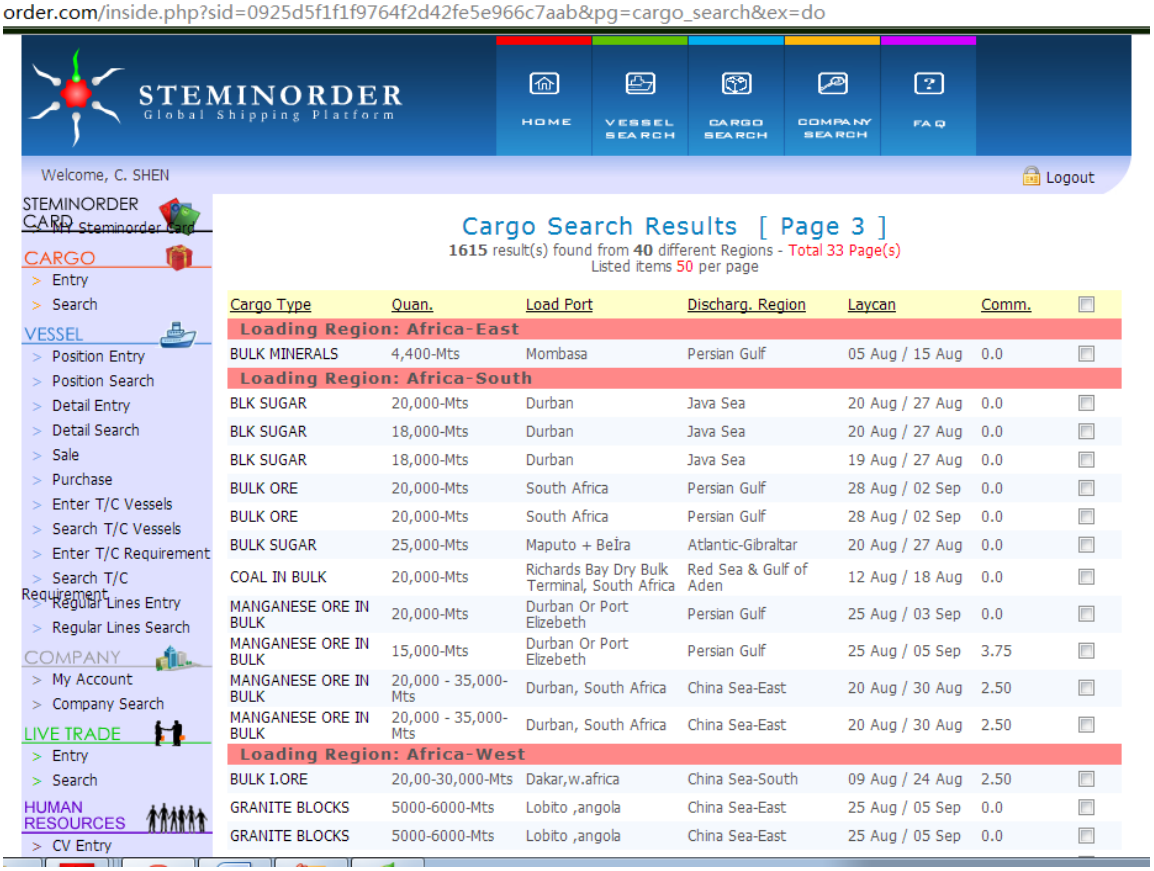


Figure 19: Steminorder Open Cargo List by Region (Screen Shot)

The cargo entry is split in 53 trading zones covering practically the whole world, starting from A- Adriatic Sea to W-White Sea. We can see rich shipping knowhow behind the design. The cargo is entered by loading and discharging region respective and thus it is easy for ship owners or brokers to pinpoint a cargo which they want to load. This function looks minor but gives great flexibility for ship owners, because with information of nearby cargo or even bit further, ship owner, who knew before one or two cargo options now are informed of multiple choices, i.e. the ship owner are empowered with more negotiation leverage with more options at hands. However it is important to notice that information entry is mutual, which means for cargo traders or charterers, more options are also open with more vessel positions available.

