Ludvik Sjåvåg

Considering Alternative Strategies to Improve Synergies between Shipbroker and Ship Designer in Upstream Shipbuilding Activities

Master's thesis in Marine Technology
Supervisor: Stein Ove Erikstad
Co-supervisor: Per Olaf Brett
June 2022

Master's thesis

NTNU
Norwegian University of Science and Technology
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Kunnskap for en bedre verden

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Background

Shipping involves multiple stakeholders from various backgrounds and roles, such as ship designers, shipbuilders, shipowners, and shipbrokers. Recently, economic setbacks have challenged the worldwide ship newbuilding market and forced shipyards to reduce their capacity level or, in some cases, shut down. Such losses in competitiveness forces us to develop more competent and efficient transactional processes. Not only improved procedures to ship design, but also the underlying processes and interaction among relevant stakeholders.

Overall aim and focus

The overall objective of this thesis is to consider alternative strategic models and performance models in upstream shipbuilding project activities and assess how these affect the collaboration between shipbrokers and ship designers.

Scope and main activities

1. Provide a concise overview of relevant strategic literature to find promising theories and models.
2. Go through each of the most prominent stakeholders involved in ship newbuilding processes.
3. Review and describe strategic theories in more detail.
4. Proceed by choosing the most appropriate strategic concept(s) for the stakeholders described in (2).
5. Understand the shipbroker role by creating a high-level activity process breakdown to establish a reference model of the project-making process;
    a. Describe the process from the first contact with a customer to contract signing.
    b. Identify more details in the essential steps of the process.

6. Describe and compare the interaction between shipbrokers and ship designers based on (4) and the reference model from (5).

7. Propose, by expanding and exploring, alternative performance and activity models and discuss measures to improve the situation.

8. Develop a case study that describes shipbrokers' point of view;

    a. Assessment of a set of previous shipbroker-ship designer collaboration projects.

    b. Evaluation of the models from (5) and (7).

9. Discuss and conclude models developed.

Modus operandi

At NTNU, Professor Dr. Stein Ove Erikstad will be the responsible advisor.

Representing Ulstein International and NTNU, Professor Dr. Per Olaf Brett will be the co-supervisor.

Some of the MSc topics in this project can be associated with the *Design Re-Engineering and Automation for Marine Systems* (DREAMS*)* initiative. This implies participating in workshops and discussions outside NTNU.

The candidate will, as part of his methodology, work part time in Clarksons alongside writing the thesis.

The thesis should be organized in a rational manner to give a clear statement of assumptions, data, results, assessments, and conclusions. The text should be brief and to-the-point, with a clear language. Telegraphic language should be avoided.

In the thesis, the candidate shall present his personal contribution to the resolution of a problem within the scope of the thesis work.

The work shall follow the guidelines given by NTNU for the MSc Project work.

Deadline: June 11, 2022

Stein Ove Erikstad

Preface

This thesis marks the end of my five-year integrated Master of Science degree in Marine Technology with specialization in Marine Systems Design at the Norwegian University of Science and Technology. The topic was changed when transitioning from the preliminary *project thesis* to the master thesis itself. Therefore, the work in this report has been carried out through the 2022 spring semester solely, constituting 30 ECTS.

Alongside writing this thesis, I worked part-time in the newbuilding department at Clarksons' Oslo office. During the past years, I found the commercial aspects of the maritime industry more and more fascinating. Also, the shipbroking profession intrigued my interests. Accordingly, I sought to use this opportunity to learn more about the surprisingly inadequate documented occupation and relate it to my university background in ship design.

Oslo, June 11, 2022

Ludvik Sjåvåg

Acknowledgment

I am incredibly grateful for the completion of this master thesis, which would not have been possible without the support and assistance of the following;

My supervisor, Prof. Dr. Stein Ove Erikstad, for invaluable discussions and guidance throughout the semester and for inviting me to participate in the workshop in Ulsteinvik with traveling grants through the DREAMS project.

The participants in the DREAMS project. I want to thank Prof. Dr. Randi Lunnan for pointing me towards relevant literature on strategy, Dr. Jose Jorge Agis for helping me understand Ulstein International's business model, and Prof. Dr. Per Olaf Brett for sharing his extensive experience in previous collaborative projects with shipbrokers, in addition, to acting as my co-supervisor.

My Clarksons colleagues, for always showing an interest in my master thesis and respecting the time it takes and all the hard work required to make it. The people at Clarksons have provided me invaluable insight into how project-oriented shipbrokers work, and I gratefully acknowledge the effort of those persons who always answered all my questions.

Finally, I would like to thank my friends and family for giving me motivation to go the extra mile.

Abstract

This master thesis analyzes how we can identify a more effective interaction between shipbrokers and ship designers in upstream shipbuilding activities. We propose four research questions (RQs) that emphasize a thorough understanding of: 1) how project-oriented shipbrokers work in Project-Making Activities (PMAs), and 2) clarity about these activities in the industry's processes and value chain. We developed the results by combining literature, such as network theories and strategic business models, observations, and interviews. Because shipbuilding projects vary tremendously in terms of theme, time, complexity, uncertainty, risk, cost, and involvement, we do not limit our results by answering how to achieve a better synergy between shipbrokers and ship designers. Instead, we reveal a framework to comprehend how each stakeholder's strategic decision determines its interaction with the others, leading to a better or worse situation - a successful or failure project. This is done by addressing combinations of the three business models; value chain, value shop, and value network, between a shipbroker and ship designer. We demonstrate with this framework that understanding the difference among the actors and their roles is essential in adapting an actor's business strategy to surrounding stakeholders in PMAs. From a strategic perspective, our analysis suggests that if a shipbroker and ship designer align their strategy, they are more likely to create a positive synergistic relationship because they are aware of possible overlapping and complementary roles. Nevertheless, we also reveal that it is not that straightforward because ship designers and shipbrokers have fundamental differences in project optionality prerequisites. In addition, every shipbroker works differently, making the interaction highly relationship-based and challenging to model generic and conceptual.

Sammendrag

Denne masteroppgaven analyserer hvordan vi kan identifisere en mer effektiv interaksjon mellom skipsmeglere og skipsdesignere i oppstrøms skipsbyggingsaktiviteter. Vi foreslår fire forskningsspørsmål som legger til grunn en grundig forståelse av: 1) hvordan prosjektorienterte skipsmeglere jobber i prosjektdannende aktiviteter, og 2) klarhet rundt disse aktivitetene i industriens prosesser og verdikjede. Vi utviklet resultatene ved å kombinere litteratur, som nettverksteori og forretningsmodeller, observasjoner, og intervjuer. Fordi skipsbyggingsprosjekter varierer mye i form av tema, tid, kompleksitet, usikkerhet, risiko, kostnad, og involvering, avgrenser vi ikke oppgaven ved a svare konkret på hvordan man kan oppnå bedre synergi mellom skipsmeglere og skipsdesignere. I stedet introduserer vi et rammeverk for å forstå hvordan hver aktørs strategiske valg avgjør dens interaksjon med de andre, som kan enten føre til en bedre eller dårligere situasjon – et vellykket eller mislykket prosjekt. Dette gjøres ved a adressere kombinasjoner av de tre forretningsmodellene; verdikjede, verdiverksted, og verdinettverk, mellom en skipsmegler og en skipsdesigner. Vi demonstrerer med dette rammeverket at forståelse av forskjellen blant aktørene og deres roller er essensielt når man skal tilpasse sin strategi mot andre aktører i de prosjektdannede aktivitetene. Fra et strategisk perspektiv, foreslår vår analyse at dersom en skipsmegler og en skipsdesigner samkjører sine strategier, er det større sannsynlighet for å få et positivt synergistisk forhold, fordi de er klar over mulige overlappende og komplimenterende roller. Likevel avslører vi at det ikke er så lett å få til fordi skipsdesignere og skipsmeglere har fundamentale forskjeller i forutsetninger i valg av prosjekter. I tillegg jobber alle skipsmeglere forskjellig, noe som gjøre denne interaksjonen ekstremt relasjonsbasert og vanskelig å modellere generisk og konseptuelt.

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Abbreviations

BS Boundary Spanner.

CD Customized Design.

CODP Customer Order Decoupling Point.

CV Customized Vessel.

DREAMS Design Re-Engineering and Automation for Marine Systems.

ETO Engineer-to-Order.

GA General Arrangement.

HTV Heavy Transport Vessel.

PMA Project-Making Activity.

RQ Research Question.

SB Shipbroker.

SD Ship Designer.

SDP Strategic Decision Process.

SH Structural Hole.

SNA Social Network Analysis.

SO Shipowner.

SOV Service Operation Vessel.

SV Standardized Vessel.

SWT Strength of Weak Ties.

T&I Transport and Installation.

UDS Ulstein Design and Solutions.

Chapter 1

Introduction

The first chapter of this study details the background and motivation for the master thesis and lays the foundation for the rest of the paper. Chapter 1 identifies the thesis' system boundaries, including a literature overview of common and relevant research articles. Finally, it describes the complete structure of the report. Figure 1.1 depicts the high-level structure of the thesis.

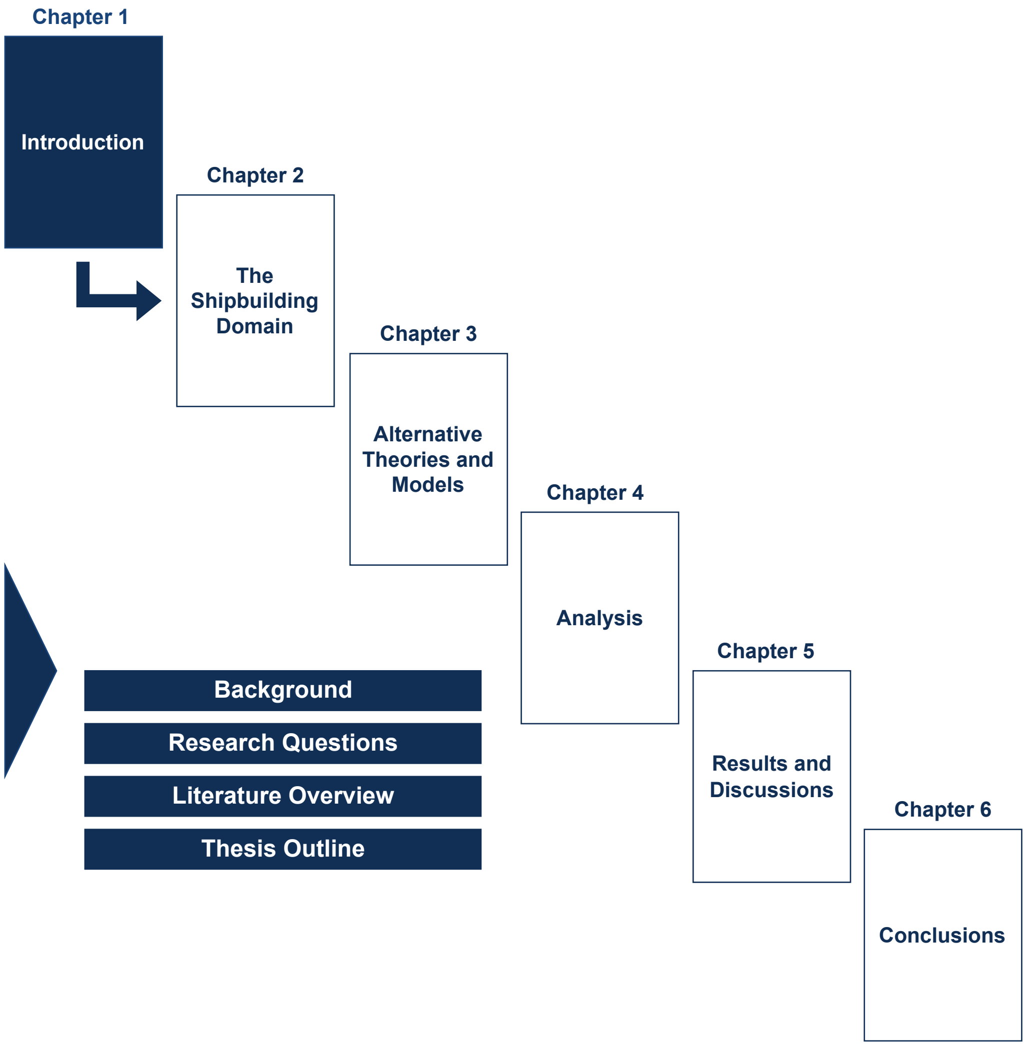


Figure 1.1: Thesis structure

1.1 Background

Shipping is complex, being a global industry involving many stakeholders and influencing variables. We identify the shipping markets as cyclic, where the cyclical fluctuations result from the constant balancing of supply and demand. Table 1.1 captures the ten most important factors related to the maritime economy, according to Stopford (2009).

Table 1.1: Most important variables influencing the shipping markets (Stopford 2009)

Demand	**Supply**
The world economy	World fleet
Seaborne commodity trades	Fleet productivity
Average haul	Shipbuilding production
Random shocks	Scrapping and losses
Transport costs	Freight revenue

On the demand side, all factors are economy-related, whereas the supply side is more affected by physical things like ships and the production of them. We have seen several economic crises during the past years. After the financial crisis in 2008, most shipping segments experienced falling rates, drop in prices, marginalized profits, and an overall plunge in the global newbuilding contract portfolio. While still recovering from that recession, the oil price collapsed in 2014, resulting in another setback for the worldwide economy, experiencing a huge decrease in vessel demand.

Such setbacks have made, among many, Norwegian ship designers and shipbuilders experience a substantial decline in recent years. This international and domestic activity slowdown is partly due to lower activity levels, but more fundamentally, lost *competitiveness*. Strengthening the competitiveness of Norwegian ship design firms requires improving the effectiveness, efficiency, and efficacy of their operations in product, process, and organization.

Ulstein and Brett (2015) argue that good ship design is not a matter of purely technical engineering activities. To reveal "what is a better ship?", they argue for the need to understand the interaction between technical-, operational-, and commercial aspects and consider them equally crucial in upstream and downstream shipbuilding activities. Shipbrokers are commercially driven people with a wide range of market intelligence and understanding. Although some research has investigated the shipbroker role, very few papers have focused on the more project-oriented brokers. For this reason, we call for a study on shipbuilding processes seen from the shipbroker's perspective.

The *Design Re-Engineering and Automation for Marine Systems* (DREAMS) research initiative was commissioned in 2021 to find out how to improve the competitiveness of the Norwegian-based ship design activities. Ship design activities consist of, among other things, developing the conceptual design, engineering and analysis, and execution to meet a set of requirements from the customer. Even though DREAMS focuses explicitly on the design activities to improve the operations in products, this thesis is hopefully a step in the right direction to also improve the operations in relation to its processes and organization of resources and knowledge to improve the situation.

1.2 Research Questions

This thesis recognizes and considers alternative strategic models in the development of shipbuilding activities seen from the shipbroker's point of view. To best approach the elucidation of this topic (Bell et al. 2022), we propose a set of Research Questions (RQs). The first RQ applies the shipbroker's "as is"-situation to Project-Making Activities (PMAs);

RQ1 What is a good reference model for shipbrokers' processes to develop and approach newbuilding projects?

We believe a reference model provides insight into how brokerage houses work on a general basis. However, their processes can, to a high degree, vary depending on, for instance, the project starting point, customer, market, and geographical location of design and building activities. To analyze the shipbroking processes, we must understand the underlying scene in different strategic models, particularly how these are carried out in real projects. On the other hand, some ship design companies have their strategy for business development in terms of PMAs. Overlapping activities between the involved parties are unnecessary, at least if such actions can be done by one side solely to the benefit of both parties. Thus, we develop a second RQ;

RQ2 What are the most essential actions to improve the synergies between shipbroker and ship designer?

To further explore and capture fundamental aspects of the thesis objectives, we extend the two main research questions above by identifying a set of sub-questions to be researched further;

RQ3 What is the best shipbroker role with respect to the ship design process?

RQ4 Which transaction documents are used between shipbroker and ship designer today? And which should be used to improve effectiveness of the newbuilding process?

Nevertheless, understanding the shipbroker role in PMA situations and its interaction with the ship designer, shipbuilder, and shipowner relies on breaking down the processes from the shipbroker's point of view and assessing them using appropriate strategic models. In answering the overall aim and corresponding RQs, a combination of qualitative research methodologies is utilized, where weekly exposure to shipbrokers, interviews, observations, workshops, and theorization procedures are means to achieve a proper empirical foundation.

1.3 Literature Overview

The literature below has been helpful as an underlying basis for the RQs and setting of the overall aim. The articles being reviewed in this section have provided a broader understanding of stakeholders' perspectives in PMAs, ranging from customers and brokers to designers and builders, and some essential strategic concepts. Including, but not limited to, the combined literature below sets the foundation for the rest of this thesis.

Strandenes (2000) is among the first to assess the shipbrokers' role and their contribution to market efficiency. Strandenes concludes with three points why brokers play an essential role in the shipping sector; shipbrokers reduce lead time, achieve more favorable ask/bid prices, and act as experts in the field. Moreover, she discovered that efficient search and matching is more desired in freight markets, particularly the spot market, where the transaction pace is high. Biglaiser (1993) describes agents in trade markets that deal with goods they do not own, called middlemen. Although not directly linked to the shipping market, he demonstrates that intermediaries can increase market efficiency by modeling the market from two perspectives, with and without intermediaries, to evaluate the highest earned welfare. The welfare gains are particularly present if there are significant differences in the quality of the sold goods. Biglaiser (1993) also indicates that markets with brokers might result in higher prices, but the quality of goods can also be higher. However, the follow-up article by Biglaiser and Friedman (1994) states that the total selling cost is expected to decrease with a go-between in the market because search costs are reduced, and the price premium firms typically charge to produce high-quality goods could be lowered. Other areas in finance have discovered convenience to use, or act as, an intermediary person. Shevchenko (2004) investigates the tradeoff between a store size that sells goods and its inventory cost to decide whether to act as a middleman or an agent producing goods to be traded. Regardless, the broker business is based on a very intimate relationship with customers. A recent master thesis by Skallist (2018) studies how shipbrokers behave to create and maintain interpersonal trust with their clients. Another master thesis by Svarstad and Dahl (2018) challenges the traditional shipbroker by arguing for the potential of digital platforms as promising match-makers in the shipping industry. Essentially, shipbrokers find themselves in primarily personal-related networks on a global scale.

Social Network theory has been used in various study fields. The research area became exponentially popular at this turn of the century, evolving from only focusing on social and behavioral science to other fields such as physics, biology, and management science (Borgatti and Halgin 2011). According to Wasserman and Faust (1994), the fundamental concepts of network analysis consist of actors, relational tie, dyad, triad, subgroup, group, relation, and network. Actors are social entities linked to each other through a relational tie, of which there are many types. While a dyad is a social tie between only two actors, a triad constitutes a subset of three actors and the apparent tie between them. Moreover, it makes sense to analyze and model the relationships among systems of actors. Such systems can either be subgroups or groups. The ultimate goal is to define the social network with all actors, groups, and relations and their interrelationships. Of the most renowned network theories we have *Strength of Weak Ties* (SWT) and *Structural Holes* (SH), proposed by Granovetter (1973) and Burt (1992), respectively. SWT is essentially arguing that weak ties promote innovation to a much higher degree than strong ties and that bridging ties between groups can only be weak. Granovetter uses the theory to argue that people with more weak ties are usually more successful (Borgatti and Halgin 2011). On the other side, Krackhardt et al. (2003) address the role of the "strength of strong ties". SH theory is about understanding the competition between actors when links have already been established either within a group cluster or between individuals in different clusters. A structural hole describes the areas where connections have failed to form between actors (Borgatti and Halgin 2011). Adding to the elementary components of network analysis, such as in Wasserman and Faust (1994), *boundary spanning* proves a crucial concept, which was already introduced by Tushman (1977). Long et al. (2013) takes the *boundary spanner* (BS) concept a step further by describing various kinds.

The Oxford Advanced Learner's Dictionary defines *strategy* as "a plan that is intended to achieve a particular purpose." The fundamental theory by Robert Anthony, where strategic decisions are being made at the top level and executed at the lower levels, clearly illustrates the underlying principles of all strategic models (Gorry and Morton 1989). However, since there exists no ideal position, we need strategy (Porter 1996). Casadesus-Masanell and Ricart (2010) propose a framework that distinguishes strategy, business model, and tactics. Essentially, there are multiple pathways to achieve the desired strategy; it all depends on the business model and how to execute the particular model. The framework coincides with Anthony's pyramidic framework. While there exist many paradigms of business models, we have mainly three models to describe a business; as a value chain (Porter 1985), as a value shop, and as a value network (Stabell and Fjeldstad 1998). Moreover, including business strategies, Zaefarian et al. (2013) address the business relationship in knowledge-intensive business. They argue that companies can enhance overall company performance and relationship performance by accurately aligning their relationship structure with their specific business strategy.

Shipbuilding activities are carried out in shipyards, which differ from traditional manufacturing systems. Activities taking place at a shipyard are influenced by facilities and available equipment, but both physical space and workers are necessities (Strandhagen et al. 2020). Iakymenko et al. (2019) increase awareness of Engineering Changes in shipbuilding projects with a focus on highly customized vessels produced in Norway. They describe a simplified shipbuilding supply chain consisting of design, engineering, production, procurement, commissioning, and after-sale. Moreover, they identify five aspects affecting Engineering Changes, where "coordination of ECs across multiple companies" results in higher iterations, hence a longer implementation time. Swahn et al. (2016) argue that understanding the cultural aspects, production characteristics, and performance are essential elements when deciding on production location because of different cultural characteristics. Haji-kazemi et al. (2015) categorize ship design and construction activities in the two domains of acquisition processes and production processes. The acquisition process consists of activities before production and induces an immense amount of information that needs to flow seamlessly across units, departments, and companies (Haji-kazemi et al. 2015).

Stakeholders perceive decisions differently, often to the frustration of the ship designer (Ulstein and Brett 2015). Ship design has evolved from a simple linear spiral approach (Evans 1959) to requiring sophisticated and profound methods described in Ross et al. (2008), Farid (2016), Singer et al. (2009), and Ulstein and Brett (2012), to name a few. The underlying principle is still iterative, following a *function-form* mapping to fulfill a set of customer needs (Erikstad n.d.; Farid 2016). Rhodes and Ross (2010) propose five essential aspects in complex systems engineering, namely structural, behavioral, contextual, temporal, and perceptual. These aspects are subjected to futuristic vessel uncertainty, a research area thoroughly described in recent years. Gaspar et al. (2012a,b) use, for instance, the Responsive System Comparison method to handle the five complexity aspects in conceptual ship design.

1.4 Thesis Outline

1.4.1 Limitations

In order to best meet the research objectives, we reduce the stakeholder interactions to evaluate the shipbroker and ship designer interface, seen from the shipbroker's standpoint. Figure 1.2 clearly reveals the essence of this thesis; the collaboration between shipbroker and ship designer. However, as the figure shows, the four main stakeholders must also be reviewed and anchored in the shipbuilding value chain. There are several different types of shipbrokers. However, in the remainder of this paper, we associate only newbuilding- and project-oriented brokers under the umbrella term *shipbroker*.

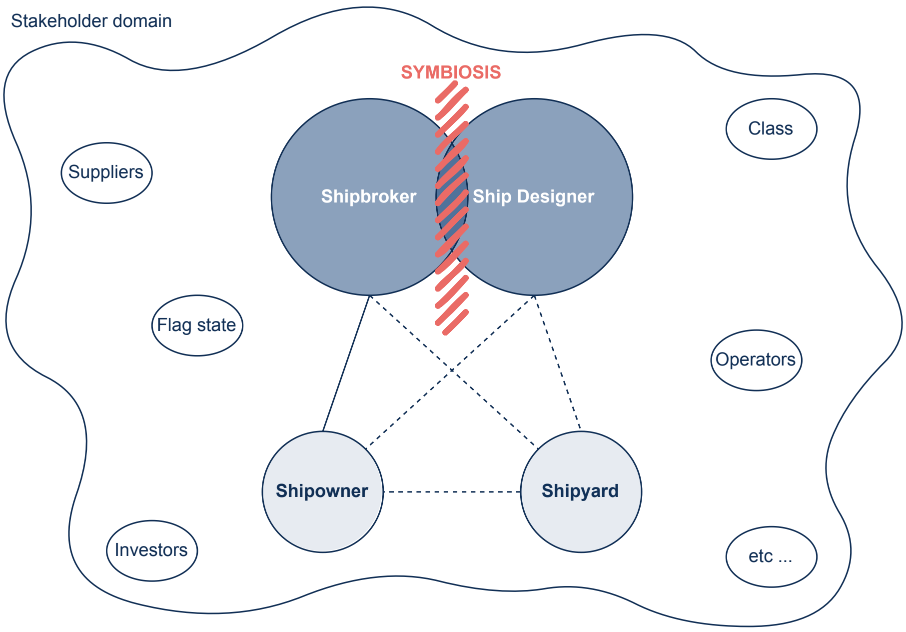


Figure 1.2: Thesis limitation in the shipbuilding stakeholder domain

Moreover, we explicitly set the system boundaries on specialized ship design processes, focusing on non-transport vessels. Not only because that is the essence of DREAMS, but because in international shipbuilding, the major shipyards have, in almost every case, their own standardized ship design they prefer to build. At the same time, it is crucial to distinguish the difference between international and domestic procedures. Internationally, it is common to treat "shipbuilding" as equipment manufacturing, ship design, and shipbuilding or system integration at the shipyard. In contrast, we distinguish and treat the three activities as separate but complementing in Norway.

1.4.2 Chapter Structure

In Figure 1.3, we see the interaction and structure between this report's six chapters. Chapter 1 sets the thesis system boundaries by mapping between identifying the problem, describing the problem, and understanding the problem. As a means to extend the introduction, Chapter 2 provides a more profound theoretical foundation to understand the main stakeholders and actors associated with shipbuilding projects. Chapter 3 provides an overview of strategic concepts and models, of which two theories stand out as promising frameworks to explore the shipbroker-ship designer interrelationship. Chapter 4 starts by describing and arguing for the chosen methodological approach before showing two case studies. Finally, Chapter 5 presents and discusses findings by combining all previous chapters before Chapter 6 concludes the report's essential discoveries.

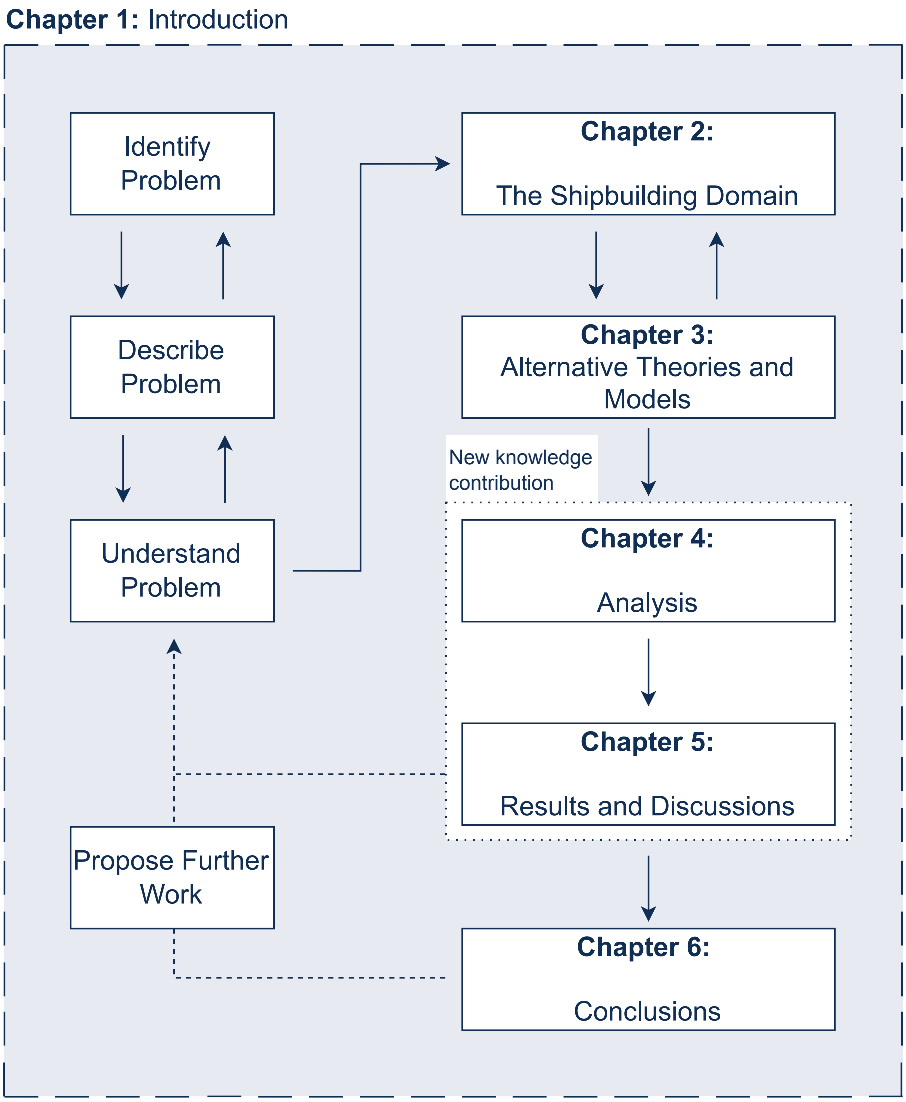


Figure 1.3: Nature of the thesis research approach and chapter interactions

Chapter 2

The Shipbuilding Domain

This chapter assesses relevant literature and background information and continues to establish a theoretical foundation from which a deeper understanding and clarification of the RQs can be found. The chapter describes the most prominent stakeholders involved in PMAs to ensure a proper understanding of what they do, how they do it, and with what strategy. Therefore, this chapter tries to isolate each stakeholder only to address each and one's core business.

2.1 The Shipbroker

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

Another definition by Plomaritou and Papadopoulos (2018) describes the shipbroker as "a person who acts on behalf, in the name of, and for the account of, one principal, either an owner or a charterer, and this is made known to all the parties concerned at an initial stage of discussions. In particular, brokers have informative, intermediary, consultative and co-ordinating functions along the transportation chain."

A third definition by Strandenes (2000) says "shipbrokers search, match agents and assist in the bargaining process between these agents. They also take care of formalities in the contract."

Although Plomaritou and Papadopoulos (2018) focus specifically on chartering brokers, the three definitions above agree that shipbrokers play an imperative role in efficient and smooth information flow in a rather complex business. Shipbrokers continuously update themselves with market intel, build and maintain close relationships with clients, and support projects and transactions wherever it is needed.

Skallist (2018) revealed that shipbrokers possess five out of ten "managerial behaviors that promote interpersonal trust" presented by Abrams et al. (2003). Moreover, Skallist disclosed six generic categories of shipbrokers' behavior, summarized in Table 2.1. When communicated to clients, these behaviors support the creation and maintenance of interpersonal trust and relationships. Abrams et al. (2003) say the two forms of interpersonal trust; "trust in a person's competence and in a person's benevolence," boost efficient knowledge creation and knowledge sharing in knowledge-sharing networks. The shipbrokers' primary function is to have an extensive network across the shipping markets to be able to as fast as possible search for the best solution, build and maintain their knowledge base, and propose innovative ideas to customers (Strandenes 2000). Thus, it is evident that shipbrokers rely on knowledge-sharing networks, where interpersonal trust is essential.

Table 2.1: Key shipbrokers' behavior (Skallist 2018)

Behavior	**Interpersonal Trust**
Trustworthy behavior	Acting with discretion
Emotion regulation	Ensuring frequent and rich communication
Proactive service performance	Engaging in collaborative communication
Customer orientation	Sharing personal information with clients
Market orientation	Give away something of value
Communication behaviour	Giving trust and good faith

There are several types of shipbrokers. While some are chartering oriented completing up to several deals per day, others focus on second-hand sales and purchase- and newbuilding projects, where securing deals usually takes much longer. These types of shipbrokers are present in every shipping market segment; for instance, in tank, container, bulk, gas, specialized products, offshore, commodities, and so on.

2.2 The Ship Designer

Pahl et al. (2007) refer to *designers* as development engineers and define them as people who "apply their scientific and engineering knowledge to the solution of technical problems, and then to optimize those solutions within the requirements and constraints set by material, technological, economic, legal, environmental, and human-related considerations." This means that system engineers handle problem-specific tasks ruled by a set of constraints.

Ship design is the perfect example of systems design. Papanikolaou (2014) distinguishes between scientists, designers, and engineers, but he says they have overlapping responsibilities and roles due to the difficulties of ship design processes. However, we typically refer to ship designers as engineers or naval architects in the maritime engineering community.

Ship design has evolved tremendously; from the time ships were used without knowing why or how they floated, to the traditional ship design, to more state-of-the-art design approaches. Traditional ship design is expressed as a spiral process, where the designer iterates until convergence. The design spiral was first introduced by Evans (1959) and has later shown up in different versions, for instance: (Erikstad n.d.; Levander 2012; Papanikolaou 2014; Ulstein and Brett 2012). It shows the design process as sequential and iterative. This design method is often referred to as Point-Based Design (Singer et al. 2009) since the designers propose, analyze, evaluate, and decide until the final design is reached. Explicitly, the spiral "effectively illustrates the sequential course of ship design through the various design steps, the repeating, iterative procedure for the determination of ship dimensions and of other properties, and, finally, the gradual approach to the final stage of detailed ship design" (Papanikolaou 2014).

There are many considerations to take in the design process. In particular, ship design is challenging because of its complexity and uncertainty. Rhodes and Ross (2010) propose five essential aspects of engineering complex systems, namely structural, behavioral, contextual, temporal, and perceptual, illustrated in Figure 2.1. The aspects range from the well-described function-form mapping in ship design to how different stakeholders perceive the decision-making process. A massive frustration for design companies is that shipowners and other stakeholders do not know precisely what they want (Ulstein and Brett 2015). This unclearness is related to the contextual-, temporal-, and perceptual aspects, i.e., factors influencing the traditional system ship design boundary as indicated in the figure.

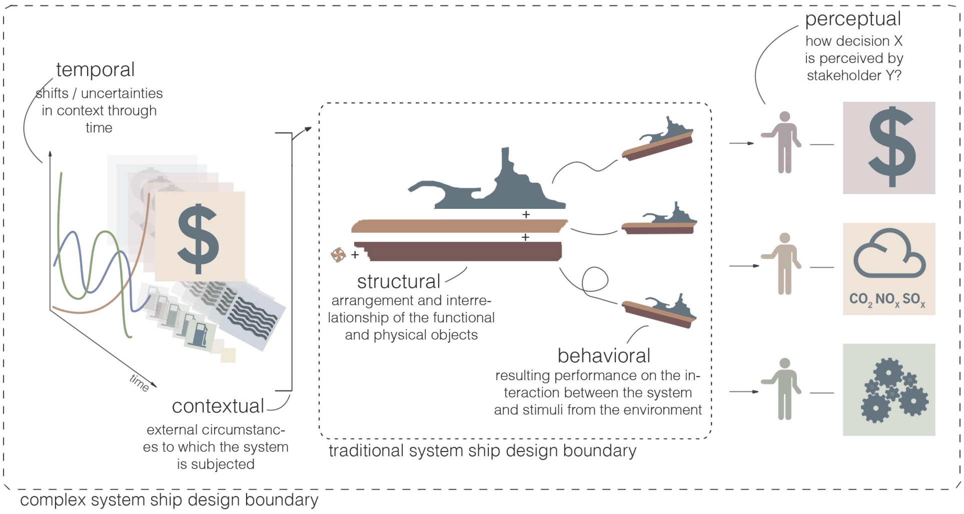


Figure 2.1: Five complexity aspects in ship design activities (Gaspar et al. (2012b), adapted from Rhodes and Ross (2010))

Systems engineering is extensively covered in the literature. The product development process for systems design approaches consists of a systematic design process. First, we must clarify the task through stakeholders' needs and requirements. After the task clarification is settled, the conceptual design phase determines the preliminary design(s) by mapping between the functional structure and the physical components. Then the designers establish a system specification layout based on the concepts in the next phase. Finally, we move to a detailed design phase, resulting in the specification of information (Pahl et al. 2007). System Based Ship Design (SBSD) is one example of identifying all systems needed to fulfill the mission(s) in the task clarification. In other words, the mission defines the design based on a functional description (Levander 2012). A more theoretical approach is described by Farid (2016) on how complex systems can be approached with Axiomatic Design. Axiomatic Design distinguishes itself from other systems engineering literature as it uses design axioms to guide the designer through the process. Decision-Based Engineering Design (Hazelrigg 1998) concentrates the engineering process as a decision-making process where problems and decisions are distinguished. Set-Based Design (Singer et al. 2009) is a newer concept replacing the traditional design spiral and Point-Based Design by eliminating (some of) the iterative process by postponing detailed specifications until trade-offs are better understood.

2.2.1 Domain Mapping

System-Based design methods systematically identify functions to fulfill a set of requirements. That is, a mapping between a functional and physical domain, referred to as the function-form mapping, which can be seen in Figure 2.2.

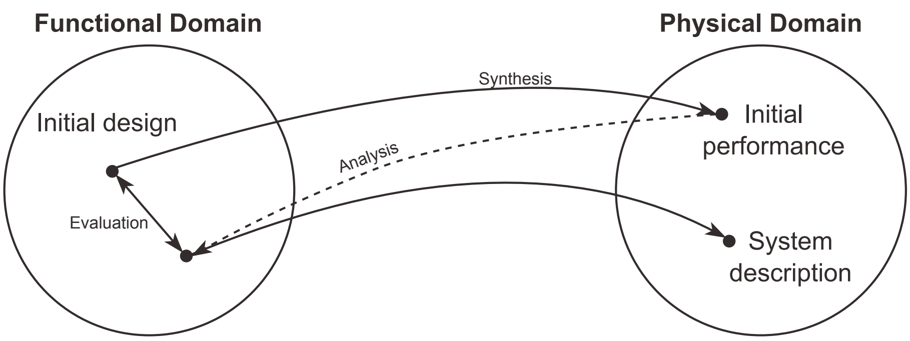


Figure 2.2: Function-form mapping between the functional and physical domain (adapted from Erikstad (n.d.))

From the Axiomatic Design perspective, the engineering design of systems consists of four domains, shown in Figure 2.3. In contrast to the function-form mapping in Figure 2.2, the axiomatic approach includes two additional domains, namely stakeholder requirements (SR) and process domain (PV). The mapping in both Figure 2.2 and Figure 2.3 can be described by *synthesis* and *analysis*. Synthesis describes a shift from left to right, going from "what needs to be achieved" to "how it is to be achieved". In contrast, analysis is the motion from right to left indicating the engineer's validation and verification (Farid 2016).

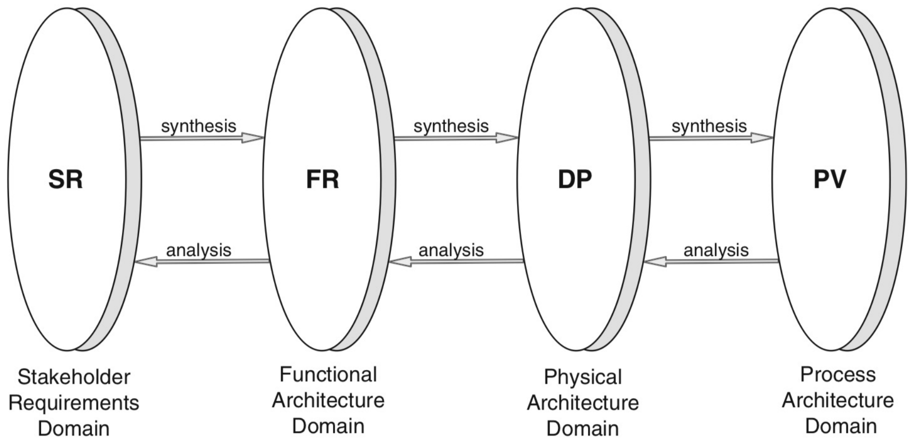


Figure 2.3: Four domains in the engineering axiomatic design perspective (Farid (2016), adapted from Suh (2001))

The domain mapping is fundamental in ship design *and* in any other engineering design practices. Even though it represents considerable back-and-forth movements, the mapping model(s) is representative of iterative-, sequential-, and parallel design methods.

2.3 The Shipbuilder

Shipbuilding requires facilities and equipment to produce ships. Many factors contribute to the process of shipbuilding, e.g.; what is to be done where?, when to do it and by who?, and with what resources?. Shipyards can choose different offshoring and outsourcing strategies. Offshoring in this context is, according to Semini et al. (2018), defined as ship production tasks carried out in a low-labor-cost country instead of a high-wage country. Another relevant question is which processes to perform within the organization and which to be performed by external suppliers, a term called outsourcing. Offshoring and outsourcing are at first sight similar, but one important distinction is that outsourcing is understood as work across organizational boundaries, while offshoring is work across geographical borders. Companies can have different levels of outsourcing. It is then called vertical integration.

2.3.1 Shipyard Newbuilding Strategies

The main stages in newbuilding production can be seen at the top of Figure 2.4. Based on the number of production stages offshored to a low-cost country before finished in a Norwegian yard, four strategies are introduced, ranging from complete Norwegian production to pure outfitting at the quay. Each of the four stages has its positive and negative sides. In strategy I all stages are performed in Norway. In strategy II some, or all, steel blocks are constructed and partly outfitted abroad in low-factor-cost country. The Norwegian yard then assembles the vessel. For strategy III the assembling of blocks is done abroad, and the yards are often called *hull yards*. The final strategy, strategy IV, is when a foreign yard assembles and outfits all the blocks into one ship. Remaining work is done from the quayside in a Norwegian yard. The different strategies have implications on flexibility, performance, costs, time, planning etc.

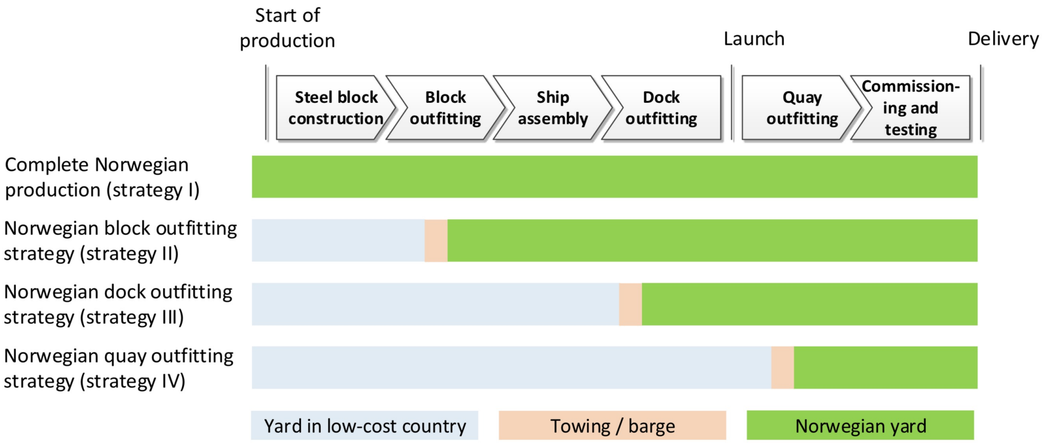


Figure 2.4: Four strategies for Norwegian shipbuilding (Semini et al. 2018)

2.4 The Supplier

Suppliers provide materials, ship systems, equipment, etc., to the shipyard. From the shipyard's perspective, different supplier relationships must be handled accordingly. For this, Peter Kraljic developed in 1983 a matrix for purchasing and supply management, which today is still the dominant approach (Gelderman and Van Weele 2003). The matrix is a simple 2 x 2-dimensional model classifying products based on profit impact and supply risk. We rank the products from low to high, resulting in the four categories; non-critical-, leverage-, bottleneck-, and strategic items. Figure 2.5 pictures the Kraljic-matrix's four domains; in the **non-critical items** there are normally many suppliers available, and the technology is well-established and straightforward. If one supplier fails to deliver, it is easy to find these items from other vendors. In **leverage items** there are also normally many suppliers available, and it should be relatively easy to find substitutes. However, in this category, the purchase volume, and hence profit impact, is more significant. So the focus should be on cost reduction. Suppliers have the market power for **bottleneck items** because of the complexity and high degree of customization related to the products. The supplier's technology is critical and might be unique. **Strategic items** are challenging to replace due to their complexity and customization combined with high purchase volume. Strategic alliances with suppliers are often the most clever move for such products.