Figure 20: Steminorder Cargo Search Entry (Screen Shot)

Vessel entry is also available but to view the detail, one has to register as a "business user" at a fixed subscription fees but merely a tight fraction of the chartering transaction. To compare with traditional brokerage as 1.25% of the transaction, a small ship owner does have incentive to hire one person delicate to match via electronic intermediary, a progressive action possibly driving traditional brokers out of the game. This again has brought the question to if there is trust. The asymmetry of the market information is greatly reduced by exponentially increase of information exchange with electronic intermediary. Lower cost and fast dispersion makes secretly kept secrets out much faster and wider. Searching via electronic intermediary cost close to nothing and both sides of the market players do enjoy larger searching scope to increase matching odds. Indeed currently the advance of technology doesn't support human intelligent activities by electronics itself, e.g. the negotiation, exclusive channel and pre-info, but as we have observed in chapter 4, large searching scale can offset some of these weaknesses. This website embraces the participation of existing market intermediary brokers – apparently in spot chartering exclusive deals are less visible than that in S&P, which means information in spot chartering is hardly a source of scares, rather more in an open environment. This is also one reason why it works. Brokers can enjoy from benefit a bigger network this platform has to bring, a larger target groups which increase successful matching. Another thing worth mentioning is Steminorder has built-in rating between charterers, broker and owners. A great idea it is to deal with "moral hazard", however through our observation, this function is not frequently utilized. How to encourage users to rate online (e.g. bonus points as the reward) improving the trustworthy of the site can be further studied.

In Steminorder, roles of aggregation, searching, matching and trust are displayed and the functions of information dispersion, network externality and large searching scope are evident. It aims to reintermdiate/cybermediate the market. However, functions similar to human intelligence in brokerage is not a visible presence in its system.

It is worth to specially mention the market of Steminorder is typically a two-sided one. Moreover its network externality is positive for both sides. Both charters and owners benefit from the increase of volume. That is why critical mass and "economies of speed" are decisive to the success of Steminorder.

5.5. Case Study Result

In both of our cases, we have observed: it is clear that Steminorder adopts strategy of being in a field of shipping where: preference is heterogeneous and the market is highly differentiated. Compared with liner shipping, in which often customers request only ETD, 20 or 40, ref or not, bulk spot market is truly way more diverse. Because of the huge fleet and large and non-deterministic cargo turnover, evaluation, searching and matching are needed and most importantly large searching candidate can be generated. Its existence is an evidence of our quantitative approach, large searching scope is crucial for electronic intermediaries to outperform. Same evidence is found in TradeWinds News Achieve and Jobs. TradeWinds News Archive searching is a perfect example of creating large searching scope for electronic intermediaries to generate user entry or to match the requirement in the meantime it is a field no human interpretation needed (The search result is the result.)

Whereas ShipX is a similar platform aiming at ship S&P. in terms of business transaction it is much less than bulk spot chartering and also a field where decision-making is much bigger a stake. That is why in this field, soft skills is more wanted by customers, which means the traditional market intermediary is even more stronger in "matching factor" than average. Moreover, what makes things worse is limitation in transaction and non-publicity of supply and demand information provide a very limited searching scope in which an electronic intermediary cannot excel its advantage in searching cost and time.

It is also interesting to notice, TradeWinds Jobs, Stermioder all set models to embrace traditional brokers and these two happen to be the winning business models in electronic intermediary in shipping. Therefore it echoes with our previous result: for the time being, reintermediation is the strategy for a business like shipping where no such technology at site can be equivalent to human intelligence, personal relations and the complex of the business nature. Re-intermediation combines the advantages of both and thus it is more a strategy fits the technology advance now.

In models where positive network externalities present in both sides, e.g. TradeWinds Jobs, ShipX and Steminorder, to accumate mass is crucial to success.

Tradewinds Mandarin distribution uses now free model to encourage an accumulation of mass, where indeed for advertisers it is a positive network externality but for the readers there is no obviously benefit to enjoy from more. So in business field electronic intermediaries cannot create positive network externalities, limit the effect of negative network externality will also limit the party who enjoys the positive network externality, for instance, the section of advisement is limited.

In terms of trust protection, TradeWinds Jobs identify real-name employers and agents so to prevent users from fraud. Steminorder deploys E-bay like rating policy. These are efforts to minimize the moral hazard problems arising from "asymmetric information" in Shipping.

Guided by our case study result and to incorporate the results from previous chapters, we can identify the strategy for E-intermediaries application in shipping in the following illustration:

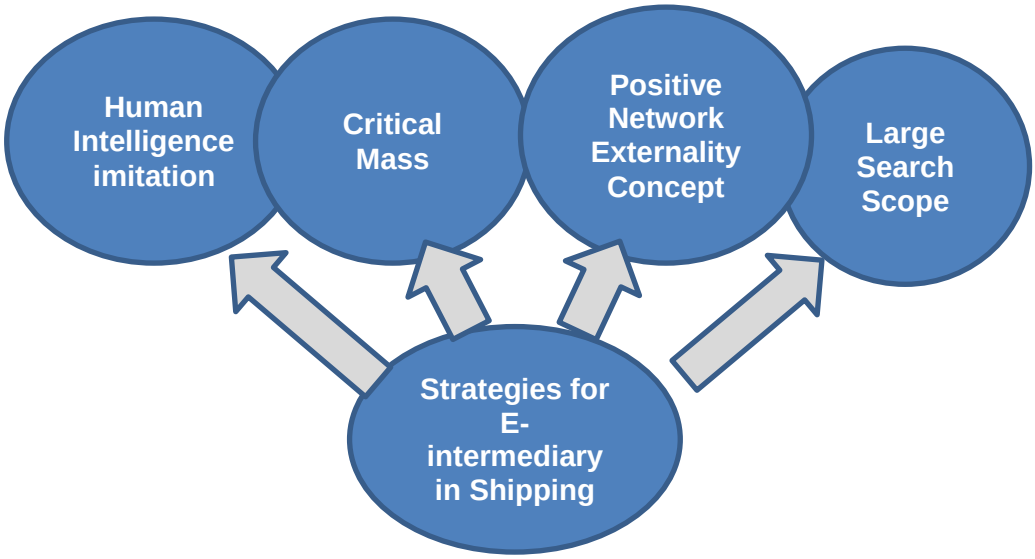


Figure 21: Strategy of E-intermediary in Shipping (Source: Author)

Main Findings III

SQ1

- In both Tradewinds and Stermiorder, it is clearly shown the electronic intermediaries aggregate the information, search and match, and disperses such information. To certain extent, this process does reduce the market power of either side and improve the market efficiency. If they can gain more users, such advantage will be overt.

SQ2

- Both attempt to solve the trust issue by creating their own organism.

SQ3:

- In shipping business where big negotiation presents but to build large searching scope is impossible, the failure seems inevitable. Whilst spot chartering on the other hand is heterogeneous but with large searching scope possibility, where it may herald hopes.

SQ4:

- Two-sided market effect in shipping; network externalities (positive and negative) and reintermediation are monitored; business symbiosis can be built on reintermediation.

6. Conclusions

This study was guided by the main research question of “How electronic intermediaries fit in the shipping business environment?” We chose to proceed with the model simulation and case studies, in an effort to give a comprehensive answer to the research question from both qualitative and quantitative approaches and results.

Aiming at an anatomic answer to the main research question, four sub-research questions are developed: first it was prerequisite to assess what added value an electronic intermediary has over a traditional one. Electronic intermediaries resemble most the roles of traditional electronic intermediaries: market clearance, supply and/or demand aggregation, pricing, information searching and dispersion, matching. Moreover, they are advantageous in reduction of searching time, information and transaction cost, enabling less friction in the market and more efficiency, better allocation of resources and creation of positive network externality. In transport field as the complex of the searching increases, the cost function of both two intermediaries increase but traditional market intermediaries display much more steep increase thus more elastic. Then it is understood traditional intermediaries are more sensitive to searching depth and scope. Electronic intermediaries display better result when searching scope is absolutely large.

Secondly, indeed there are issues arising from “asymmetric information”. Lemon problems and moral hazard are most prominent ones likely to be augmented by electronic intermediation. “Lemon” problem can deteriorate the appetite of E-intermediary users which leads to adverse selection. The reputation is more vulnerable and less dependable in an electronic context, and therefore moral hazard and trust issue is a problem which hampers the wide diffusion of the technology. Case studies show that by introducing online rating system and operating in real names can harness the moral hazard to certain extend.