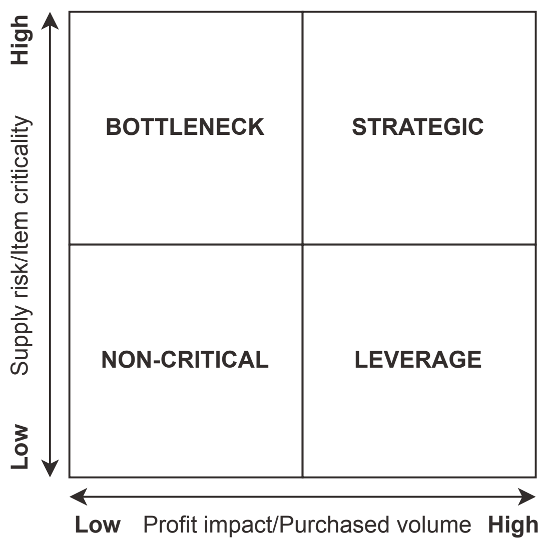


Figure 2.5: Kraljic's purchasing portfolio model (adapted from Gelderman and Van Weele (2003))

Through movements within the matrix, we identify various strategic directions. Gelderman and Van Weele (2003) distinguish two strategic approaches; 1) holding the same position and 2) actions to pursue other positions. Through three in-depth case studies on Dutch industrial firms, the authors also discovered that the overall business strategy is, among other factors, additional information required when developing portfolio-based strategies. That is an association with the top-level in Anthony's framework (Figure 3.1). For leverage items, the shipyard should focus on long-term contracts and try to develop strategic partnerships with relevant suppliers. You can consider investing in technology to reduce dependence risk for bottleneck items, but a perhaps smarter move for smaller shipyards is to accept the dependence. The yard should ideally, participate in joint ventures and strategic alliances in the strategic item category to develop trust and long-term partnerships with the vendors.

2.5 The Shipowner

For the remainder of this thesis, we understand the shipowner as the customer. The Customer Order Decoupling Point (CODP) is a way to distinguish market interaction strategies in manufacturing industries, such as shipbuilding (Semini et al. 2014). Production of complex vessels is commonly referred to as Engineer-to-Order (ETO) manufacturing, meaning the design process is initiated when the customer has placed an order. Moving the CODP more downstream means introducing the customer at a later stage in the manufacturing and design processes. Figure 2.6 presents four different customer interaction strategies from the designers' and builders' perspectives. In a more marginalized industry, relying solely on ETO can be challenging. Therefore, we commonly see most shipyards have more standardized designs to pursue a Make-to-Order strategy.

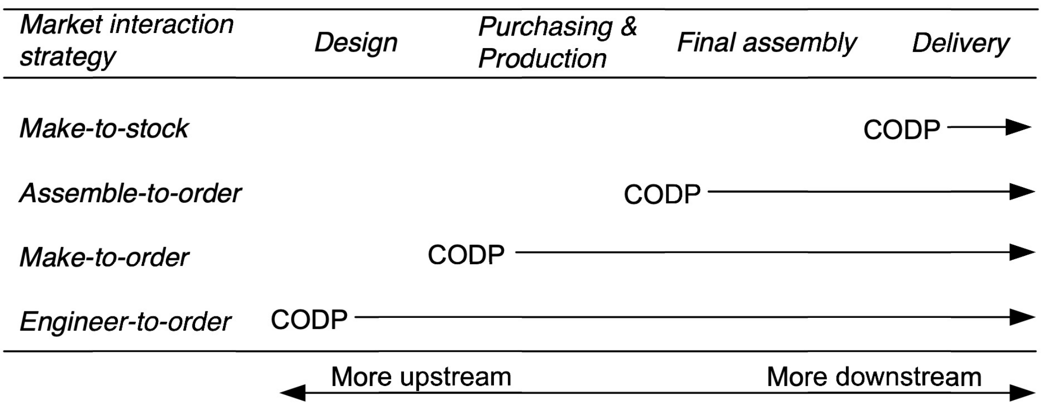
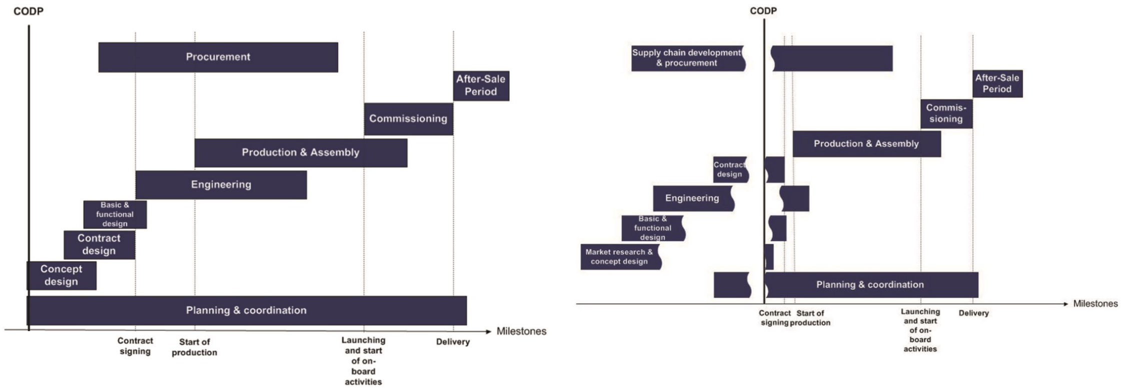


Figure 2.6: CODP and different market interaction strategies (Semini et al. (2014), adapted from Olhager (2003))

Agis et al. (2016) discuss the unintentional consequences of the golden era of the offshore oil and gas industry and how vessel design strategies must change following times of low demand. They highlight how a high oil price is the leading cause of higher-cost vessel design solutions, which in the current market are no longer competitive. It is also pinpointed that the industry must change from a "more is better" to a "good enough" practice, where standardization is mentioned. Through a shift in the CODP more downstream, we typically move from a Customized Vessel (CV) to a Standardized Vessel (SV), as depicted in Figure 2.7. The apparent distinction between Figure 2.7a and Figure 2.7b is the CODP placement. In the former, the shipowner is introduced at the beginning of the process and participates in every major ship-specific decision. This can be demanding for the designer (Ulstein and Brett 2015), not to mention time-consuming and costly. In the latter, many design activities are initiated before the shipowner is involved. Planning and coordination can, in some cases, also be started.



(a) Customized design (b) Standardized design

Figure 2.7: Shipbuilding activities and CODP (Semini et al. 2014)

Another essential distinction between the two strategies is that SVs require a high degree of standardization, e.g., a modular platform, which is challenging to achieve for complex engineering systems like ships (Erikstad 2019). Customized or standardized vessel design; *-itilities* such as flexibility, changeability, scalability, and agility should be included in ship design activities to ensure robustness to vessels meeting high market uncertainty (Pettersen et al. 2018). Rehn et al. (2018) address the tradeoff between two other *-itilities*, versatility and retrofittability, to achieve flexibility with findings indicating that retrofittability can increase the economic performance because of a relatively low up-front investment cost. In essence, achieving SVs is motivated by a reduction in lead time and risk, increased production efficiency, and the establishment of product catalogs. However, SVs risk being less optimized either in physical architecture or performance capacity (Erikstad 2009). Table 2.2 summarizes distinctive behaviors between CV and SV, where we see that CV is overall more complicated than SV.

Table 2.2: Strategy and typical product/market attributes relationship (adapted from Semini et al. (2014))

Market Attributes	**CV Strategy**	**SV Strategy**
Cost/price	Higher	More ships, lower unit cost
Lead time	Longer	Shorter
Delivery precision	Harder to achieve	Easier to achieve
Customization level	Higher	Lower
Variety	Higher	Lower
Standardization	Desirable, difficult to achieve	A must
Change in orders	Value offered to customer	Must be kept low
Number of components	Very high	High
Min volume requirements	One or two	Typically three or more
Order quality qualifiers	Lead time, on-time delivery, price	Lead time, on-time delivery
Order winners	Flexibility, product features	Price, product features

2.6 Value Chain Process

In shipbuilding projects, necessary activities consist of marketing and sales, concept design, contract negotiation, project planning, detailed design, engineering, procurement, fabrication, outfitting, and commissioning (Mello 2015). In Figure 2.8, these activities are separated by the main actors and linked to each other to describe the process workflow. The activities are divided into pre-contract and post-contract. According to Mello (2015), it all starts with the shipowner informally reaching out to the ship designer to reveal potential projects. Based on these discussions, the ship designer carries out an interactive tendering process to understand what aspects are necessary to include in the design to capture value for the customer. This initial tendering process includes contacting central equipment suppliers and the shipyards to get an opinion on initial costs, potential yard sloths, and overall technical specifications. These are all introduced to the shipowner as the bidding processes start. The shipowner might, something it usually does, involve several ship design companies to find the best vessel design. In other words, the ship designer could end up without a contract, although several hours were spent in the tendering process. When a contract is signed, the shipyard can start planning, and the troublesome coordination between ship designers, shipyard, and other suppliers starts.

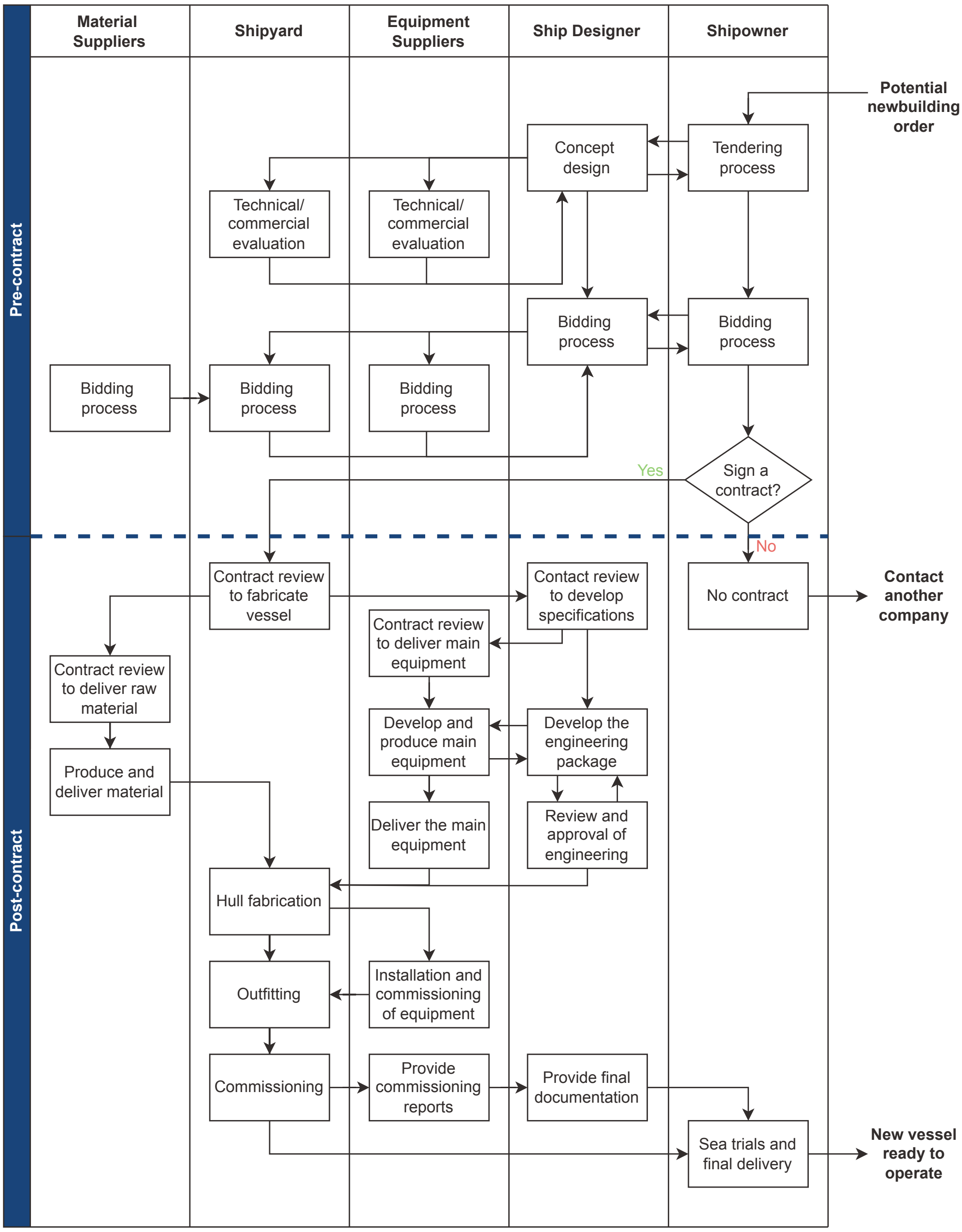


Figure 2.8: Pre- and post-contract workflow of the main shipbuilding processes (adapted from Mello (2015))

Mello et al. (2011) describe three loops in the generic shipbuilding project execution, namely tendering loop, engineering loop, and fabrication loop. They argue that Supply Chain Management must focus on the tie between these three loops to succeed, particularly the tendering/engineering link, because the tendering loop is where the customer needs are translated into the customer requirements (Erikstad n.d.; Farid 2016), laying the *vessel specification foundation*.

According to Hagen and Erikstad (2014), the upstream shipbuilding processes (PMAs) are divided into three categories;

(i) **Project development:** Activities consisting of developing a response to the tender request (the "Potential newbuilding order" in Figure 2.8) until all necessary documentation is completed and prepared for entering a contract.

(ii) **Design and engineering:** Activities consisting of developing, verifying, documenting, and communicating feasible technical solutions and information for the ship to be realized.

(iii) **Procurement and materials management:** Activities consisting of acquiring necessary components and materials, as well as making sure internal logistics are set for production.

In (i), from the shipyard's perspective, the most common is that a customer (or a shipbroker) issues a tender or asks for an offer quotation. However, this is highly dependent on several factors like; trade and commercial surroundings, risk, ship type, complexity and familiarity (series vs. one-off), customization degree (CV vs. SV), and customer relationship (Hagen 2021). In the project development phase, there are also various *project initiators*. Table 2.3, which is extended from Hagen (2021), presents some of the main cases.

Table 2.3: Initiations of ship newbuilding projects

Project Initiator (Indicated in **Bold**)	**When**
Owner → Ship designer → Yard	Common in Norwegian shipbuilding. Ship designer in control of design
Owner → Yard → Ship designer	Common in large-scale (SV) tonnage. Yard controls the design
Owner → Broker → Ship designer/Yard	"Common" in most segments. Broker influences design on behalf of owner (input)
Owner ↔ **Broker** → Ship designer/Yard	More unusual. Broker pitches idea to a long-lasting, close, and active client
Broker → Yard	Risk-taking, speculative brokers. Brokers become owner
Ship designer ↔ **Yard** → Broker/Customer	Common in large scale (SV) tonnage. Yard ha preferred designs/available time sloths

In parallel with developing a project, design (ii) is initiated. Figure 2.9 comprises the high-level overview of the design process, which consists of stakeholder interactions and its processes toward the final product. There might be several departments $D_1, ..., D_n$ within each stakeholder, for example, a commercial team, an operational team, and a technical team. All of these actors have different *motives*, although within the same company. Whereas the top management mainly cares about the financial aspects, the technical department is concerned with high-cost equipment to ensure the ship performs the best possible. Because of such opposing opinions, it is necessary to comprehend what each actor in each stakeholder *really wants*, e.g., by performing a thorough stakeholder analysis. The ship designer is mostly concerned with the customer, but the customer will most likely be more concerned with its customer, and so on.

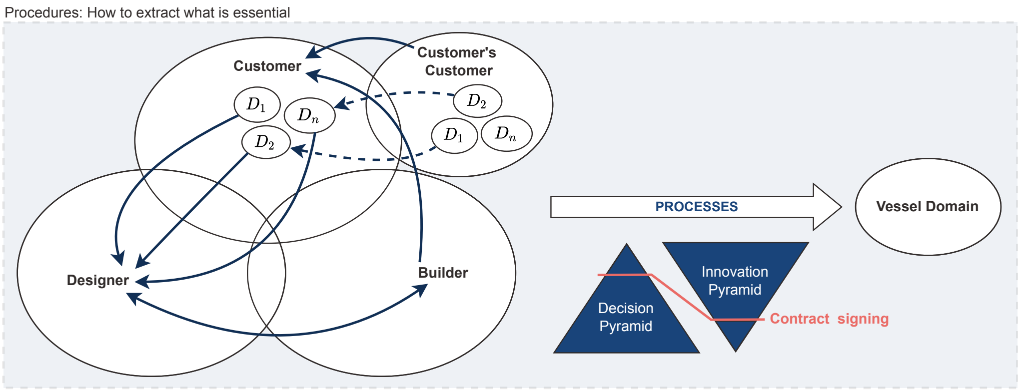


Figure 2.9: Stakeholder conflict in the decision-making process (adapted from Ulstein International, 2022)

The processes to reach the outcome, a ship that hopefully satisfies all interest parties, consist of many decisions being made. Design decisions are captured in the *Decision Pyramid*. Much like the fundamentals in Anthony's framework, the essential decisions are made at the top level - even before contract signing, indicated by the orange line in Figure 2.9. Before contract signing, the ship designers do everything to maintain a low-cost level. Like the shipbrokers, they usually work under "no cure no pay", which might become critical if the early design escalates. Interestingly, the ship designers spend the least time on the most influential decisions. Moreover, there exists a reversed pyramid, called *Innovation Pyramid*, which describes the pool of innovation, change, and potential new solutions. This domain is most significant at the point in which the ship designer meets the customer. As discussions begin, the opportunity room narrows down. Shipbrokers commonly use this document to collect and compare ship designs in a tender process.

The Decision- and Innovation Pyramid can be further broken down, as illustrated in Figure 2.10. The rightward object in the figure represents the pre- and post contract in the upstream activities, whereas the leftward entity pinpoints the corresponding focus areas. It is crucial to understand the market, particularly all the possible operation contexts. Once the market is thoroughly studied, the ship designer can start sketching the "large" concept perspective and gradually transit to the "small" concept perspective. The result is an *outline specification* marked by the small red drop. The outline specification is often a 100+ page document containing all the overall decisions, including main dimensions, cargo capacity, installed power, supplier list, etc. Appendix A describes the specification in more detail.

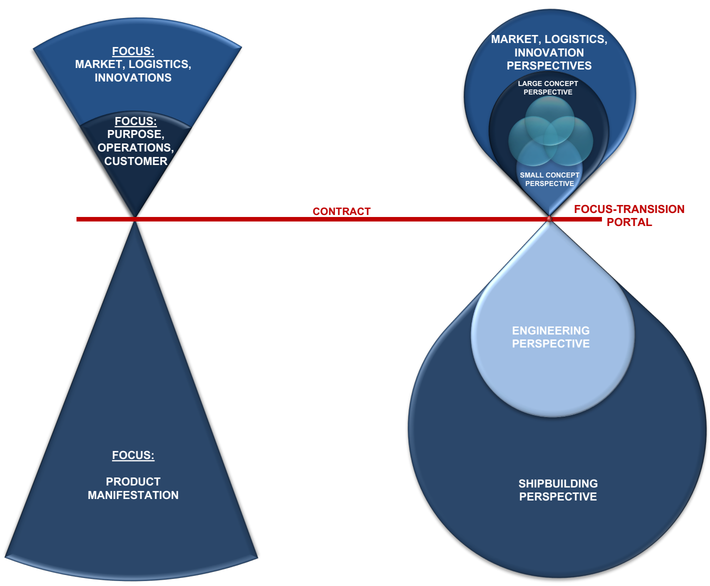


Figure 2.10: The pre- and post-contract signing design process (Ulstein International, 2022)

The Ansoff Matrix, first described by Ansoff et al. (1957), is practical to exemplify why the ship designer is subjected to less flexibility, than for instance shipbrokers, and thus have fewer options to choose projects freely. Figure 2.11 shows the Ansoff Matrix with products $P_1, ..., P_n$ and corresponding services $S_1, ..., S_n$. The matrix is a framework for strategic decisions that includes, in this context, which ship types and ship markets to focus on in the maritime industry. Position (2,1) (row, column) represents the easiest products in the designers' portfolio because they know both products and markets. There, the probability of success is greatest. On the contrary, position (1,2) represents the hardest position because both products and markets are unfamiliar. Nevertheless, although Ansoff primarily worked specifically on the product-market relation, it is important to highlight that behind product-market lay resources and activities. Therefore, under those circumstances a ship designer, or a shipbuilder, decides to design a new vessel in a foreign market; the person still has experience with the same tasks. I.e., designing a ship follows profoundly the same steps whether the designer has experience or not in the product-market domain.

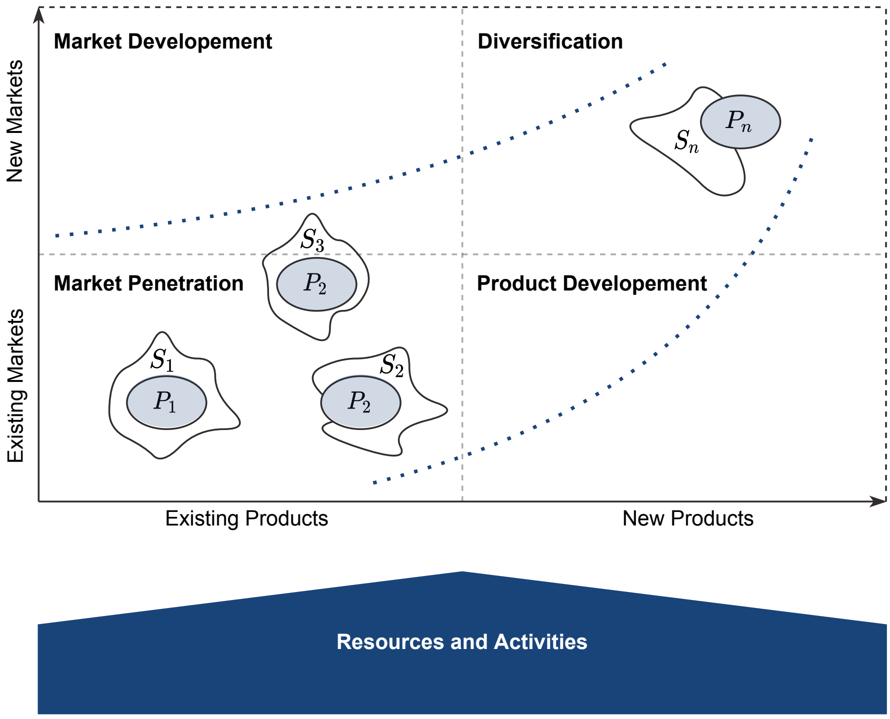


Figure 2.11: Ansoff Matrix for product-market diversification (based on Ansoff et al. (1957))

Chapter 3

Alternative Theories and Models

This chapter introduces several strategic concepts and theories rather than focusing solely on one approach. The alternative theories and models would traditionally be elaborated and learned in detail through a literature review in the project thesis. As an engineering student without being lectured on these concepts, it is therefore meaningful to bring out the relevant perspectives as the topic completely changed when transitioning from the project thesis to the master thesis. This chapter draws up alternatives that can also be rejected, which we discuss in the last section.

3.1 Business Models

Robert Anthony (Anthony 1965) believed organizations like a hierarchy of decision-making levels and proposed in 1965 a framework to help understand how decisions are made in an organization and aid decision-making in Management Information Systems (MIS). In the triangular-like model we find at the top strategic planning, followed by managerial- and operational control, as illustrated in Figure 3.1.