Thirdly, we exemplify with ship brokering where the traditional intermediary is human intelligence intensive, featuring trust safeguarding, negotiation, contact follow-up, interpersonal relationship and pedigree. No such function at full utilization electronically is at site. Shipping industries is highly differentiated and segmented with heterogeneous preference and goods, and therefore meditation is a complex with multi-fold meanings. What makes things worse is because in shipping the goods flow and information flow are not synchronized the asymmetric of information is even worse than that in many other industries. Constraint by the search scope in shipping, the advantage of electronic intermediaries cannot excel. Information searching in shipping is usually in sequential fashion, where searching ends where right candidate is found. Traditional intermediaries use experience and channel so no big searching scope is needed for them. This hampers the application of electronic intermediary which build network externality on considerable mass. These features in shipping all slow down the steps of Electronic intermediaries.

Lastly, our simulation shows that when searching scope is very large, taking chartering brokerage for example, electronic intermediary can outperform traditional intermediaries.

Thus absolute rather than relative large mass is critical for building up the network externality in shipping. Very large searching task can offset the weakness of electronic intermediary but emphasis is on the phrase “very large”. To combine the expertise of a traditional broker with the large searching scope embodied by electronic intermediary is expected to generate even better results.

Our essential conclusion is that: reintermediation is clear the vision for shipping and four core strategies for electronic intermediary in shipping domain are identified: human intelligence imitation, critical mass building, positive network externality concept and large searching scope.

7. Recommendations and Strategy Advice

To team up with the traditional intermediaries: shipping is a business with long and deep-rooted traditions. Any effort to bring new things is likely to encroach on the existing interest. To embrace this fact, one is advised to team up with those who have got a small market share and without big market power. Those are the entities which tend to accept “disruptive creation” and to re-intermediate themselves. Such re-intermediation can form business symbiosis that benefits all the members on board.

To accumulate considerable mass: As our simulation indicates, a reasonable large amount of user can offset some weakness of electronic intermediary. At the early stage, it may be a good choice to waive the fees for members but to cultivate the user’s habit. Electronic intermediary can only create significant network externality when they absolutely outnumber the customers of a traditional market intermediary and such number has to be large enough to materialize a large search scope for customers.

The reputation is vulnerable in electronic intermediation and in shipping business the sheer value of one deal makes people more cautious than in many other industries. Online rating systems or feedback may not be enough for shipping. Ideas of how to safeguard reputation for shipping and be an agent of trust have to be creatively devised.

Data hosting and analysis kind of intermediaries have higher entry level, because of the intertwining expertise behind. That may explain that why such intermediary is run by traditional brokers (Bunkervision, AMXmarine, etc.). But because of their mostly non-neural position, many actors in the industry are unwilling to share the data. This can be a chance for independent 3rd party like TradeWinds to step in as an independent operator of such platform. User participative platform has lower entry level, for the same reason it is difficult to build a platform with high concentration but it may not be so difficult when possessing a similar network. Tradewinds may consider starting a user participative platform thanks to its already large scale of subscriber volume. Existing users, if on board this platform, is a huge targeted network to lure advertisers.

For the platform Steminorder, the future is calling. It seems the website is run by people with certain savvy in shipping and is also with quite some knowhow in electronic intermediaries. This is evidenced by their rating system of users, a typical mechanism to minimize moral hazard. What they need, in line with our simulation, is to accumulate more users to outperform the current brokers, who may later be forced to “re-intermediate”. Furthermore, according to two-sided market theory, when it grows to formidable size it is the standard of the industry. The winner takes all. “Economies of Speed” is something worth mentioning here. So act, and act fast! If I were them, I would seek strong partners (like the big commodity trader or ship owners) to market on a global scale, to make the platform known by more professionals and to increase the platform value. A company in network economy instead of maximizing the company profit shall shift to maximize the network value (Armstrong & Hagel, 2000). Our advice answers to this argument. Give it a thought.