Figure 3.1: Illustration of Robert Anthony's Framework (adapted from Anthony (1965))

Essentially, Anthony's way of thinking suggests that the decisions are broad and essential at the top level. The scope covers goals and objectives for the organization as a whole. As we move downwards, the decisions become more precise. Management control can be understood as tactical planning and ensures that resources required to attain organizational objectives from the above level are used efficiently. At the bottom level, decisions have limited scope, and tasks are rather specific (Gorry and Morton 1989).

Anthony's triangle has been used in various applications. For instance, Shang and Seddon (2002) use the pyramid framework to develop and assess a methodology for the benefits of business managers' enterprise systems. Aurum and Wohlin (2003), on the other hand, combine organization-oriented macro models and process-oriented micro decision-making models to examine requirements engineering processes to illustrate the essential nature of decision-making in the engineering field.

The framework offers a hierarchical approach to decision-making such that MIS can classify existing information and provide the right level of information to specific personnel at a specific level for optimal management operations. However, the terminology provided can be somewhat misleading. All hierarchy stages consist of both planning and control. Nevertheless, this thesis aims to assess strategic models for relevant stakeholders in the shipbuilding domain. Hence, all levels are relevant for the remaining of this paper.

According to Porter (1996), *strategy* is the forming of a unique and advantageous standing that includes a set of activities. We need strategy because there is no one ideal position. Hence, an underlying goal is to have a framework to identify a valuable position. A company must therefore focus on core competencies and synergies between activities (Porter 1996). An organization's business strategy depends on its role, whether alone or inside a comprehensive network. Paulus-Rohmer et al. (2016) state that if a company is aware of this, it can adapt its business model to fit the surrounding ecosystem best possible.

Casadesus-Masanell and Ricart (2010) distinguish strategy, business model, and tactics; while strategy accounts for the overall direction of a company, it can choose different business models to get there. It is the business models that create value for the stakeholders. Tactics refer to the remaining options that come with the chosen business model. Moreover, Casadesus-Masanell and Ricart (2010) integrate the three abovementioned concepts in a two-stage process framework in which they in stage 1 choose the business model, and in stage 2 make tactical choices ruled by the chosen business model. In this way, they argue strategy and business model as related but different concepts. Paulus-Rohmer et al. (2016), on the other side, distinguish the tree concepts, to a much higher degree, as individual stages, demonstrated in Figure 3.2. Appendix C.1 gives a great example of applying business models for a ship designer.

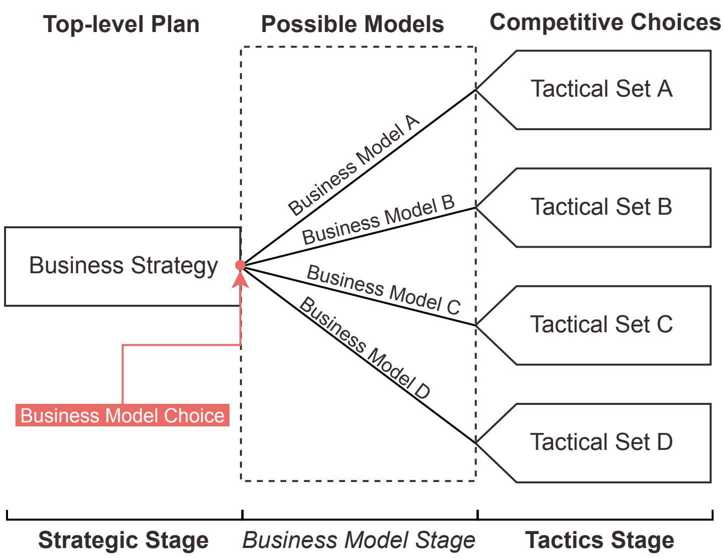


Figure 3.2: Relation between strategy, business model, and tactics (adapted from Paulus-Rohmer et al. (2016) and Casadesus-Masanell and Ricart (2010))

Value is created by performing a set of activities, which can vary tremendously. Companies have different structures depending on their services and which strategy they decide to use. Stabell and Fjeldstad (1998) properly defined the generic categories *value shops* and *value networks* by building on the long-linked, intensive, and mediating technologies topology by Thompson (1967). Furthermore, Porter (1985) described *value chains*. The three distinct value configuration models are valuable for analyzing managerial value creation decisions in terms of primary activity categories, cost- and value drivers, and strategic positioning options (Stabell and Fjeldstad 1998). Table 3.1 summarizes the main differences between value chain, value shop, and value network before we explore them respectively in more detail in section 3.1.1-3.1.3.

Table 3.1: Summary of the three value configuration business models (Harris and Burgman 2005; Stabell and Fjeldstad 1998)

	Value Chain	Value Shop	Value Network
Business problem	Transforming inputs into products (*Production-based*)	(Re)solving customer problems (*Idea-based*)	Linking customers directly and indirectly (*Relationship-based*)
Deliverables created	Products	Solutions	Service and opportunities
Business-logic method	Sequential	Cyclical, spiraling	Simultaneous, parallel
Value creation strategy	Achieve scale and focus on efficient capacity usage	Make optimal use of human capital	Achieve scale and focus on efficient and effective capacity usage
Activities	Inbound logistics	Problem finding	Network promotion
	Operations	Problem solving	Contract management
	Outbound logistics	Solution choice	Service provisioning
	Sales and marketing	Execution	Network infrastructure
	Service	Control/evaluation	

3.1.1 Value Chains

Porter (1985) is considered the number one source on value chains and configuration analysis for competitive advantage, where he says that all activities in a value chain contribute to buyer value. Figure 3.3 shows the value chain activities grouped into categories. The model consists of support activities and primary activities. The primary activities constitute ongoing production, marketing, delivery, and servicing, while the support activities make up the purchased inputs, technology, human resources, and other support functions to the company (Porter 1990). Moreover, the generic value chain model clearly illustrates the sequencing set of primary activities following the timeline of the value creation. The support activities are shown as layers to demonstrate the parallel execution of these activities and that they potentially apply to every primary activity. Finally, the margin arrow tells us that all parts in the value chain have an associated cost, which together produces value at the end in terms of a product (Stabell and Fjeldstad 1998).

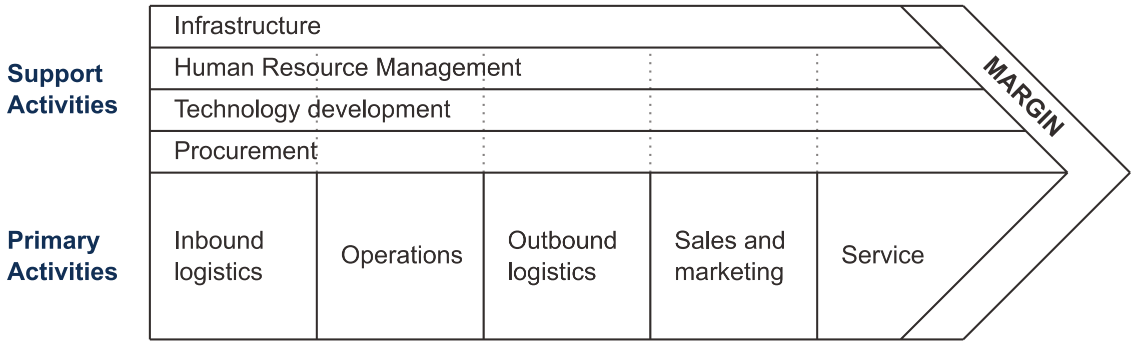


Figure 3.3: The value chain diagram (adapted from Porter (1985))

Altogether, Porter (1985) defines the generic activities in the value network diagram (Figure 3.3) as;

Primary activities (Porter 1985);

- Inbound logistics: “Activities associated with receiving, storing, and disseminating inputs to the product.”
- Operations: “Activities associated with transforming inputs into the final product form.”
- Outbound logistics: “Activities associated with collecting, storing, and physically distributing the product to buyers.”
- Sales and marketing: “Activities associated with providing a means by which buyers can purchase the product and inducing them to do so.”
- Service: “Activities associated with providing service to enhance or maintain the value of the product.”

Support activities (Porter 1985);

- Procurement: “Function of purchasing inputs used in the firm’s value chain, not to the purchased inputs themselves.”
- Technology development: “Range of activities that can be broadly grouped into efforts to improve the product and the process.”
- Human Resources Management: “Activities involved in the recruiting, hiring, training, development, and compensation of all types of personnel.”
- Firm infrastructure: ‘Activities including general management, planning, finance, accounting, legal, government affairs, and quality management.”

3.1.2 Value Shops

In value chains, value creation occurs by transforming inputs into products. However, value shops apply resources, schedule activities, and rely on intensive technologies (Thompson 1967) to solve customers’ problems (Stabell and Fjeldstad 1998). Moreover, Stabell and Fjeldstad (1998) use the “shop” metaphor due to the similarities between problem-solving firms and the way the shop of a mechanic repairs cars. Notably, the metaphor signals that “assembly and matching of both problems and problem-solving resources are important for the organization and management of the value shop” (Stabell and Fjeldstad 1998).

Figure 3.4 displays the value shop configuration. Identical to value chains, shops have the same support activities described above. On the contrary, the primary activities are quite different. Unlike the value chains' sequential nature, value shops are more cyclical. Explicitly, the interruptible activities demonstrate that if the chosen approach does not resolve the problem, a new round is initiated with new committed resources (Fjeldstad and Andersen 2003). In addition, shops do not produce products with the aim of economy of scale. They cannot standardize procedures to the same degree as chains because shops work on a case-by-case basis.

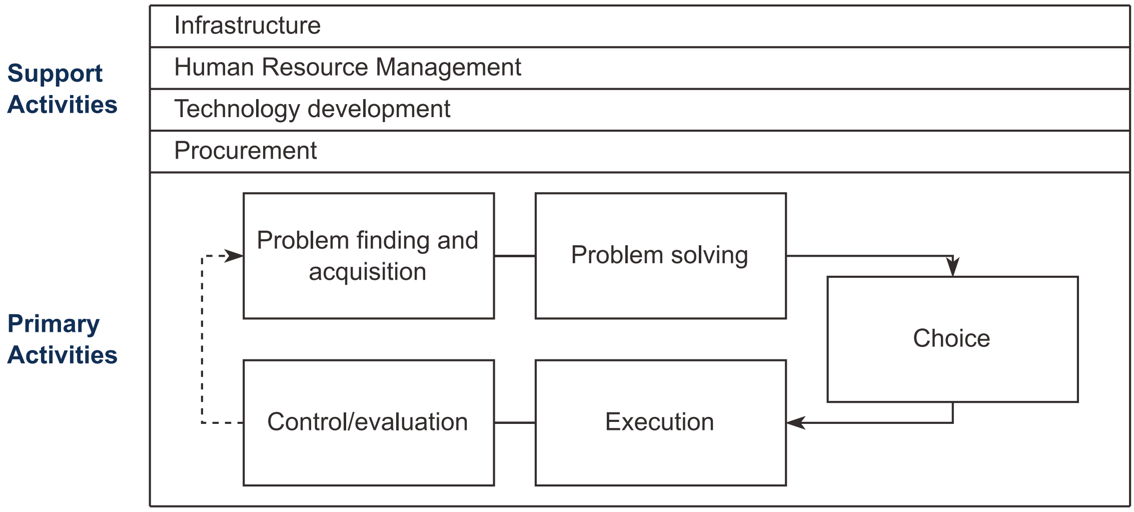


Figure 3.4: The value shop diagram (adapted from Stabell and Fjeldstad (1998))

From the value shop diagram, we observe five generic primary activities spiraling until satisfaction, which by Stabell and Fjeldstad (1998) are defined as;

- Problem finding and acquisition: "Activities associated with the recording, reviewing, and formulating of the problem to be solved and choosing the overall approach to solving the problem."
- Problem solving: "Activities associated with generating and evaluating alternative solutions."
- Choice: "Activities associated with choosing among alternative problem solutions."
- Execution: "Activities associated with communicating, organizing, and implementing the chosen solution."
- Control and evaluation: "Activities associated with measuring and evaluating to what extent implementation has solved the initial problem statement."

3.1.3 Value Networks

The value network relies on a mediating technology (Thompson 1967) and describes firms that "link clients or customers who are or wish to be interdependent" (Stabell and Fjeldstad 1998). The firm is not a network in itself, but it provides network services. Fjeldstad and Andersen (2003) describe value networks as companies that create value through the exchange of goods, information, and capital. Value networks distinguish from the two other business models in the way that there are no sequences between the activities. Activities are performed simultaneously, as indicated in Figure 3.5. The value network diagram also has the same support activities as the two abovementioned models.

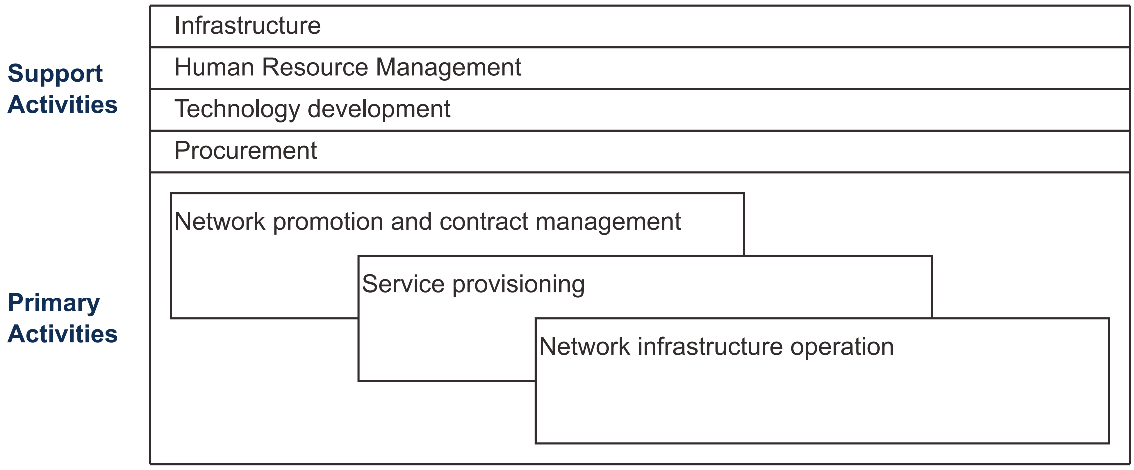


Figure 3.5: The value network diagram (adapted from Stabell and Fjeldstad (1998))

There are three generic elements in the network configuration model. Stabell and Fjeldstad (1998) define the three primary activities as;

- Network promotion and contract management: "Activities associated with inviting potential customers to join the network, selection of customers that are allowed to join, and the initialization, management, and termination of contracts governing service provisioning."
- Service provisioning: "Activities associated with establishing, maintaining, and terminating links between customers and billing for value received. The links can be synchronous as in telephone service, or asynchronous as in electronic mail service or banking. Billing requires measuring customers' use of network capacity both in volume and time."
- Network infrastructure operation: "Activities associated with maintaining and running a physical and information infrastructure. The activities keep the network in an alert status, ready to service customer requests."

The three business models; value chain, value shop, and value network, have different drivers of value appropriation. Drivers are the parameters of a product function as they affect productivity and value creation. Fjeldstad and Lunnan (2018) describes essential drivers behind each business model respectively; the (production-based) value chain's most important drivers are economy of scale, vertical integration, capacity utilization, internal and external interaction, localization and positioning, timing, and regulations. For the (idea-based) value shop, the essential drivers are reputation building, localization of activities with clients and partners, learning (across projects and clients), internal interaction, and external interaction of activities with clients and partners. The (relationship-based) value network's drivers are composition of the customer base, scale, and capacity utilization.

3.2 Strategic Decision Processes

Fjeldstad and Lunnan (2018) define a business' *vision* as the answer to "Where does it wish to be in the future?". As a response, the authors describe strategy to answer "How does the business get there?". Although there is no unique input to these questions, Strategic Decision Processes (SDPs) aim to support strategic decisions by systematically giving the organization direction, coordination, and integration. SDPs consist of three principal activities, summarized in Table 3.2.

Table 3.2: Three fundamental activities for Strategic Decision Processes (SDPs) (Fjeldstad and Lunnan 2018)

Activity	Notation	Description
Evaluation	E	Predict and consider futuristic uncertainty. This activity should capture circumstances in the surroundings that might affect the company in the future.
Planning	P	Develop alternatives on how we can effectively run the business in changing surroundings and choose among the alternatives.
Actions	A	Initiate chosen alternatives above. The aim for SDPs is to create strategic changes which represent a substantial change in priorities and overall goals.

The order in which the three activities are performed is not pre-determined, but depends on the SDP-type, of which there exist three; planning, emerging, and experimental. Strategic planning is when a business bases its strategy to develop resources and competencies it already posses. The plans provide organizational directions. The second SDP is emerging, which in essence is when the business bases its strategy to explore new opportunities and create new activities and resources. In most cases, the strategists are not fully informed about options, available actions and consequences, and stable and predictable environments, making it hard to implement the pre-formulated strategies. Therefore, it is better to make strategic choices on an ongoing basis. Experimental SDP is the last among the three and suits more unpredictable and fast-changing surroundings. The complete information necessary to create detailed plans is not fully available in such environments. Hence, we need to analyze and experiment (Fjeldstad and Lunnan 2018).

3.3 Corporate Strategy

Synergy is, according to the Oxford Advanced Learner's Dictionary; "the extra energy, power, success, etc., that is achieved by two or more people or companies working together, instead of on their own." In other words, business units in a corporation produce a combined effect more significant than the sum of their separate outcomes; $1 + 1 > 2$.

A corporation is understood as a cluster of organizations that are identified as a single unit by law. If a corporation wishes to succeed, synergy across the business units is crucial. Corporate-level strategy targets a single business' diversification to gain a competitive advantage by controlling a group of companies in different market products (Hitt et al. 2016). Moreover, there are four main categories of synergies, namely financial-, operational-, competitive-, and competence-based (Fjeldstad and Lunnan 2018);

1. **Financial synergies** are when a business unit gets money directly and internally through the group for investments. To be a synergy, the corporation needs to allocate assets better than external actors to achieve a higher return for the business unit. Financial synergies are seen in Table 3.3.

2. **Operational synergies** are accomplished through coordination between the operational departments of the company's value-creation activities, like procurement, production, logistics, HR, etc. An essential operational synergy is usually reached if different business areas share their core competencies. Operational synergies are summarized in Table 3.4.

3. **Competitive synergies** are reached because a unified corporation will most likely have a stronger market position than the business units have on their own. Negotiations and distribution are easier to conduct when businesses are cooperative.

4. **Competence-based synergies** result from the attractiveness of employees to work in a corporation rather than a small business because of more opportunities to self-realize. The overall effect is that the corporation will most likely attract better resources. The competitive and competence-based synergies are listed in Table 3.5.

Table 3.3: Financial synergies (Fjeldstad and Lunnan 2018)

Component	Analysis	Scale
Market risk	Corporation's business units follow different growth and market conditions. These balances each other to reduce the corporation's total risk	Insignificant - Significant
Optimize taxes, fees, currency	Unified business units reduce the corporation's expenditures like taxes and fees	Insignificant - Significant
Internal investments	Corporation can more optimally allocate investment funds because of improved understanding of futuristic results	Insignificant - Significant
Balance profits from promising units	Corporation's ability to balance its business unit portfolio to finance investments in new business opportunities	Insignificant - Significant

Table 3.4: Operational synergies (Fjeldstad and Lunnan 2018)

Component	Analysis	Scale
Shared services	Corporation can increase value and reduce costs by extract overlapping activities across business units	Insignificant - Significant
Vertical integration	Increase attractiveness and value / reduce costs by coordinating companies that supply and purchase from each other	Insignificant - Significant
Bundle	Increase attractiveness and value / reduce costs by coordinating companies that share the same customer(s)	Insignificant - Significant
Core competencies	Does the business areas share core technology? Has the knowledge progress in one area increased value in another?	Insignificant - Significant

Table 3.5: Competitive- and competence synergies (Fjeldstad and Lunnan 2018)

Component	Analysis	Scale
Competitive synergies	Does the company's bargaining power increase towards important actors by combining the business areas?	Insignificant - Significant
Competence synergies	Do the employees view the company as more attractive?	Insignificant - Significant

Through the various synergies in Table 3.3-3.5, we achieve an essential foundation in order to analyze potential actions to take. Figure 3.6 provides a disciplined approach to achieving synergy that supports the administration to gain wisdom and avoid frustration (Goold and Campbell 1998). The first action is to calculate the synergy value. More exploration is necessary if the corporation's potential of realizing the synergy is unclear. However, if it is small, they should not pursue the synergy. The subsequent actions consist of evaluating different opportunities and then selecting the intervention that fits the synergy type and the corporation's resources.

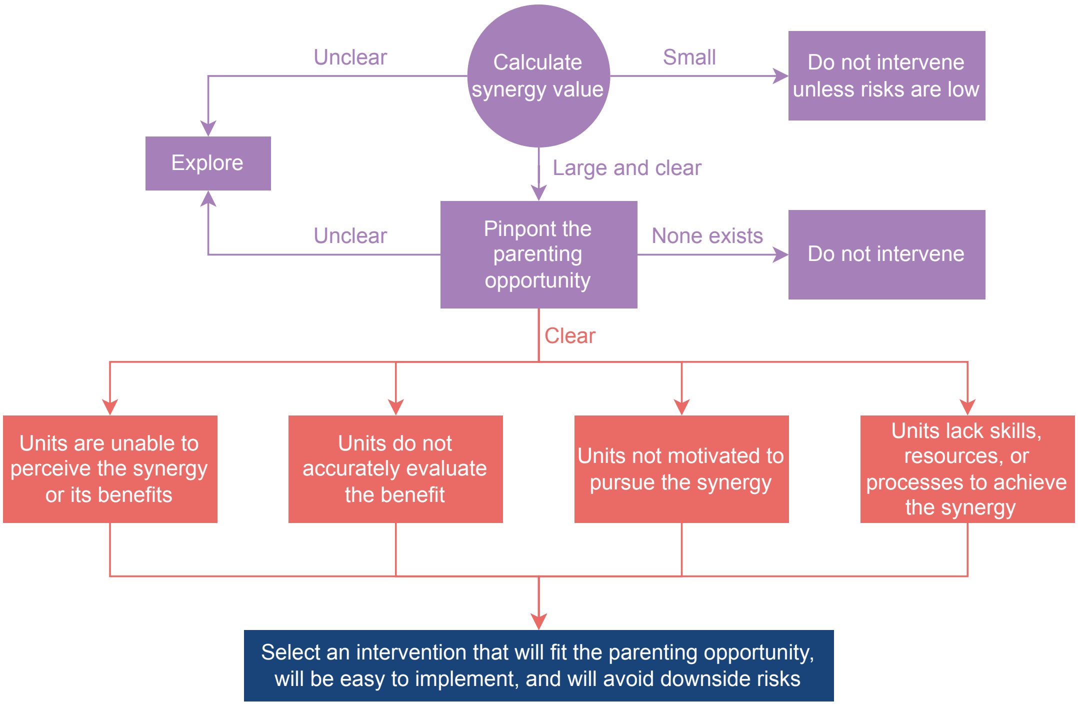


Figure 3.6: A disciplined approach to synergy (adapted from Fjeldstad and Lunnan (2018) and Goold and Campbell (1998))

3.4 Social Network Analysis

Every market consists of a set of independent companies that interact with each other (Fjeldstad and Lunnan 2018). The companies work towards a common goal, whether linked together or not, namely creating value for their customers. Since the shipping markets are particularly complex with fluctuating dynamics and many stakeholders involved, it is crucial to analyze the network and understand strategies to develop and maintain relationships.