Our study begins with one quotation; it might as well end with another:

"*Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning."*

- *Winston Churchill*

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Appendices

I. Recent Chartering Transaction of Joinocean Shipbrokers

Vessel Name/deadweight	**Cargo**	**Route**	**Hire (usd)**
Mv xinxiangan 21k	iron ore	ex pasir gudang to Yangzhou	12 pmt
Mv kota berkata/17k	12000mts bagged fert	ex Qinzhou to coulomb	26.75 pmt
Mv comatce star/23k	22000mts coal	nakhodaka to jingtang	9.25pmt
Mv sh grace 30k	24200mts iron ore	Isabel to caofeidian	14.75pmt
Mv yulongling 32k	pig iron	1tct ex eci to Thailand	6000pd
Mv haiyu 27k	unknown	1tct ex nakhodaka to thailand	6150pd
Mv theoskepsti 50k	42000 mts fert	ex nantong to kandla	19.25 pmt
Mv xinxiangrui 22k	21000mts aggregate	Guangzhou to Singapore	8.5pmt
Mv glory 30k	18500coal	ex nakhodaka to jintang	12.5pmt
Mv comatce star 23k	22000 mts coal	ex nakhodka to qinhuangdao	11.5pmt
bk Champ 28k	27000 mts iron ore	ex dakar to china	37.5pmt
C 24k	19000 mts sbm	ex upriver to malaysia	53 pmt
Mv luxury 20K	20000 mts iron ore	ex isabel to caofeidian	15.15pmt
Lr Lily 30k	26000 mts iron	ex Kuantan to Jinzhou	13.75 pmt
Mv Xiazhiyuan 27k	21500 mts coal	ex Vladivostok to Qinhuangdao	11.1 pmt
Mv cmb yasimine 33k	steel product	1 tct ex Fareast to Se.Asia	6050 pd
Tan binh 36k	21500 general cgo	xinggang/haiphone and bakgkok	Lump-sum 380,000
Mv glory Hangzhou 20k	18500 mts coal	ex vladivostok to qinhuangdao	12.65 pmt
Mv long bright 37k	30000 mts coal	ex nakhodka to river port	9.5 pmt
Mv xiazhiyuan 27k	steel product	1tct ex nakhodka to se.Asia	5950 pd
Mv Cmb Edouard 32k	Steel product	I tct ex China to Se. Asia	8000 pd
Mv xinhaihe 17k	7000mts iron	ex Irene to Zhangjiagang	14 pmt
Mv s thai 8.6k	6000mts fertilizer	haiphong to ulsan	20 pmt
Mv spring nelson 8.4	6000 pet coke	ex tarjun to inchon	26 pmt
Mv sao kim 7k	6000 wbp	wbp ex jakarta to haiphone	26 pmt

II. Simulation Illustration (500 cargo Scenario)

	SHIP a	P value	Ship b	Cargo b	Trd	Elec	Trd	ele	Trd	Elec	Trd	Elec	Trd	Elec	Trd	Elec	Trd	Elec	Trd	Elec	Trd	Elec	Trd	Elec
1	0.246809	0.102765	0.26343	0.390798	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	0
2	0.311116	0.172478	0.334336	0.564433	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
3	0.61704	0.720793	0.953695	0.152186	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0.344912	0.21904	0.512535	0.543197	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
5	0.648191	0.770639	0.790626	0.370099	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1
6	0.252211	0.107683	0.313312	0.516701	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
7	0.644707	0.765324	0.95549	0.729431	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
8	0.3812	0.276255	0.381918	0.984564	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
9	0.441803	0.385531	0.03516	0.875015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0.353194	0.231465	0.328261	0.458638	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
11			0.299714	0.664693	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
12	0.828971		0.632471	0.801658	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
13	0.171029		0.374934	0.676648	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
499			0.133004	0.472234		0		0		0		1		0		0		0		0		0		0
500			0.428503	0.102289		0		0		0		0		0		0		0		0		0		0
					41	41	38	44	52	50	40	56	56	57	39	42	57	48	40	48	47	43	43	43

The 14th till 499th cargo and ship matching results are hidden.