3.4.1 The Four Markets

There are essentially four different market types; perfect competition is characterized by many small businesses with no control of their prices due to identical products and low entry barriers. On the other side of the spectrum, there is monopoly. In a monopoly, there is one firm, and due to very high entry barriers, it has control over prices. In between the two extremes, we find monopolistic competition and oligopolies. Monopolistic competition is a market with many small businesses and remote barriers to entry. The products are similar but not identical. On the other hand, oligopolies are markets with few large companies characterized by more considerable entry barriers (Coiacetto 2006). Table 3.6 summarizes and exemplifies the four markets.

Table 3.6: The four economic markets and their characteristics

	Market	**Entry barriers**	**Example**
$\uparrow^{+}$	Perfect competition	Low	Apple farmers
Number of	Monopolistic competition	Slight	Clothing Stores
companies	Oligopoly	High	Car Manufacturers
$\downarrow_{1}$	Monopoly	Enormous	Railways

Some scholars have studied the shipping markets and their position in the markets mentioned above. Sys (2009) investigated the container liner shipping industry and uncovered the segment as an oligopolistic market. However, she found that the degree of oligopoly depends on the trade lane. Haralambides (1996) focused on the bulk shipping segment, arguing the segment more towards a perfectly competitive market because of the similar tonnage and operational characteristics. Precisely placing the maritime markets in one of the four generic markets is problematic. Stopford (2009) characterizes the sea transport demand in shipping as a complex industry "and the conditions which govern its operations in one sector do not necessarily apply to another; it might even, for some purposes, be better regarded as a group of related business." There are so many more influencing factors (Table 1.1) in the shipping industry compared to, for instance, the car industry.

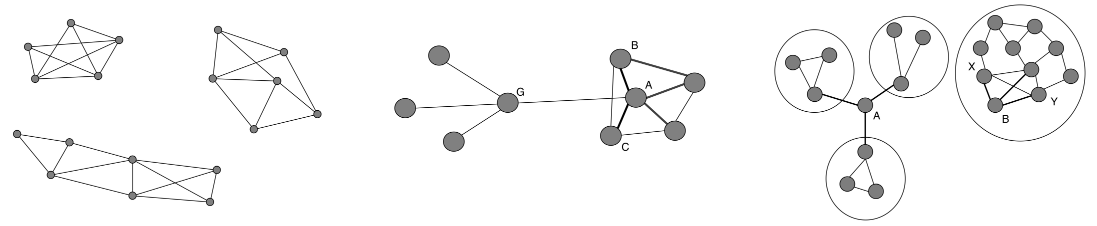
The differences between monopolies and perfect competition markets are transparent, but distinguishing between monopolistic competition and oligopolies is more challenging. As both markets sell relatively matching products, the firms in such markets have a certain degree of control of the prices. But how do companies in oligopolies compete? For instance, an Audi costs about the same as a BMW, and neither of the two producers gains much by continuously decreasing prices to bump up car sales. They, therefore, compete without changing the price; a term in the financial world known as *non-price competition* (Symeonidis 2000). To make the strategic best decisions, the firms can use game theory.

3.4.2 Network Theories

Research on Social Network Analysis (SNA) has rapidly grown in the last decade as the world has constantly globalized. There are numerous distinct networks. Borgatti and Halgin (2011) define a network as a set of "actors or nodes along with a set of ties of a specified type (such as friendship) that link them", and describe SNA as a way of characterizing network structures. Fjeldstad and Lunnan (2018) identify a network as *actors* and the *relation* between them. An actor can be an individual, a group, or a company, whereas the relations can vary from personal relationships, transactions, associations, memberships, activities, physical connections, formal relationships, or family (Wasserman and Faust 1994). However, networks do not necessarily have to be connected, as illustrated in Figure 3.7a. Among the more well-known network theories, we have *Strength of Weak Ties* (Granovetter 1973) and *Structural Holes Theory* (Burt 1992) which possess different characteristics;

The Strength of Weak Ties (SWT) theory by Granovetter (1973) is about the strength of interpersonal ties, which Granovetter defines as the "combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie." The idea of SWT is straightforward. Firstly; if two arbitrarily individuals, A and B, have a strong tie, and a third individual, C, has a strong tie with B, then A and C will most likely have a weak tie (Borgatti and Halgin 2011). In other words, since A and B are overlapping, and B and C are overlapping, the chances are high that A and C will overlap. Secondly; *bridging ties*, ties connecting an individual to someone outside their existing links, are potential origins of inventive concepts. Figure 3.7b provides an example of a bridging tie between the arbitrary node A and G, where node A holds the highest benefit as it is the only one in its social group that receives outside information; from G.

Structural Holes (SHs) theory described by Burt (1992) captures "how competition works when players have established relationships with others." In the theorization, Burt argues that *holes*, i.e., disconnections between players in a market, enable us to understand the results of competitive behavior in an area. The theory features cluster networks as illustrated in Figure 3.7c. Although A and B have the same number of ties linked to them, SH theory argues that node A has the advantage of receiving more novel and nonredundant information (Borgatti and Halgin 2011). The information B receives from node Y is likely to contain the same sort of information received from node X because they are interconnected in the same pool. Node A acts as a brokerage between clusters, which according to Burt, can be an amplifier for creativity and a power tool as it acts as an information gatekeeper. In the illustrative example, there are more SHs in A's network than in node B's; links have "failed to form" to a much higher degree for A's cluster than B's.



(a) Network with three components (b) Bridging tie from A to G (c) Two cases of structural holes

Figure 3.7: Network illustrations (Borgatti and Halgin 2011)

In essence, Burt (1992) mentions how the benefits of being involved in a network in a competitive arena manifests in three forms; access, timing, and referrals. Table 3.7 summarizes the value of information in a network with SHs. There seems to be a consensus in social science and Social Network Theory that being involved in networks increases opportunities and benefits.

Table 3.7: Value of information in network theory (Burt 1992)

Information Form	**Description**
Access	Receiving a piece of valuable information and knowing who can use it
Timing	Having the right information at the right time, often as early as possible
Referrals	Personal contacts provide significant information to you before the average person does

Another elementary concept in network theory is the boundary spanner (BS) role. Tushman (1977) introduces the BSs' function to link an internal network in an organization to external information sources, which he argues to be an important information processing mechanism in an innovation process. Long et al. (2013) distinguish between boundary spanner, bridge, and broker. A boundary spanner "bridges the structural hole between two clusters conceptualized as being separated by a boundary of some sort, e.g. outside the network or department." The bridge bridges the SHs between two clusters, whereas the broker is an intermediate between two unlinked actors, or clusters (Long et al. 2013). Although, intuitively similar terms, Long et al. (2013) highlight their respective motivation. The BS facilitates information flow, whereas the broker facilitates some transaction. Appendix C.2 and C.3 provide material for better understanding these theories.

3.5 Stakeholder Optionality

Real options represent a type of flexibility, first used in the financial world (Black and Scholes 1973; Cox et al. 1979; Merton 1973). In finance, the most obvious example of an option is to have the right to buy or sell a stock without being *obligated* to do so. However, real options have since extended its area of use. For instance, in the engineering domain, Neufville (2003) proposes real options analysis as a means to change the design of an engineering system. Nembhard and Aktan (2010) assess real options in a great variety of fields, including binomial lattice in manufacturing operations, flexibility in engineering design, and real option models for outsourcing. In real options analysis, specifically on a system level, we can differentiate between real options "in" or "on" projects. "Real options "on" projects refer to the standard real options treating the physical systems as a "black box," in contrast with real options "in" systems that concern design features built into the project or system" (Rehn 2018; Wang and Neufville 2005). Table 3.8 shows the main characteristic differences between real options categories, as described by Pettersen in his master thesis.

Table 3.8: Difference between real options "in" and "on" projects (Pettersen 2015)

"In" Options	**"On" Options**
Path-dependent	Path-independent
Less endogenous	More endogenous
Flexible system components	Flexible investment decisions
Requires technical understanding	Technology is a "black box"

Real options has also a natural place in the strategic domain. Strategy is simply about handling a portfolio of real options (Luehrman 1998), and this allocation of options provides managerial flexibility for which projects to pursue (Trigeorgis 1996). Trigeorgis and Reuer (2017) model the real options life cycle depicted in Figure 3.8. They specify four basic life cycle stages. The first stage is to identify hidden options, that is, opportunities. The second stage consists of acquiring more knowledge about the options discovered in the first stage. Thus, we need to gather more information about the opportunities. In stage three, we manage and develop the real options. Finally, in stage four, the real option is exercised. From the figure, we observe the sequential nature of the four stages, leading up to the three choices; whether to continue, discontinue, or change strategy.

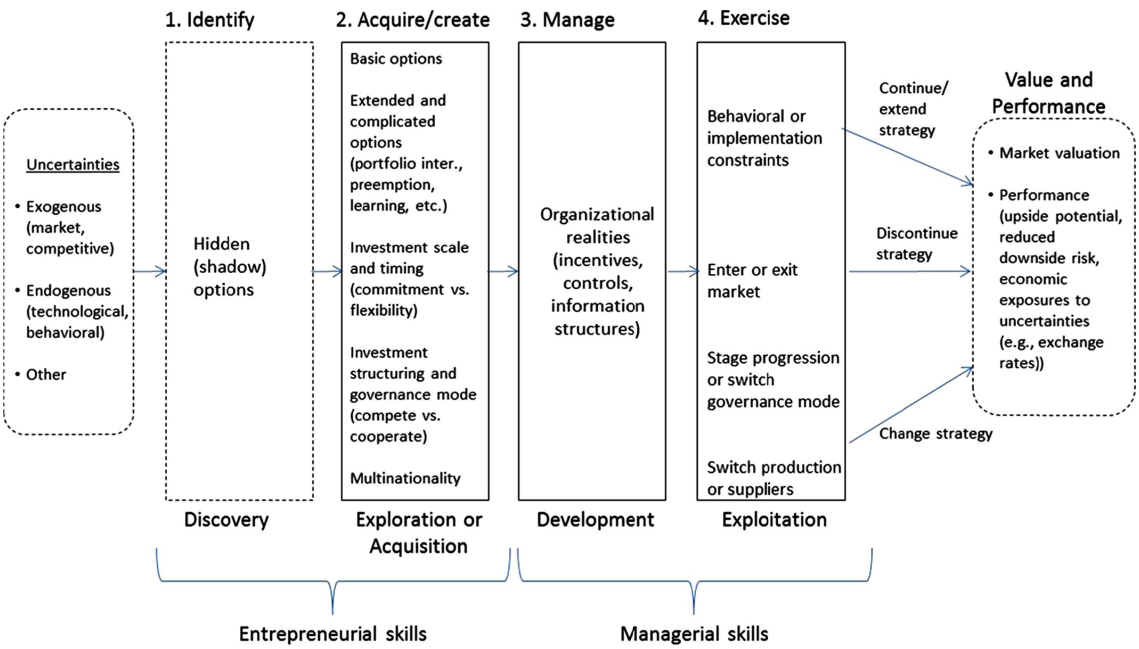


Figure 3.8: Four stages of real options (Trigeorgis and Reuer 2017)

3.6 Chosen Theory

This chapter touches upon many theories, frameworks, and models to help make the most appropriate model choice for the remaining thesis. In finding, describing, and reviewing the various model-based approaches, it became clear that business model theory and network theories are the most relevant concepts to support and enhance the understanding of how to achieve the thesis' overall aim. First of all, the three value configurations: value chain, value shop, and value network (Porter 1985; Stabell and Fjeldstad 1998) are fundamental models to describe precisely how a firm is creating value. Interestingly, they also provide a relevant framework to understand the *roles* each *actor* can have in the PMAs. For instance, a ship designer can be modeled as a value chain or a value shop, depending on its role in the upstream shipbuilding activities. On the other side, a shipbroker can be modeled as a value shop and value network. To explain, analyze, and discuss these two examples, then understanding the underlying business models is crucial. Second, it is prominent that the shipbroker's core activity is handling information. Fundamental network theories (Burt 1992; Granovetter 1973) provide the appropriate views in understanding the stakeholder interactions, roles, structural holes, trust, relationships, and positions. Social network theories are especially helpful in understanding the shipbroker's role. Although corporate strategies helped understand how synergies can be achieved between cooperating entities, the theory was a mismatch to the stakeholder interactions as they are independent actors, not firms under the same group. The other models contribute to a good background understanding of the main literature and are therefore included in this chapter.

Chapter 4

Analysis

The Oxford Advanced Learner's Dictionary defines research as "a careful study of a subject, especially in order to discover new facts or information about it." In general, master theses bring *something* new to the table through case studies. This chapter describes the methodological approach in more detail and provides two case studies portraying two broker-designer-specific projects seen from a shipbroker's perspective.

4.1 Methodology

It is essential to understand why we conduct research. Kothari (2004) groups four research objectives as a means to answer undiscovered truths in the scientific world;

1. To gain familiarity with a phenomenon or to achieve new insights into it (called exploratory or formulative research studies).
2. To portray accurately the characteristics of a particular individual, situation or a group (known as descriptive research studies).
3. To determine the frequency with which something occurs or with which it is associated with something else (known as diagnostic research studies).
4. To test a hypothesis of a causal relationship between variables (known as hypothesis-testing research studies).

Although knowing the objectives of research is essential, it is equally important to have a clear overview of which types of research exist. Research applies to a great variety of areas. Kothari (2004) summarizes the main types of research as four opposing pairs;

(i) **Descriptive** vs. **Analytical**
Descriptive research includes distinct sorts of surveys and fact-finding questionings to describe the present situation.
Analytical research involves analysis of already available information and knowledge to make a critical evaluation of the material.

(ii) **Applied** vs. **Fundamental**
Applied research aspires to find a solution for an immediate practical problem either in society or in a business organization.
Fundamental research is essentially about generalizations and formulations of theories, meaning it targets information with a broad base of applications by adding existing scientific knowledge.

(iii) **Quantitative** vs. **Qualitative**
Quantitative research is based on measurements of quantity measurements and analysis of phenomena expressable through an amount.
Qualitative research is non-quantity-based and is concerned with phenomena involving quality or kind. It is especially important in behavioral science.

(iv) **Conceptual** vs. **Empirical**
Conceptual research is related to some abstract idea(s) or theory. It has its roots in early philosophers trying to develop new concepts or build on existing ones.
Empirical research relies on observations and experience alone, often without considering any form of theorization. Like quantitative research, empirical is data-based, but one central distinction is that it must be capable of being verified by experiment.

In addition to the abovementioned, Kothari (2004) describes (v) "some other types of research," which essentially are variations of one or more of (i) to (iv).

The research strategy in this master thesis is a combination of descriptive research and qualitative research methods. The lack of already available information, at least on shipbrokers and their role in PMAs, made it difficult to pursue an analytical research approach. In this case, quantitative research is also problematic to choose in the unknown terrain of shipbroking literature. Furthermore, observing shipbrokers in their natural environment for a longer period of time, performing a specific case interview with a shipbroker, and collaborating in workshops with a multidisciplinary team consisting of ship designers, industry partners, and academia, provided great combinations and sources of "empirical" background.

4.1.1 Observations

Ethnography is a term described by Bell et al. (2022) which involves watching, listening, and asking questions to a specific group of people. Ethnography is a time-consuming research strategy because the researcher has to inhabit a social world over an extended period of time. Still, it can be highly effective in business strategy research if the goal is to gain perspicuity about a particular context or to understand procedures better (Saunders et al. 2009).

From the initiation of this master thesis to its completion, the researcher worked in a paid part-time position three times a week in the shipbroking house *Clarksons*. During this period, the researcher worked at the newbuilding desk in the shipping department learning the procedures, participating in meetings and presentations, working on individual tasks, and doing additional assignments the other shipbrokers asked for. In the beginning, it was interesting to see the amount of information received, sent, and forwarded via email to both clients *and* internal colleagues. As more people entered the office due to the relaxed local Covid-19 restrictions, the researcher observed an increasing number of shipbrokers constantly speaking on the phone. At one moment they were discussing business, but they also had personal phone calls every so often. Moreover, some of the researcher's tasks included systematically comparing design proposals for various vessel types and benchmarking offers and quotations from different shipyards on multiple projects. Being exposed to the shipbroking community to see how they work on a weekly basis was invaluable for the completion of this thesis. Although the observations from January until June were not "strictly" observations scientifically grounded, they were systematically collected and processed in the way of answering the thesis RQs, and hence became a valuable scientific tool (Kothari 2004).

4.1.2 Interview

In addition to all the observations, the researcher intended to perform several interviews to further build on what was observed to gather more specific, reliable, and valid data (Saunders et al. 2009). The researcher approached three specific shipbrokers, asking if they had stories, experiences, or descriptions of previous broker-designer interactions. Of the three, only one had the time to be interviewed. This shipbroker proposed several cases the researcher could include in this thesis, but narrowed them down to two specifics. The two cases formed the basis of this thesis' case study. The primary purpose of the interviews was to describe existing projects where shipbrokers and ship designers have worked together to get a clearer picture of how projects are typically carried out when shipbrokers are present.

The interview was executed in a closed and private meeting room. Firstly, the participant was informed about confidentiality, privacy, and anonymity. The shipbroker was already informed about the interview's topic, but it was explained again. Moreover, a recorder was started, and the participant was reminded about the ability to cancel the interview at any time. The interview was made up of both precise and open-ended questions following an interview guide, seen in Appendix B, which means that the interview was, in one way, a *structured interview*. In contrast, the open-ended questions supported thoughtful answers and flexibility by the participant, the opposite term named *unstructured interviews* (Kothari 2004).

4.1.3 Workshops

A third essential aspect of the researcher's methodology was participating in DREAMS workshops. The "main" workshop was a three-day session at the end of February 2022, where the DREAMS participants were invited to ship designer and shipyard *Ulstein* in Ulsteinvik. At Ulstein, ship designers held presentations about the difficulties and challenges of genuinely meeting customer needs. Moreover, we were given a guided tour through the yard facility to understand logistical aspects better and how various shipyard strategies could be implemented.

4.1.4 Research Background and Procedures

This above-described *inductive research design* methodology is towards the more unusual procedures. In the early stages of creating the thesis objective, we found it challenging to develop hypotheses that could be tested. In addition to the minimal publicly available material on the shipbroker role, the researcher and his supervisor found out that having a descriptive and qualitative analysis would be the best approach for the researcher to learn more about the shipbroking profession. Therefore, the part-time job at Clarksons was an essential part of the methodology. Another paramount aspect of the method was to be included in the DREAMS project, providing invaluable discussions with ship designers, employees at a shipyard, and a multidisciplinary team of professors, co-students, and other people from the industry. Although the empirical foundation is not the best, the researcher tried, to his best ability, to use the opportunity to self-experience the shipbroking community *and* ship designer community and apply those experiences in combination with fundamental theories.

4.2 Case Study 1: HTV for Offshore Wind Components

The first project presented is an ongoing shipbroker-initiated newbuilding business case. The process started with Clarksons' Transport and Installation (T&I) team in Aberdeen. The department, part of the Renewables team, helps clients with the logistics of offshore wind foundations and turbines in and out of so-called Marshall Ports. This includes bringing the components into the ports and onto installation vessels. The T&I team realized that the supply of vessels transporting wind foundations and turbines, Heavy Transport Vessels (HTVs), would not be able to cope with the ever-growing demand in the offshore wind sector. In other words, there is going to be a massive shortage of such vessels. The T&I team, therefore, reached out and shared its ideas to both potential shipowners and shipyards about the prospect in this particular segment. They were met by great enthusiasm and interested owners and builder, but no real customers with financing in place. Some wanted to stand by and wait, while others wished to enter the market with a beforehand contract. Then the newbuilding shipbrokers from Clarksons' Oslo office were involved in the discussions on whether to pursue the opportunities or not. Up until this point, there were no public tenders or specific contracts in the market, meaning if the shipbrokers decided to continue with the T&I team's ideas, it would be "on speculation" that the market would in the future need those vessels. It is not uncommon to see shipowners contracting vessels on speculation. The shipbrokers did decide to create a business case, and internal meetings were immediately initiated about which ship designers to approach.

However, the shipbrokers knew that ship designer Ulstein Design and Solutions (UDS) obtained an already completed HTV design. Both parties knew each other well, so when the shipbrokers approached UDS, the ship designer wanted to be a part of the project. The shipbrokers made minor changes to the design to optimize it according to their expectations to what fits the market best. The changes included adding duel fuel methanol as propulsion and changing some of the main parameters to be able to transport the newest (and biggest) foundations. Such changes were essential in developing the project for the shipbrokers. This way, they can tell the customers that they had contributed to optimizing the vessel design. It was essential to highlight that the shipbrokers participated in perfecting the design. There were no severe issues between Clarksons and UDS during the design phase because the ship designer understood the shipbrokers' intention. For instance, there was a consensus that methanol duel fuel was the easiest, cheapest, and most reasonable solution without any heavy analyses.

Currently, the shipbrokers are getting quotations and price offerings on the conceptualized ship design they finished with UDS from about 20 shipyards in Asia. In the meantime, they made a list of ten plus potential shipowners they plan to approach. The list consists of already close clients and customers they have never conducted business with. Once all the yards have responded, the shipbrokers can update and finalize the business case and then present it to the customers on the list. The presentations will consist of a combination of the vessel itself but, more importantly, a thorough market update made by the analysis team in Clarksons.

In the very early stages of this project, the Clarksons shipbrokers approached a particular shipowner, which coincidently was working on an, more or less, exact vessel type. They were a perfect match and decided to collaborate. However, the shipowner did not want to use the UDS design because they had already initiated dialogues with another ship designer. As a result of the "main" project, the shipbrokers discovered another project opportunity they could pursue in parallel. The new ship designer was personally familiar with the shipbrokers and trusted them, which made it easier for them to enter a collaboration with the shipowner. Moreover, the shipbrokers did not disclose or use the UDS vessel design directly in the "new" project. They wanted to keep it professional and show seriousness on behalf of UDS in the case of potential futuristic projects cooperation.

Essentially, Case study 1 can be summarized in six findings;

1. Brokers' T&I team identified market opportunity for more HTVs.
2. Discussions between chartering- and newbuilding teams led to agreeing to price up a vessel concept to bring to a selection of owners. "Ready to order" concept to maximize the chance of success.
3. The shipbrokers identified UDS as the most appropriate designer due to the familiarity with the heavy transportation market in Central Europe and already established concept design.
4. Optimized the vessel somewhat to match the brokers' perception of expected market demand, primarily dimensions of wind turbine components.
5. UDS prepared an updated concept design on a no-cost basis which the brokers brought to shipyards for pricing.
6. Parallel discussions with potential owners and investors led to a parallel track with an owner wanting a different design in a slightly different market.

4.3 Case Study 2: SOV for Offshore Wind

The second case study describes a project that started with a close and well-established client of Clarksons. The two had been working on multiple projects earlier. The technical principal in the shipping company is related to one of the people in Clarksons leading the offshore wind venture. The shipowners were interested in entering a new market segment with Service Operation Vessels (SOVs), ships they did not already have in their fleet. Together with their analysts, the shipbrokers made presentations about the offshore wind market and the potential for future wind investment. The shipowners were convinced, and the two decided to develop the project together. There was no prior contract with an end-user, meaning the project would be executed on speculation of future contracts.

Firstly, the shipbrokers initiated a tender by approaching various ship designers. The customer wanted to have an independent ship designer not already established with another shipowner in the wind market segment. There is a tendency to see the major shipowners having "their own" ship designer working for them. Altogether, the client sought a disconnected and recognized ship designer with an impressive track record yet relatively new to the offshore wind segment. The shipbrokers identified three potential ship designers to include in the tender and chose one after dialogues and examinations with the client. The ship designer had previously designed two SOVs, providing them sufficient market knowledge without compromising the risks of being too attached to other shipowners. In fact, the ship designer did not have a proper customer relationship in this particular market. Due to the two earlier SOV designs, the ship designers had relatively satisfactorily insight into such vessels *and* in-house reference ships they could use as a basis to avoid starting from scratch, which was necessary to provide comfort to the customer.

In the following, the shipbrokers participated in the design process, aiding the shipowner and the ship designer in establishing the main ship specifications. When the design was more or less completed, the shipbrokers approached yards for pricings in a yard tender. After discussions with the client, they chose the best offer.

Although the shipbrokers provided loads of input to the project, both to the ship designer and shipowner, the client's interest in offshore wind was based on internal concepts and ideas. That is often the case. A few years before the vessel contracting described in this project, the shipbrokers had another ship design tender for an SOV. In this described newbuilding case, the same ship designer was involved reaching the final round to compete with only one other ship design company. For several different reasons, they did not win the project. However, coming that far meant they had a complete and mature project, and that project was the starting point for this client's project. The ship designer had the necessary track record, and because of that, the shipbrokers knew about the knowledgeable and experienced people in the particular ship design company.

Still, there were several challenges. After the vessels were contracted, the vessel design changed. For instance, the beam was increased by 0.6 meters to cope with stability issues. Partly, the ship design was perhaps not thorough enough; however, it was also due to heavier equipment on board than what was told by the manufacturer. Such problems are inevitable in these types of projects, and they occur because of poor communication, human errors propagating downstream in the design process, and early assumptions in the beginning. During concept design, the equipment is not ordered. Therefore, the ship design will be affected if there is a mismatch between weight, dimensions, or center of gravity in what the shipbuilder procures. There are margins to cope with such problems, but it evolves into a problem if the error becomes too significant. For complicated (highly CV) ships, like in the offshore market, it is common to understand each new vessel entering the market as a prototype, i.e., there is "always" something new that has not been tested. Whereas, in the traditional shipping segments (tank, bulk, and container), significant problems usually do not occur because the shipyard is designing the vessel and proofing it before it is put into the market by the sales team.

This case represented an ideal customer for the shipbrokers because the shipowner was in a foreign market but still trusted the shipbrokers to "control" the process, from first finding the most appropriate ship designer, then providing opinions on the design, to finally getting the best deal from the shipyards. The process would have been entirely different if the customer was already established in the market segment. Moreover, the ship designer was also reliant on input from the shipbrokers, especially on the design itself and the marketing it needed. The chosen ship designers tend to wait for the customer to approach them.

Case study 2 can be summarized with the five points below;

1. Shipbroker convinced an established client to build SOVs on speculation.
2. Shipbroker launched designer tender and shortlisted three designers based on the owners' various preferences.
3. Shipbroker acted as owners consultant on vessel design and charterer-relevant specifications, capacities, and mission equipment.
4. Shipbroker initiated a global newbuilding tender with the chosen vessel design.
5. Owner ordered two firm vessels with options to declare another four vessels (two of which have been declared).

4.4 Findings from the Case Studies

Case study 1 illustrates how shipbrokers can use their knowledge and market presence to develop and push something into the market. For instance, they know which shipyards can build the specific vessel types, thus narrowing the search time. In traditional shipping, all direct communication Clarksons does with the Chinese shipyards goes through the people in the Shanghai office. The local newbuilding shipbrokers there connect better with the yards than a European would do. In offshore, the Norwegian brokers have direct dialogues with the major shipyards and use the Shanghai office for the smaller and more unfamiliar yards. In either case, the information received between different maritime clusters is essential. The case also illustrates how important trust is. Every shipbroker is different and works differently. The Clarksons shipbrokers have a long time perspective on their projects and know how much damage that would have been caused to their reputation if they had just brought the UDS design to the competing ship designer. Some shipbrokers do not care about that and do whatever it takes to complete projects as quickly as possible.

Case study 2 describes the "traditional" view of the shipbroker; an intermediary between the shipowner, shipyard, and ship designer. However, all communication between the stakeholders does not go through the shipbroker. During the conceptual design phase, the shipbroker participates in most discussions and contributes with its opinions. At this stage, where one designs for tremendous market uncertainty, the customer trusts the shipbroker as an expert. Though, as the project matures and the conversations become more and more technical detailed, the shipbroker fades out. He does not have valuable contributions at this stage. Shipbrokers work under "no cure no pay" and receive a commission fee after the deal is done, which means that they do not get more paid by participating in every meeting until the ship is launched. At the same time, shipbrokers strive to maintain a close relationship with their clients in case of potential projects in the future. Hence, they will always be there for their clients if they wish to have them in the meetings.

The project in Case study 2 started with a close relationship, and every stage of the process is relationship-based; on the client-side, ship designer-side, and shipyard-side. The case illustrates that having strong relations means everything. The ship designers trusted that the shipbrokers introduced them to serious buyers and a thoughtful project. At the same time, the shipbrokers were confident that the ship designers would provide quality work and be easy to work with to satisfy the shipowner. In essence, having a well-reputed name and being trusted is critical, whether as a shipbroker, ship designer, shipyard, manufacturer, etc. Many shipbrokers are not trusted by ship designers, which becomes a problem when the process is exceptionally person-based. Ship designers must rely on shipbrokers not uncritically mass sending their design to everyone. Concurrently, to the ship designers' interests, the design is spread sufficiently in the market so that the "right" shipowners know about it.

Traditional shipping and the offshore market are rather different. Traditional shipping has higher degree of standardization of vessels (SV) than in the offshore segment (CV). The yard pushes its design into the market in traditional shipping, either through shipbrokers or via its dedicated sales teams. In the offshore market, third-party ship designers are more common to use. Some shipyards are utterly dependent on an outsourced ship design, whereas others have an in-house designer within the same group. Having a ship designer and a shipyard within the same group can often result in problems attracting third-party ship designers' designs. For instance, there was an extensive trial in 2021 between the Italian cable laying- and shipowner company *Prysmian* and the Norwegian ship designer *Salt Ship Design*. Prysmian had a tender for a vessel design, in which Salt Ship Design won. After the design tender, the shipowner approached, among several, Vard Shipyard for pricings, which suddenly resulted in a Vard ship design instead of a Salt ship design. In summary, the court ruled that Vard had copied the Salt design and proposed a much cheaper vessel if Prysmian chose their design instead. Above all, this is the perfect example of the value of trust in the maritime industry.

The projects described in these case studies have at least one apparent common denominator; both were started on the basis of well-established designs. Often, there must be "something" to show the shipowners to get them interested. This "something" can be referred to as the *transactional documents*, consisting of the General Arrangement (GA) plan, outline specification, or pocket plan. From the shipbrokers' perspective, it may be suitable to enter a project "from scratch". However, this happens utterly seldom. Most projects are sourced from previous work, where some features are new developments to create a sense of innovation. Usually, it is the ship designers taking this initiative by themselves.

One of the issues with the offshore industry is that there is little standardization, i.e., "every" ship is a prototype and different from its peers. However, this is not necessarily the ship designers' fault. Often, the market does not want standardized and modularized ships; it wants something unique. This uniqueness challenges both the shipbroker and the ship designer. The shipbroker is used to handling specifications from the beginning of a project. For the ship designer, it is costly to make a concept and basic ship design solution, and it will often hesitate to "just make an outline specification." Sometimes, the shipbrokers recommend that they do some "no cure no pay"-work and make an outline specification based on something they have done before. If the ship designer refuses, the shipbrokers will most likely take the project to the competing ship designers because they know they will provide the specification free of charge. In other cases, the shipbroker recommends the client to pay the designers something in advance to see a more substantial commitment to the project.

Just recently, the two giant Chinese shipyards *COSCO* and *China Merchants* released their own designs for the offshore wind market. Since they have already built a few of these ship types, they think using their knowledge to develop new designs is a good strategy. However, the interviewed shipbroker elaborated why "no one" in the market wants their designs. At least all the serious actors know and understand the immense knowledge needed to design such vessels. All the intangibles associated with the design process of SOVs need much experience, which is why the same shipbroker believes Norwegian ship designers should be well-positioned to survive. In fact, ship designers in general might become even more important, also in traditional shipping. Due to the green transition the maritime industry is experiencing today, the vessels will become more complex with new propulsion systems and technologies. Moreover, there will probably be more focus on truly optimizing the hull shapes to squeeze out the last improvement percentages.

The maritime industry is highly opaque and relationship-based. There is tremendous intangible and soft information swirling around, and keeping track of this can be of extreme value. Knowing what your peers are contracting might give the shipowner the confidence he needs to continue his project. Knowledge is one factor; another is the human aspect. There are people on "both sides of the table." One ship designer might enjoy working with a shipbroker, whereas another will not. One shipowner can match perfectly with a specific broker but can completely mismatch with another, even within the same broker company. All the intangible information, contacts, dialogues, and trust are factors that cannot be systemized and put into a matrix, which some people struggle to understand. This is why some individuals do not like shipbrokers and conflict working with them. But those who appreciate the shipbrokers' role know that they, at least the good ones, do not only move documents and trade yard slots, but they add value by having the best control of the market and holding some technical expertise. Shipbrokers can also strategically be used to market a ship designer's brand and introduce them to customers and market opportunities.

Chapter 5

Results and Discussions

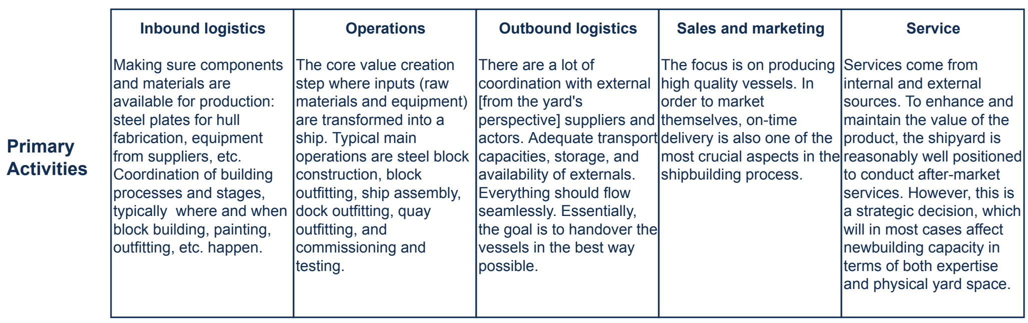
This chapter presents processed results and discussions. First of all, we synthesize the chosen theories from Chapter 3 into the shipbuilding domain, focusing on the ship designer-shipbroker interaction. Moreover, a set of descriptive models describe the "as is"-situation of PMAs seen from a shipbroker's perspective. In the more descriptive text areas, we define and use the following acronyms; shipbroker (individual) (SB), shipbrokers (general) (SBs), ship designer (individual) (SD), ship designers (general) (SDs), and shipowner (SO).

5.1 Business Models in the Shipbuilding Domain

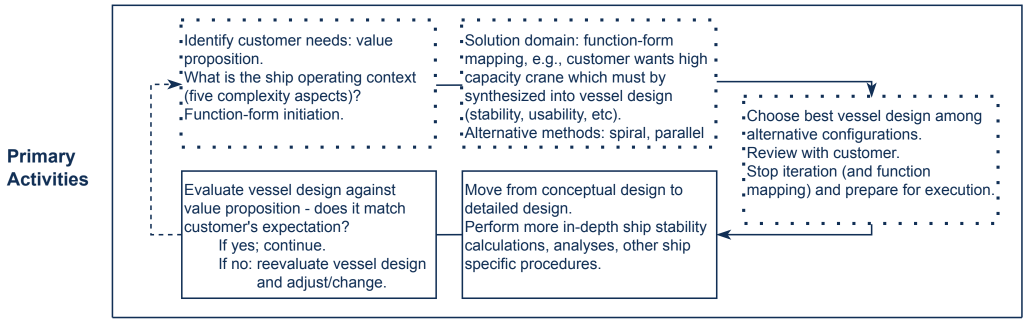
First of all, we need to understand what the chosen theories from Chapter 3 mean in the shipbuilding domain, in particular, how value is created in terms of strategic value creation decisions. To better understand the three business models proposed by Porter (1985) and Stabell and Fjeldstad (1998), we relate them to how each actor in the main stakeholder domain can "traditionally" be expressed, summarized in Table 5.1.

Table 5.1: Stakeholders' core business

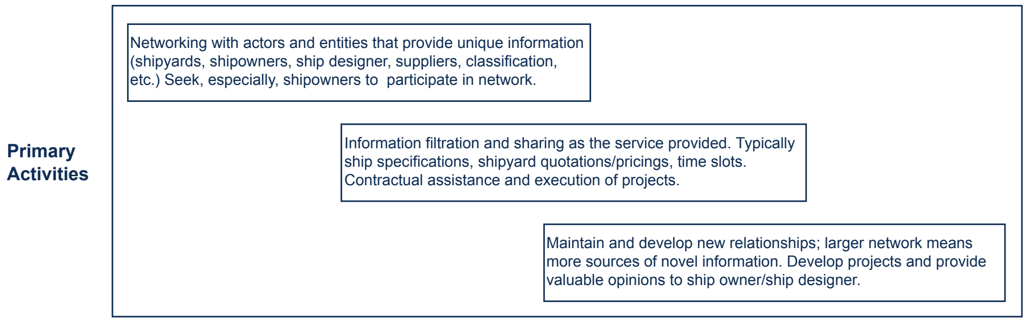
Stakeholder	**Configuration**	**Main Attribute**	**Description**
Shipyard	Value chain	Resources	Figure 5.1a
Ship designer	Value shop	Capability	Figure 5.1b
Shipbroker	Value network	Network	Figure 5.1c



(a) Shipyard in the value chain model



(b) Ship designer in the value shop model



(c) Shipbroker in the value network model

Figure 5.1: Primary activities in the value creation models synthesized to the main stakeholders

Table 5.1 grasps each actor's core business role, with Figure 5.1 complementing what the value chain, value shop, and value network can mean in the maritime context. For now, the support activities are of no interest; hence Figure 5.1 only includes the primary activities of a shipyard, ship designer, and shipbroker. Figure 5.1a describes the production-based business model with a focus on shipyard operations and how to efficiently handle logistical issues of raw materials and internal and external factors. More fascinating is how the ship designer can be described as a value shop as in Figure 5.1b. We propose that the three dotted boxes represent the idea-based thinking of a value shop, whereas the two remaining boxes can be understood as a value chain, production-based thinking. In other words, the dotted boxes represent the conceptual design phase, which according to the senior ship designer at UDS, is driven by ideas, innovation, and problem-solving. In the execution phase, the activities transform the inputs (extracted from the dotted boxes) into the final product, a complete non-physical description of the vessel. Finally, Figure 5.1c describes the shipbroker value network configuration, particularly how a shipbroker can control information and its desires to expand and maintain its network. A common consensus from shipbrokers across various departments at Clarksons is how the shipbroking profession is becoming more sophisticated. In general, they see how shipowners demand more knowledge-based services from them. This suggests that the shipbroker, in addition to sharing novel information, must be able to have a problem-solving, idea-based role. Therefore, the core business role for the stakeholders proposed in Table 5.1 can be expanded into several role configurations.

For an actor, we can discuss the three strategy models separated from what other actors around do. However, we think it is more interesting to understand the strategic decisions of a single actor in processes where multiple actors interact. Almost in a game-theoretical approach, these strategic decisions could affect an actor's role. Following the thesis limitation, we consider the three value configurations for shipbrokers and ship designers, shown in Figure 5.2. The figure indicates central elements, key drivers, and role distributions between the two actors, where the diagonal line represents shared attributes between the two. Moreover, the text is divided into "harmonious" and "conflicting" by color to clearly show what attributes fit the actors and what can potentially be challenging. We propose that shared role attributes are sources of potential for conflicts.

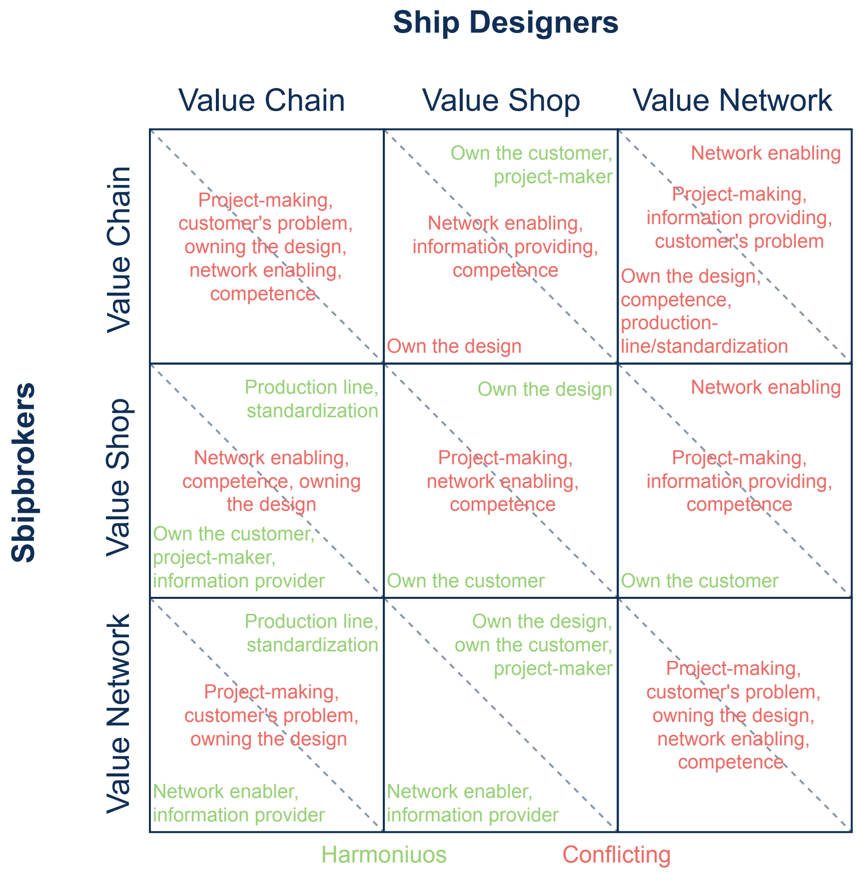


Figure 5.2: Value configuration matrix between shipbroker and ship designer

The framework that Figure 5.2 provides came up as part of the process at a late stage of the master thesis. At the same time, it was revealed during a DREAMS workshop that there is little theory about combining the three business models this way. Within the limitation of this thesis, we have restricted opportunities to go deeper in detail. However, the framework delivers a basis for further discussions of results in this chapter. In efforts to understand the framework, we can, for instance, consider shipbrokers as a value chain in the way of creating a "fabric" by hiring naval architects and designers to bring the projects further downstream before introducing a customer (in a similar form of thinking regarding the CODP (Semini et al. 2014)). For whatever business model the ship designers choose, this becomes a potential conflict source since the two actors would then interfere with each other's value appropriation. Going through each matrix cell, we propose that it does not make sense to model ship designers as a value network since "someone" needs to make the design decisions. Similarly, it is challenging to argue that shipbrokers can take the value chain as a suitable business model since they do not have the expertise to produce ship designs. That leaves four exemplary configurations, presented in Table 5.2.

Table 5.2: Alternative value configuration models for a shipbroker (SB) and a ship designer (SD)

	Value Configuration		Notation
Model	**Shipbroker**	**Ship Designer**	**SB/SD**
A	Value network	Value shop	network/shop
B	Value network	Value chain	network/chain
C	Value shop	Value chain	shop/chain
D	Value shop	Value shop	shop/shop

Who owns the shipowner's (SO's) problem? Arguably, this role is covered by the value shop since the value network is about connecting players, while the value chain focuses on mass production (Stabell and Fjeldstad 1998). Value shops deliver solutions (Harris and Burgman 2005). An important finding in the understanding of model A-D in Table 5.2 is which actor takes which role, particularly on owning the SO's problem. In model A, the SBs role is to connect actors, whereas the SDs are the customer's trusted partner and have the project-maker role. This means that the shipowners and ship designers use the shipbroking network only as an information source. The roles are evident, and each actor easily understands what activities the other actor performs. SBs are driven by customer base composition, e.g., connecting shipyards and shipowners by critically assessing scale vs. exclusivity. SDs are driven by creating a good track record and reputable designs. They are also the actor interacting with stakeholders about major (design) decisions being made. Model B suggests a business model that could be problematic since neither SBs nor SDs take the value shop configuration, i.e., the project-making role. This configuration can provide a too large gap between the two actors, making it challenging to complement each other. While the SBs strive to scale up their network, the SDs do the same in terms of design standardization, leaving emptiness to who is *really* solving the problem. In model C, the SBs are value shops, and SDs are value chains, meaning that now the shipbroker is taking the project-maker role, whereas the designer is purely focusing on producing design. Since the SBs take the responsibility for the project, the SDs can purely focus on the design activities and not worry about other business-related aspects. Here, the SBs' drivers are to build reputation by being the shipowner's trusted partner. The location of the PMAs are also essential drivers. The SDs focus on a production line and standardization to achieve economy of scale, i.e., more ship designs are better. Model D proposes a shop/shop configuration. In this case, both SBs and SDs are competing in solving the customer's problem; they both wish to act as the customer's representative. However, since we believe only one actor can own the customer's problem, we address this configuration as a source of potential friction and issues between the two players. The roles can easily conflict since either actor enters the other's value creation and appropriation domain, taking over the other actor's function. An Ulstein representative said that to have a collaborative relationship with SBs, there needs to be a clarification of expectations in advance to which actor should do what, i.e., a clear role boundary and distribution. The same message was said from a Clarksons SB.