III. Simulation Results (Averaging 10 Vessels of Successful Matching)

	250 AC results		475 AC Results		500 AC Results	
No. of results	Trdt	Elec	Trd	Elec	trdt	elec
1	27.1	26	41.3	46.1	50.7	45.4
2	25.5	23	35.3	39.3	53	45.9
3	26.5	26.4	48.1	46.7	50.4	50.9
4	26.4	26.7	46.1	48.8	48.1	49
5	25.2	25.5	46.6	50.4	51	45.3
6	25.5	25.5	48.2	47.1	49.4	47.3
7	23.5	23.7	48.9	50.9	45.5	46.5
8	22	23	46.7	48.7	48.2	45.8
9	25.3	21.4	47.6	48	52.3	40.8
10	25.8	21.3	47.4	46	50	46.5
11	25.5	24.2	47.9	48.4	55.3	48.3
12	25.7	22.2	48.7	49	49.1	49
13	26.7	22.3	46.9	47.8	47.9	45.2
14	25.6	24.5	44.2	47.5	51.9	44.5
15	27.3	23.8	48.6	47.7	52.9	46.8
16	26.3	25.4	42..2	45.6	47.2	45.3
17	23.6	24.6	46.7	45.3	49.1	47.7
18	23.1	22.9	47.3	52.8	49.1	44.6
19	25.2	26.3	47.9	48.3	48.6	43.5
20	30.2	25.6	44.5	43.1	46.2	46.1
21	25.9	21.9	46.1	46.7	47	49.7
22	23.3	21.7	43.6	44.9	45.9	46.2
23	27.7	23.1	44.7	44.9	52.4	46.8
24	29.9	24.7	48.3	50.3	44.2	50.8
25	24.3	26.6	46.1	47.9	54.9	41.3
26	23.8	23.8	48.6	47.4	50.4	46.6
27	24.9	25	48.7	52.3	52	48
28	23	27.1	45.8	48.4	46.6	47.8
29	20.7	24.6	47.5	47.5	44.3	46.1
30	22.3	25.9	44.4	50.5	46.3	47.5
31	25.7	24.5	44.5	43.6	47.2	47.8
32	24	24.8	48.1	47.3	47.8	46.9
33	23.7	27.8	49.2	49.8	48.5	49
34	25.6	23.2	52.6	51.1	52.3	45.7
35	26.2	25.2	49.3	51.2	56.1	49.8
36	23.5	23.3	49	52	55.4	44.3
37	29.1	24.5	45.9	44	47.9	42.9
38	24.4	24.1	46.1	49.1	50.1	43.8
39	26.1	24	52	51.2	46.6	45.7
40	23.7	24.3	47.4	48	53.9	47.7
41	24.5	25.8	44.4	43.2	50.1	46.8
42	24.9	28.3	47.2	48	50.2	43.5
43	25.8	24.4	44.6	47.5	50.7	47.8
44	26.1	24.5	44.6	47.2	47.9	47.3
45	24.1	20.9	49.7	50.1	49	46.7
46	23.9	28.2	45.9	44.7	46.5	44.7
47	26.1	24.9	50.1	47.1	47.9	47.6
48	24.4	22.7	43.2	43	43.8	45.1
49	21.2	27	43.7	46.2	46.6	47
50	26.3	25.1	44.2	46.6	51	47.3

IV. Email Requesting Interview (for the Case Study)

Dear Mr XX/ Ms XX,

I hope this email finds you well. We met at XX.

This is Cong, an international student from Erasmus University doing a M.Sc. in Maritime Economics and Logistics. Currently I am carrying out a study, which is also my graduation paper, on application of electronic intermediary in shipping business, a subject somehow largely neglected. I have deployed some models to see how electronic intermediary fits shipping and I am wondering if you have interest in participating in an interview? We can conduct this interview at site or so we can do this via telephone or Skype. All you need to do is to let me know a time and I will be there!

Background of the study: (attachment)

Some terms may be mentioned in our interview: (attachment)

I look forward to your reply. Thanks in advance.

Best regards,

C. Shen

V. Framework for the Interview (for the Case Study) and the Interviewee's Introduction

Prepare before interview					
Date	/2013	Was the interview recorded?	Yes/No	Anonymous	Yes/No
Company Name					
Address					
Who is interviewed (name and title)					
Interviewee's main involvement with shipping business					
Contact info					