5.2 Shipbroker Network

There are multiple stakeholders involved in a newbuilding project, and each one has its network, normally with common elements. Nevertheless, to stay within the thesis limitation, we only consider the main stakeholders in PMAs. Figure 5.3 illustrates the SO, SB, and SD tied up in a simple network. Everyone is connected and has a relationship with each other, but they also have additional connections with other stakeholders, as indicated by the dotted lines around. These can be individuals, other SOs, other SBs, other SDs, various shipyards, classification societies, suppliers, etc. The network in Figure 5.4 also represents a simple network, but where the SO and SD do not have a relation. In other words, there is a structural hole (SH) between the two, putting the SB in an advantageous position by controlling information (Burt 1992).

Each player has a particular role in the network based on the competencies it represents. The SD knows how to design a ship, and a presentation during the Ulstein workshop indicated that in most cases, design companies invest many resources into market research and in developing close relationships with potential shipyards that can build their design(s). On the other hand, SBs add value through market information and other knowledge-based services. Thus, the network in Figure 5.3 is uncommon to see on a project-by-project basis. When SDs and SBs "compete" for the same overlapping activities, it becomes difficult to cooperate, and synergy between the two is quickly vanishing.

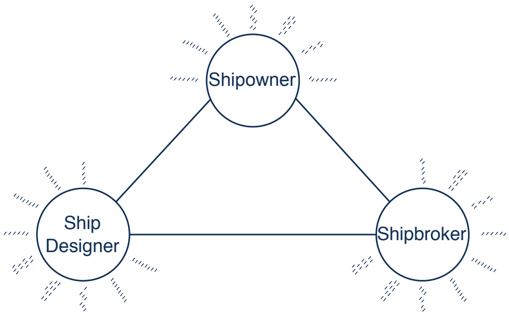


Figure 5.3: Simple network between shipowner, shipbroker, and ship designer

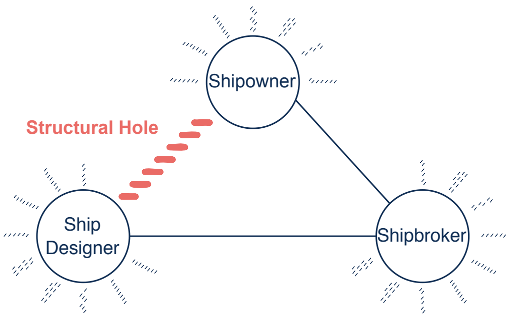


Figure 5.4: Structural hole in a simple network between shipowner, shipbroker, and ship designer

A key observation, supported by the case studies, about SBs' contributions in PMAs is their presence in every necessary significant maritime cluster. Under those circumstances, the SBs act as boundary spanners (BSs) between different maritime groupings, as we indicate conceptually in Figure 5.5. In each cluster, there are pools of every type of marine industry actor, from which the SBs extract information and filter appropriately towards the SOs.

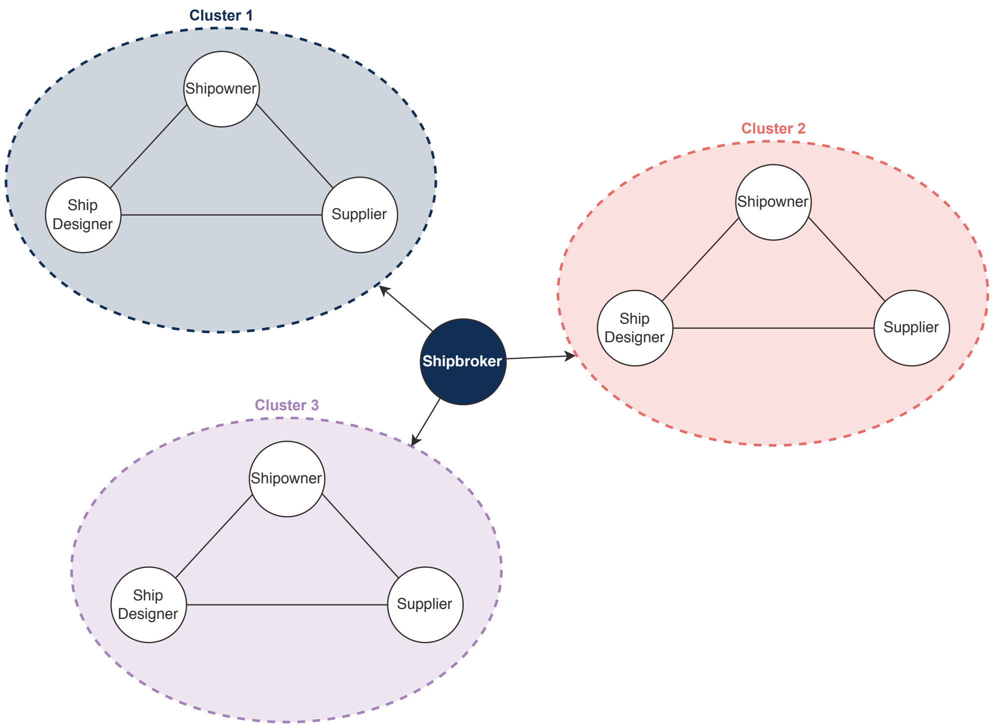


Figure 5.5: Shipbroker as a boundary spanner among maritime clusters

Moreover, we can develop a more specific model than Figure 5.5 that solely illustrates the SB as a BS. Figure 5.6 captures multiple SBs boundary spanning a set of arbitrary clusters; Cluster 1, Cluster 2, ... , Cluster 12. Each cluster represents a network of actors, different from one another and varies due to geographical locations or market segments. The SBs are interconnected through strong relationships.

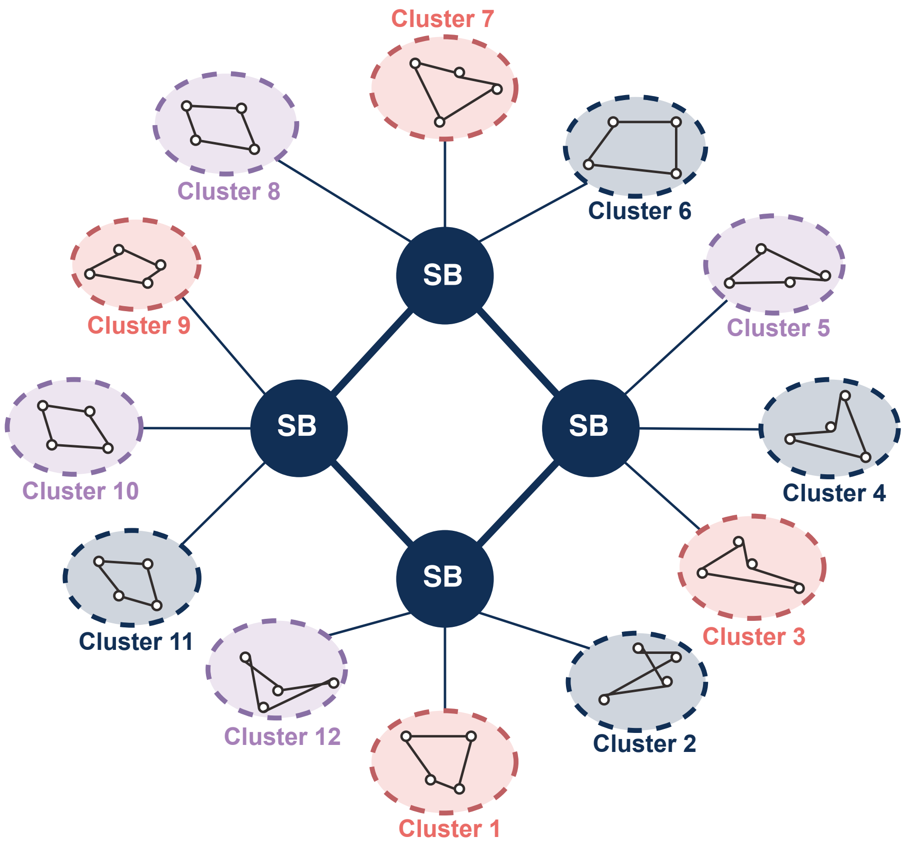


Figure 5.6: Network of four arbitrary individual shipbrokers (SB) boundary spanning maritime clusters

Whereas Figure 5.6 portrays SBs' large network in a simple manner, Figure 5.7 provides a more comprehensive picture by capturing the case study findings regarding the worldwide presence. The major shipbroking companies have departments and offices all over the world. This range allows them to cover a wider scope of what is going on in the industry, providing more information, more knowledge, and thus a comprehensive market overview rather than a regionally based SD. Transitioning from Figure 5.6 to Figure 5.7, the SBs are now forming the "main" clusters. In effect, the clusters in Figure 5.6 now form the sub-clusters. In reality, one can argue that all sub-clusters are tied up to each other. Either as overlapping networks or just one actor connected to another in different sub-clusters. The green SB in Figure 5.7 indicate another SB type, for instance, second-hand sales and purchase shipbrokers or chartering shipbrokers. Cluster 1 and Cluster 2 exemplify two brokerage departments, within the same group, at two different geographical locations.

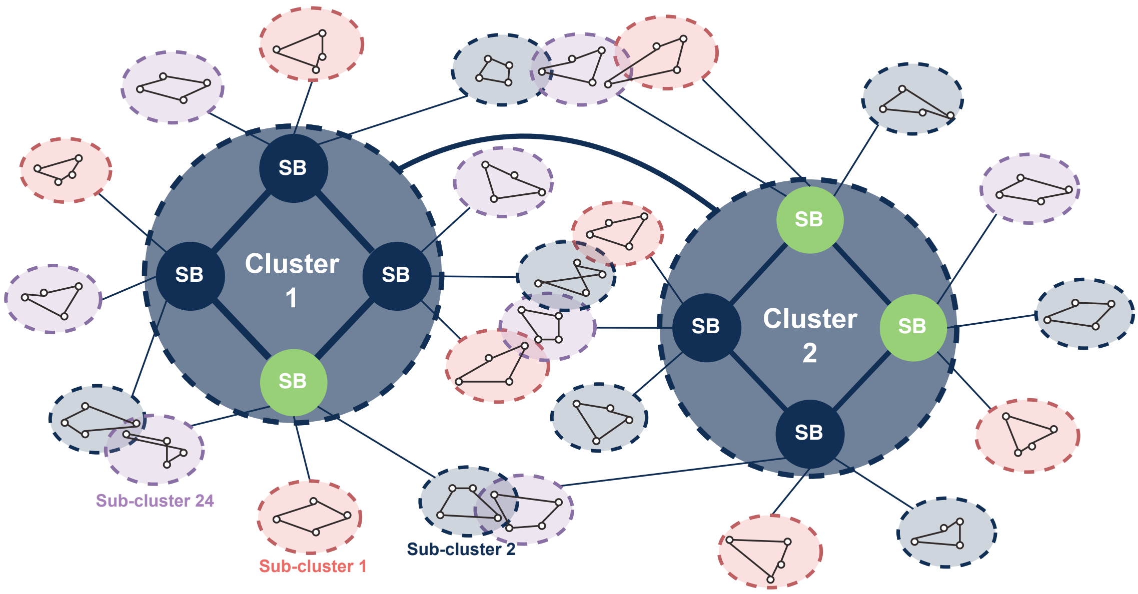


Figure 5.7: Shipbrokers as boundary spanners between maritime sub-clusters

The most important resources being conveyed in the SBs' network are information and knowledge (Strandenes 2000). Among the most noteworthy stakeholders in the network are shipyards, ship designers, and ship owners. But the network can also consist of suppliers, classification societies, operators, investors, ports and terminals, insurance companies, organizations, etc. Following Fjeldstad and Lunnan (2018), the two below tables provide more insight into the network. Table 5.3 characterizes the relationships in the activity links. Table 5.4 describes the SBs' network and their corresponding position.

First and foremost, SBs get their most valuable insights from shipyards in terms of tangible information, firm information, and offers and proposals. Trust is necessary between the two [broker/yard], but more important is the trust between the SB and the SO. The SO is the client, ultimately paying for the vessel(s). In addition, the client is dependent on trusting their shipbroker to get them the best deal possible. Therefore, trust is more critical on the broker/owner side. Interestingly, none of the actors are tied up by rules, contracts, or ownership, unless, for instance, a SO has offered an exclusive mandate to the SB. Usually, such grants are given on a project-by-project basis. Another exception is when two parties enter a *Letter of Intent* (LOI). In this case, there are contracts governing.

Table 5.3: Characteristics of main relations in the shipbroker network (framework by Fjeldstad and Lunnan (2018))

Shipbroker	Shipyard	Ship Designer	Shipowner
Relation characterized by trust	Medium	Medium	High
Limitations from new action	Medium	Low	High
Resource dependency	High	Low/Medium	Low
How interaction is regulated	Norms/None	Norms/None	Norms/None

The size of the networks varies across actors. There are relatively more shipyards than ship design companies. Therefore, it is reasonable to state the broker/yard network as big, as indicated in Table 5.4. For a single SB, the SO network is usually not that big, especially if the clients are active in newbuilding projects. However, their [SBs'] combined network, as illustrated in Figure 5.7, covers significantly more customers. Moreover, the broker/yard network and broker/designer network are typically non-exclusive. What one shipyard is telling a SB, it is probably telling (more or less) the same thing to another broker from another company. The same can, in some cases, apply for the SO as well, but it is more common to see the SO stick to the same SB because of individual, interpersonal trust (Skallist 2018).

Table 5.4: The shipbroker's network and its position (framework by Fjeldstad and Lunnan (2018))

Shipbroker	Shipyard	Ship Designer	Shipowner
Network size	Big	Small	Medium
Exclusive network	No	No	Yes/No
The network's steadiness	Permanent	Changeable	Permanent
The network's relation	Strong	Medium	Strong
Influence other actors	Medium	Low/Medium	Medium/strong
Access of resources from actors	Strong	Low/Medium	Strong

This section analyzes and illustrates a SB's network to external actors and internal colleagues. The network models are based on qualitative research, trying to show how SBs are positioned in a: network (Figure 5.3), network of networks (Figure 5.5), and network of clusters (Figure 5.6 and Figure 5.6). Importantly, a network position is not decided by the actor itself. It is a structural consequence of the network location (Fjeldstad and Lunnan 2018).

The networks in this section were modeled gradually from the simplest network to a more comprehensive (Figure 5.3/5.4 → Figure 5.7), with the intention of making the strategic network models easier to understand. In reality, the networks are extensively complex, chaotic, and arguably impossible to model correctly. However, they undoubtedly support and illustrate the two fundamental network theories by Granovetter (1973) and Burt (1992). The relationship between nodes in the network can either be *strong* or *weak* (Granovetter 1973). It depends on several factors. Our qualitative findings on the strengths of the ties at least hint that the SB/shipyard tie is considered a strong tie. They have dialogues frequently, and the two tend to build personal and trustworthy relationships (Skallist 2018), particularly if the SBs know this is a yard they can do repetitive business with. In return, the shipyard stays up-to-date with what is happening in the market. It is, however, impossible for a SB to have a strong tie with every shipyard in the world. Hence, SBs must strategically target the ones they believe are best suited for potential projects in the future. Between a SB and SO, the tie can either be weak or strong. In cases where the client returns to its SB to do more projects, the link is considered strong. Nevertheless, SBs can have clients that do newbuilding projects "on their own" for various reasons, and in such cases, the tie can be considered weak. Following the SWT theory (Granovetter 1973), we see that a strong tie between SBs and SOs, and SBs and shipyards results in a weak tie between SOs and shipyards (Borgatti and Halgin 2011). Moreover, as Figure 5.7 reveals, newbuilding shipbrokers have strong relations to different types of SBs; sales and purchase brokers work on a client-by-client (SO-by-SO) basis (Stopford 2009), and chartering brokers work on a charterer-by-client (end-client-by-SO) basis (Plomaritou and Papadopoulos 2018), enabling a comprehensive information flow, but also strong connections. Such strong connections, among other things, are why SBs can initiate projects as described by the model in Figure 5.10. They are able to cover a large portion of stakeholders, particularly shipowners.

Our findings of generalized, qualitatively described network models demonstrate why SBs are in an advantageous network position. They know about the most rewarding opportunities as they identify Burt's (Burt 1992) ideas that information benefits come in the three forms access, timing, and referrals (Table 3.7). Moreover, the models now provide evidence of why shipbrokers are representative examples of actors taking the value network configuration (Stabell and Fjeldstad 1998). The shipbrokers' job is to facilitate two unlinked actors (Long et al. 2013). An important aspect of choosing this business model is that it can be exceedingly time-consuming to maintain and expand all connections (Granovetter 1973), especially among various types of stakeholders. Figure 5.7 documents the SHs developing between each sub-cluster. It underlies how shipbrokers' ego network (Borgatti and Halgin 2011) provides them a huge advantage, specifically due to the propagating domino effect we see because of each shipbroker boundary spanning a set of clusters (Tushman 1977).

5.3 Paradigms of Strategic Models

Presently, we have synthesized strategic business models and network theory to the maritime domain. As we advance to this next section, we will present strategic models manifested as activity diagrams yet incorporating the above-synthesized material.

5.3.1 Shipbroker Reference Model

As previously mentioned, a shipbroker's main role is to be an intermediary between buyer and builder. Neutrality is essential to act on behalf of the shipyard and the shipowner. It is, however, common to see the SB stand more on the buyers' side because they need more support in a newbuilding negotiation than the builder, who usually has a dedicated sales team. Securing a project varies depending on numerous factors, yet, the base activities are more or less the same for every ship segment, customer, and shipyard. The model in Figure 5.8 represents a direct response to RQ1 and is predominantly based on observations and built-up experience from working in a shipbroking company.

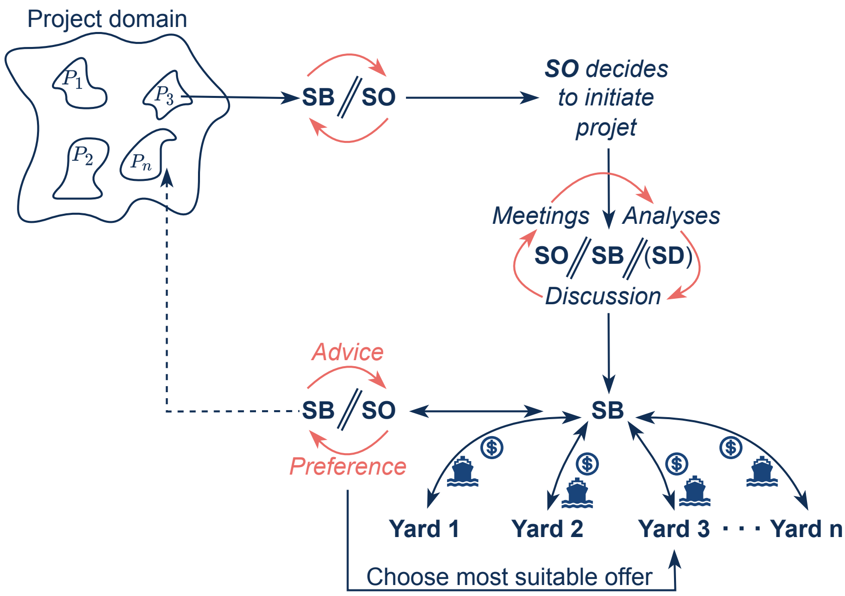


Figure 5.8: Reference model for a shipbroker (SB) to develop and approach projects including shipowner (SO) and ship designer (SD)

In the reference model, it does not matter *where* the project comes from. The model generalizes all projects (P_1, P_2, ... , P_n) into a pool of *potential* realizations, where each project represents an *option*. A project can be developed by the SB, pushed by a shipyard, or from a customer tender, depending on which stakeholder initiated the process (as proposed in Table 2.3). First of all, the SB and SO discuss the potential project(s), illustrated as the interaction SB//SO. If the two have never met or worked together, the first meeting will commonly be about getting to know each other, followed by introduction- and market presentations. This is the SB's chance to "sell" its services and convince the client how they [SBs] add value to shipbuilding projects. Impressive track records and being recognized in the industry are essential attributes SOs value; a shipowner said in a "first meeting" with the client where the researcher participated. There is also a need for good chemistry between the two parties. When the SO decides to pursue the project, the discussions begin. The SO has internal meetings and forwards its needs to the SB, which then approaches shipyards asking for that particular project. In standardized tonnage (SV) (tank-, container-, and bulk segment) built by the largest Asian shipyards, there is usually an in-house design department carrying out the ship design activities. It is also common to see joint ventures between large Asian ship design companies and shipyards. In other cases, the SO has acquired its own ship design through an independent SD, which is more common in European shipbuilding. Nevertheless, from the point the SO makes the decision, the process can be broken down into five steps;

1. **Inquiry**: is first initiated by the SB with the shipyards. This first step is about requesting information from shortlisted interested and potential yards to obtain proposals, i.e., which shipyards in the market are established and able to carry out the project. Depending on the complexity of the request, it can take days to several weeks to receive official offers or design proposals.

2. **Quotation**: Once the inquiries are gathered, the SB continues collecting offers. The offers contain at least the following; the number of vessels and specifications, price usually in US$, payment terms, delivery dates, refund guarantees, and subject mutual agreement of the contract and specification. Usually, the seller (shipyard) provides a refund guarantee in case of the proposal is withdrawn. The payment terms are inseparable from the price and are highly shipyard-specific. However, these terms and the price are negotiable. The biggest drawback for the buyer (SO) is that the yard will often demand "subject to prior sale", meaning it can sell the proposed yard slot to someone else before the buyer accepts the offer.

3. **Negotiation and commitment**: The next step is to review the builders' offers and start the negotiation of all terms. The yard will likely compete with other yards, and the buyers will also compete for the same yard time slots. Up-to-date market info is therefore essential. When all terms are agreed upon, the "subject to prior sale" is removed, and the yard is committed to offering the arranged time slots. The SB then assists and advises contractual elements to ensure both parties' satisfaction.

4. **Contract signing**: takes place once specification and contract are agreed, and the deal becomes legally binding. The first payment installment is paid upon the agreement's effectiveness, but not before the seller issues the refund guarantees.