"Interview"	
Mr or Ms **, Please tell us again your field of practice and years of experience in shipping or shipping peripheral business.	
Are you familiar with the concept of electronic intermediary? (If respondent is not familiar: Internet intermediaries bring together or facilitate transactions between third parties on the Internet. They give access to, host, transmit and index content, products and services originated by third parties on the Internet or provide Internet-based services to third parties (OECD, 2010).	
Do you know any electronic intermediary application to shipping business? If yes, do you use or have you experienced before any of those?	
And, what do you feel about the electronic intermediary you have experienced?	
News disperses information. Online Content delivery is also one of electronic intermediary (OECD, 2010). For online digital news provider, the strategy identified by some scholars is to set to become market-making intermediaries. Do you have strategies similar to that and what is the performance so far?	
The roles of intermediaries include: Aggregation, information searching and dispersion, pricing, matching and trust providing. What do you think in general the shipping electronic intermediary activities of your business have reflected (some of) these function?	
Trust issue is often mentioned as a theory under electronic environment: Do you think this is particularly the obstacle for adopting electronic intermediaries in shipping business, where personal relationship and pedigree have a lot to say? Does your company have some method to secure the trust in the electronic intermediation?	
We think electronic intermediaries can offset some of their weakness, compared with traditional market intermediaries, not only by lowering the searching cost and time but by expanding the information searching scope to reduce information asymmetry in the market. What intermediation that you think have empowered the key clients, say, big owners and charters, to get informed or to search in broader scope than what they could have achieved without? Which works best?	
Similarly, traditional market intermediaries have advantage in negotiation, knowhow, and expert advisor which are all very important in shipping business. We see some ship brokers have already combined their advantage with electronic application, a phenomena identified as re-intermediation. What do you think about it?	
Intermediary activity is a broad notion. There are many in shipping, but ship brokering is a one typical. There have been many efforts to disintermediate the brokerage business by bringing high technology into the area but hitherto, seldom success but	

rather failed triumph has been pronounced. What do you think it is the reason hampers that?	
Other open discuss; Q&A.	

Introduction of the Interviewees:

FPG
Financial Products Group

Marcus Jung	Partner at FPG Asset & Investment Management ("FPG AIM")
Mr Jung has more than 20 years of experience in finance, shipping and taxation field. He worked for ING Group, DVB Bank and now just started as the partner of FPG AIM, a Joint Venture with Financial Products Group Co. Ltd., Japan ("FPG", www.fpg.jp), eying on transactions in the transportation industry with a focus on shipping and aircrafts. Mr Jung also displays academic presence by guest lecturing in Denver University, USA and Erasmus University, the Netherlands, on ship finance subjects.	
Michiel Muller	Partner at FPG Asset & Investment Management Asia Pte. Ltd.
Mr Muller works in transport finance with FPG AIM as a partner. Before his current position, he was the Vice President of DVB Bank and also an associate in Fortis Group as a specialist in intermodal finance.	

Lloyd's Register

Dimitrios Chalas	Technical Helpdesk Surveyor at Lloyd's Register
Mr Chalas has been stationed in Middle East, Far East and now the U.K. for ship surveying and shipbuilding development projects. Mr Chalas holds an EMBA from Rutgers, The State University of New Jersey.	

Mitsubishi Corporation

Tony Tanaka	Chairman, Mitsubishi Hellas AEE
Mr Tanaka jointed Mitsubishi Corporation in 1980s and kicked off his shipping career in 1985. He has a wide range of expertise in chartering, shipbuilding, S&P, ship finance and project analysis. He has rotated around Mitsubishi global offices in London, Huston and now Athens. He chairs Mitsubishi Hellas AEE, with a main focus on shipping business.	
Maria Mylona	General Manager, Ship Dept., Mitsubishi Hellas AEE
Ms Mylona started her career with Mitsubishi Corporation and since then she dedicated herself to the ship business. She is an active business person with demonstrable strength in ship project analysis, business management and marketing, a strong and reputable name in the Greek shipping community.	

Leonard Opitz Stornes	Managing Director at NHST Media Group Asia
Mr Stornes has been the Managing Director of NHST Media Group Asia for more than 10 years. Before he was an IT researcher at University of Oslo. He holds an EMBA from Henley Business School and did the Advanced Management Program at Harvard Business School. He has both maritime and technical background with three publications.	
Pranjal Borkotoky	General Manager Sales - Asia Pacific at TradeWinds
Mr Borkotoky is consultative sales professional leading a team from the forefront in trade media industry with 15 years of experience. Prior to his current position, he was at Leaf Offshore and Getit.	
Rigzin Angdu	Team Manager at NHST Media Group-TradeWinds
Mr Angdu, with more than ten years of experience in the media industry, is a top performing sales professional with more than a decade of proven track record in the trade media industry. He holds a University degree from Delhi School of Economics. He has been with TradeWinds for more than 7 years.	