5. **Post fixture and building of the ship**: Now that the contract is signed, the process typically continues with a kick-off meeting and other initial meetings to discuss ship technical aspects. These are discussions between technical consultants, class, yard, and buyer.

During the five steps described above, communication and information flows are demanding. Therefore, the SB's role is to assist and forward messages to ensure that both parties are satisfied. SBs add value by selecting the appropriate yard by reviewing each yard's quality, reputation, and reliability. Moreover, they provide commercial analyses for yard proposal assessments. Shipbrokers spend much time building close relationships with shipyards. Therefore, it is likely they can get a shipowner's project priority, which in a competitive market is crucial. In addition, shipbrokers have much contract experience. In-depth knowledge of contracts and commercial realities of contract negotiations across different countries is essential to reconcile two clients with opposing aims due to, for instance, cultural differences. Shipping intermediaries can also reduce management time and involvement.

The reference model might look seemingly sequential on paper. Still, in reality, almost all of the activities happen in parallel, and in a discontinuous way, showing similar characteristics to a value network (Stabell and Fjeldstad 1998). SBs do not start talking to shipyards after they know what the SO wants. Broker/yard dialogues usually happen on a daily basis, even without a specific ongoing project, for the SB to be continuously updated on shipyard status, market prices, and availability in the shipping segments Strandenes (2000). Interestingly, in addition to having a simultaneous and parallel business-logic method, the SB possesses cyclical and spiraling traits similar to the value shop configuration (Fjeldstad and Andersen 2003). In essence, SBs base their businesses on their massive network, but at the same time, they apply resources in a problem-solving way of thinking. The simplest form of visualizing how SBs' value creation configuration is, is by merging the primary activities from the value shop diagram and value network diagram (Figure 3.4 and Figure 3.5). As experts in their field, SBs can be understood as specialized shipping consultants, working on simultaneous, multiple layers of the value shop's primary activity spiral; problem finding → problem solving → solution choice → execution → control and evaluation. The reference model tries to describe this interpretation as a flowchart model, despite the challenges of displaying several parallel dimensions of a cyclical procedure.

Although we have managed to establish a reference model, the model is quite generic in terms of the variations in starting point of the project. Nevertheless, it would not make sense to make it more specific. Within the model, there are considerable variations on what activities are carried out and by who. In addition, it does not capture the SD's role in the upstream project phase. The model, therefore, describes traditional shipping more accurately than the offshore market, where the largest shipyards possess in-house ship designers and usually prefer to use their designs. However, we can extend the model.

5.3.2 Extended Shipbroker Reference Model

In the offshore segment, the SD is even more important and present than in traditional shipping. The reference model proposed in Figure 5.8 can therefore be adjusted to fit the process in the offshore market better. Figure 5.9 reveals the extended reference model. First of all, Case study 2 reveals that projects commonly branch out of each other in various unexpected directions, illustrated through the overlapping projects P_1, P_2, ... , P_n in the project domain. Moreover, the extension includes a ship design tender, not just a shipyard tender. After the SO decides to pursue the project, the SBs approach design companies SD1, SD2, ... , SDm and ask for a specification, indicated by the purple document, to show their client.

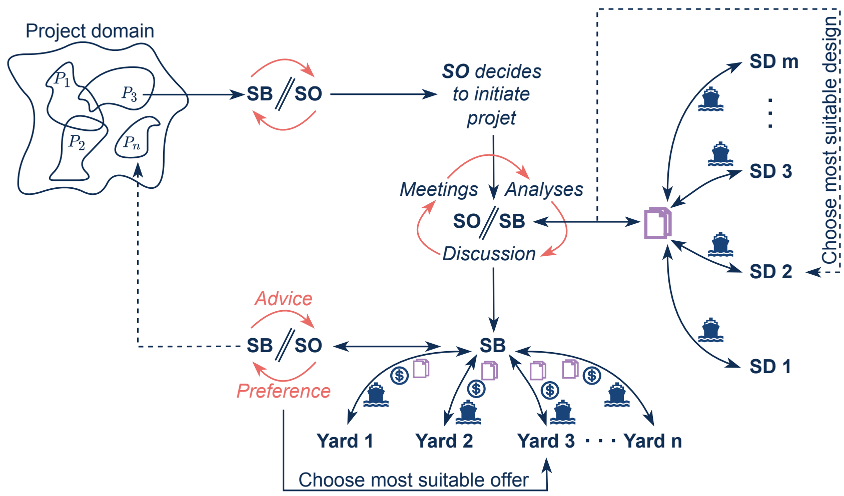


Figure 5.9: Reference model for a shipbroker (SB) to develop and approach projects including shipowner (SO) and ship designer (SD) in the offshore market

The extended reference model in Figure 5.9 clearly shows the SDs' presence in the offshore market. They are needed to a much higher degree because CVs are considerably more challenging to make (Semini et al. 2014). Moreover, the model reveals that not only do the shipyards compete to win a contract, but the SDs also participate in a tender competition. According to the interviewed shipbroker, SBs *and* SOs expect to see a concept design being delivered momentarily in most cases. If the SDs do not have an outline specification or something similar, they are put in a tough position. First of all, it is costly to develop a conceptual ship design according to a UDS ship designer. A ship designer could be rather hesitant to compete in a tender, especially if there are many competing for the same project. Second, it is problematic for SDs to demonstrate that they are running product development and striving for innovation, yet aiming for standardization, which are important attributes for the end-customer. Nonetheless, the underlying principles of the model encompass why the there could be difficult for SDs to work with SBs; although working on the same project, they are sitting on different sides of the table, have different optionalities, and perhaps unaligned relationship structures to acquire the best performance (Zaefarian et al. 2013). This result highlights how important it is to choose a strategic business model (Table 5.2) that fits the surrounding actors.

5.3.3 Market Opportunity Model

Figure 5.10 captures how SBs can develop a business case on their own and is a generalization of Case study 1. SBs identify an opportunity in the pool of countless project possibilities that they believe holds great potential in the future. To develop the project, the SB concentrates on finding a SD that is interested in collaborating on the project. There can be many designers to choose among (SD1, SD2, ... , SDm), but generally, the shipbrokers possess insight into which is a potential match. Actually, a SB would probably identify the project in the first place due to its familiarity with a particular designer. Once the ship designer is onboard, understanding that the project might fail, the SB approaches shipyards and asks for pricing, yard time slots availabilities, and maybe a manufacturer equipment list. After receiving offers, the SB updates the business case and starts preparing presentations to all the potential SOs; SO1, SO2, ... , SOk. If anyone of them are interested, they might prefer to make some minor changes to the design. The SB might also negotiate better terms and prices once the SO is included in the project.

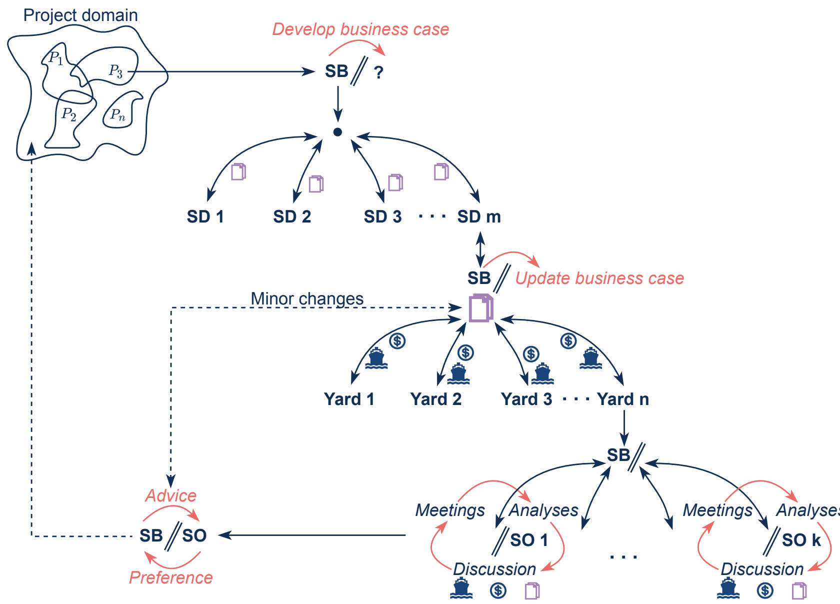


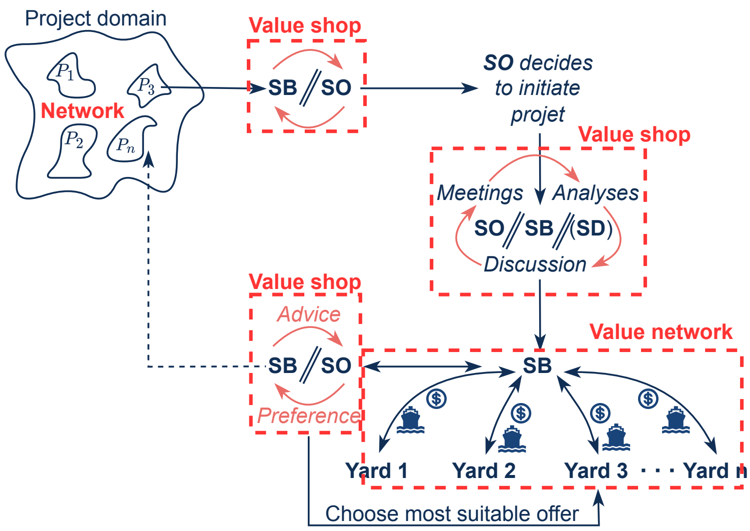
Figure 5.10: A shipbroker's (SB's) strategy to develop projects with a ship designer (SD) for a shipowner (SO)

Following Skallist's (Skallist 2018) results on SBs' behaviors to build and maintain interpersonal trust (Table 2.1) indicate fundamental characteristics to, in the first place, be able to initiate a project without a prior customer. Both the SB and SD must be aligned and have a mutual understanding of how to deploy and proceed with the project successfully, which in return can enhance achievement in relationship and overall performance (Zaefarian et al. 2013). Moreover, the proposed model represents how the SB can use its core knowledge. In the five complexity aspects following ship design suggested by Rhodes and Ross (2010), SBs (should) have *at least* exceptional insight into the contextual-, temporal-, and perceptual elements. Depending on shipbrokers' educational background and previous experience, they could additionally have some thoughts on the structural- and behavioral aspects. However, Figure 5.10 relies on picking projects where the customer is introduced at a late stage in the process, i.e., the CODP is moved more downstream (Semini et al. 2014). From the shipbuilding and production perspective, the downstream shift of the CODP means, by following Figure 2.7, that market research and concept design, basic and functional design, engineering, contract design, and supply chain development activities are initiated and partly completed before having the customer. Moreover, Figure 5.10 provides an example of an *experimental* Strategic Decision Process (SDP) described by Fjeldstad and Lunnan (2018), where the sequence of process activities is E → A → P (Table 3.2). The SBs' strategy consists of exploring new opportunities and creating new activities. The nature of Figure 5.8 and Figure 5.9 is more similar to the SDP sequence P → A → E. The shipbrokers' surroundings are familiar, allowing them to transform the plans into actions. Afterward, the activities can be evaluated and provide new input to the new planning (Fjeldstad and Lunnan 2018).

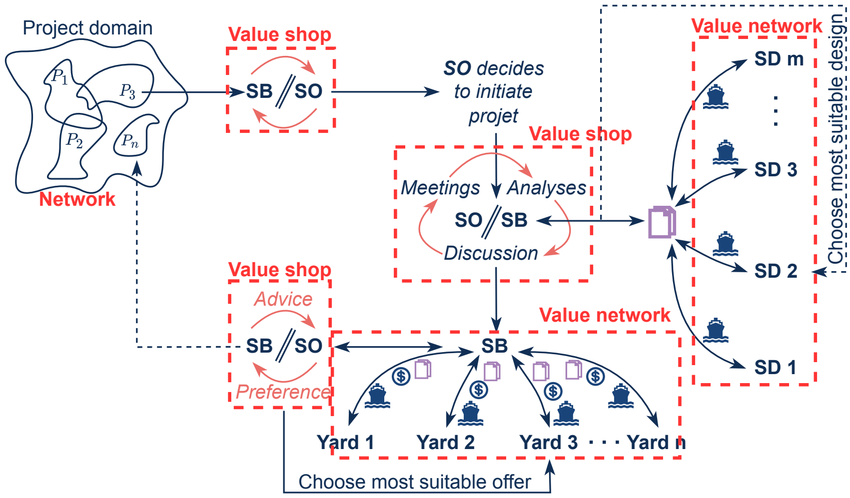
The descriptive models presented in Figure 5.8-5.10 are partly showing a process, partly showing a network, and partly assigning stakeholders to the various nodes. Therefore, to correctly interpret the models, we need to relate them to business models A-D proposed in Table 5.2. Figure 5.8 indicates a shop/chain (model C) configuration. Undoubtedly, the SB is the project-maker and controls the process, while the SD is only focused on designing the vessel. That is, if a SD is used at all. Hence, the results confirm that this is a good choice for describing the traditional shipping market. Depending on the project, Figure 5.9 can be understood as the value configuration model A, B, or C. The extended reference model illustrates, to a higher degree than the reference model, the network SBs posses and use in PMAs. And if the SD is heavily involved, it could be viewed as a value shop actor. On the other side, the model omits the SDs in the value shop (*Meetings* → *Analyses* → *Discussion*) spiralling characteristic. Therefore, the SDs can have a value chain configuration. From the same argument, we can define the SB as a value shop. Figure 5.10, which is capturing Case study 1, illustrates a shop/shop-like (model D) configuration, partly because the customer is not yet identified but also because both the SB and SD are working together, synergetically to take advantage of both parties' competence. Although the "SB" is in the center of every step, the SD is arguably contributing to the project-making. The SB finds the customer and uses its knowledge to input design proposals. The SD uses its capability to problem-solve and almost predict the customers' needs before they know it.

5.3.4 Model Analysis

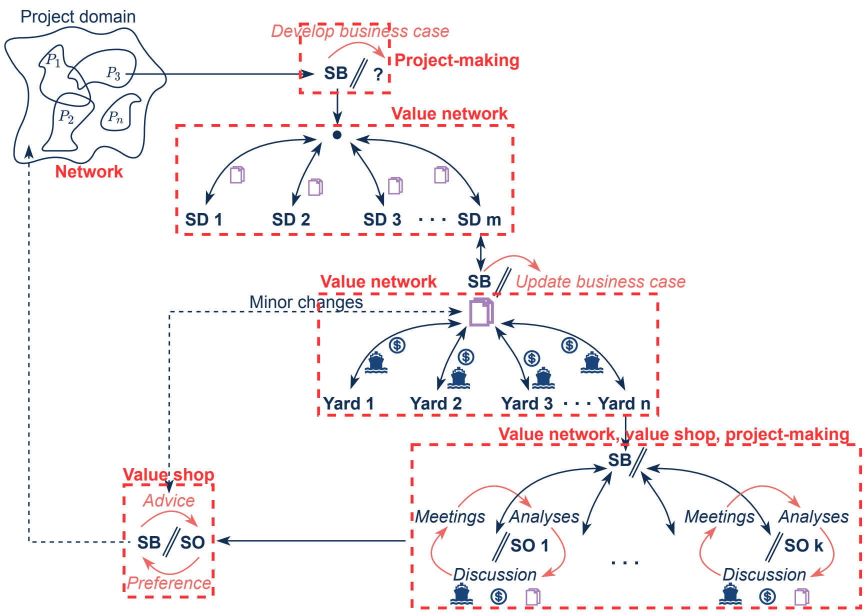
We can propose a further extension to our framework by identifying which parts of the upstream newbuilding process belongs to which business model, i.e., value chain, value shop, and value network. Figure 5.11 reveals what this could look like from the shipbroker's perspective.



(a) Underlying network with value shop thinking



(b) Value shop and value network



(c) Predominantly value network and a clear project-maker

Figure 5.11: Business model analysis of the shipbroker reference model variations

We argue that breaking down each step in the activity diagram in Figure 5.8-5.10 provides a better, clearer, and easier picture to precisely pinpoint what activities give value shops characteristics and what gives value networks features to the shipbroker. From this standpoint, it should be more straightforward to identify which roles, tasks, and responsibilities are covered. Furthermore, this same activity can be extended to viewing the ship designer's perspective. Combined, such a framework should make it easier to understand mutual strategy, different prerequisites, and other fundamental differences between a shipbroker and a ship designer in PMAs.

5.4 Opposing Prerequisites

SBs and SDs have two distinct prerequisites for selecting which project(s) to pursue and which to shelve. While SBs wish to have a wide-ranging portfolio of projects, the SDs can only focus on a few, which was revealed by a UDS ship designer. Figure 5.12 explores the reference model's project domain in more detail. The project domain consists of various project options, where these projects can vary extensively; shaped by, for instance, scope, market, and size. In project P_1, we identify the two time instances *contact with the customer* and *contract signing*, which in this context is understood as the *lead time*. In most cases, SBs tend to choose the project(s) that minimizes the lead time. Since the shipbroker works under "no cure no pay"-deals, selecting the project with the shortest lead time and the highest success probability is the most natural choice.

On the other hand, SDs want to spend as "much time as possible" on the design activities because that is where they are creating value. For a ship design company, a longer lead time means more time to apply its knowledge and expertise to meet the customer's expectations. However, an increased lead time makes the project less attractive for the SBs. This lead time battle effectively describes the "conflict" between the two actors. It also highlights why a synergistic collaboration between SBs and SDs can be problematic to achieve.

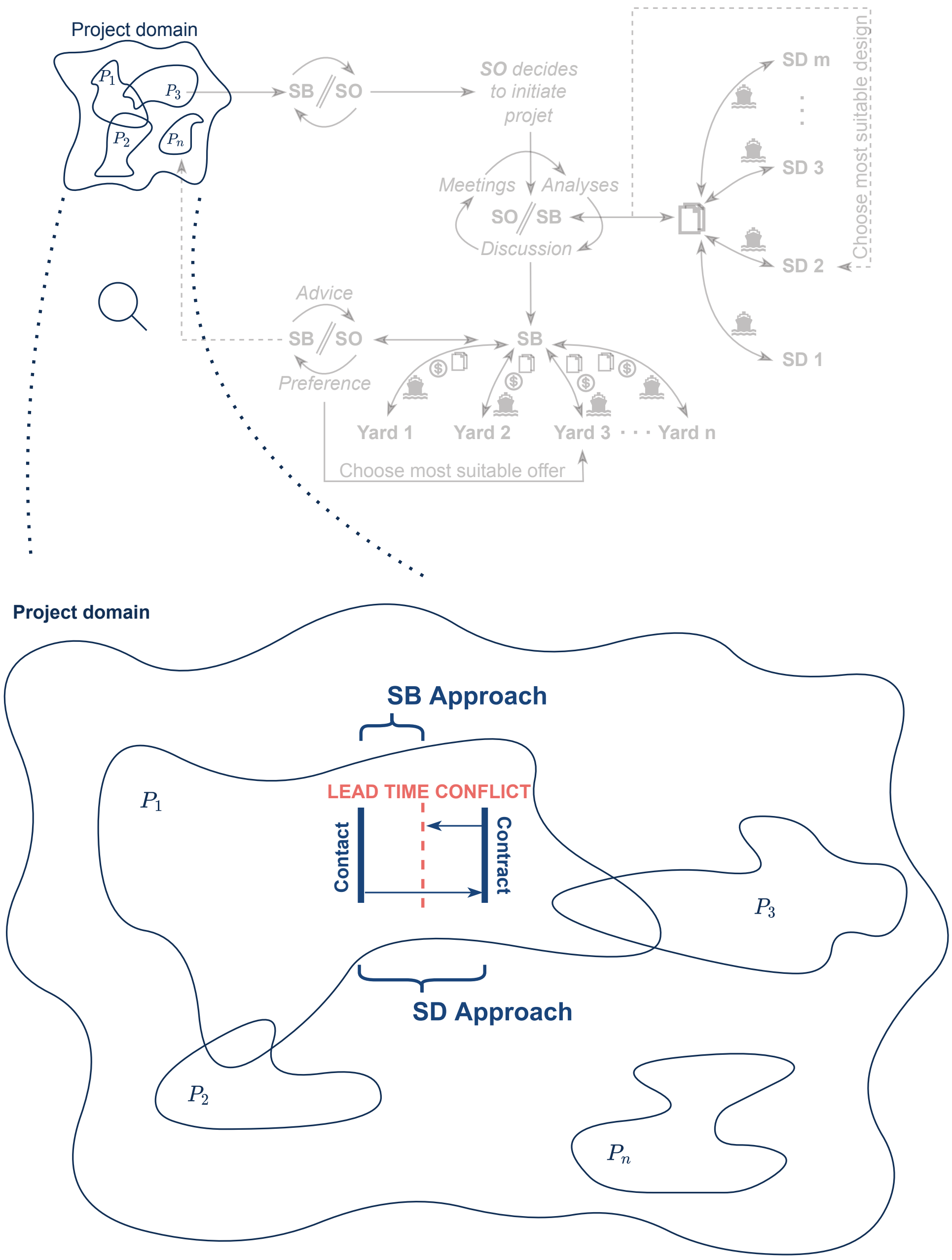


Figure 5.12: Lead time conflict in the project domain between a shipbroker (SB) and a ship designer (SD)

Essentially, the SDs need more time to understand the project. Ultimately, they are the ones that will finalize the project and realize all specifications for the ship to make sure the vessel is operating correctly. The SBs do not have to, to the same degree, worry about understanding the customer's needs because they are *just* middlemen. By default, a shipbroker knows that the customer has many choices to make, and interfering, involving, and participating in these decisions too much can result in unnecessary distortion of the process. To perform good ship design work, the designer needs adequate control of the solution.

Unlike the SDs, SBs have the advantage of diversified project optionality and less attachment to the execution and realization of the vessel, which is an important finding in the understanding of real options prerequisites for SBs and SDs. Following Wang and Neufville (2005) and Pettersen (2015), our results cast a new light on why SBs represent real options "on" projects, whereas SDs are more subjected to real options "in" projects. In reviewing Table 3.8, SBs have, to a much higher degree, more investment flexibility than the SDs. They can also treat technology as a "black box", which the SDs certainly cannot. The SDs are extremely more path-dependent than the brokers, which the Ansoff Matrix (Ansoff et al. 1957) in Figure 2.11 supports. A ship design company ticks all the boxes in the value shop terminology (Stabell and Fjeldstad 1998). At the same time, they possess value chain characteristics (Porter 1985) by transforming input, e.g., thoughts, ideas, and customer needs, into a product, the ship design. SDs are not bounded to outbound logistics, but they do provide services after the product is delivered. In essence, SBs have more real options "on" projects because of less commitment to all the activities that must be performed. In strategic management, Trigeorgis and Reuer (2017) pinpoint fundamental issues managers face between *flexibility* and *commitment*, and *cooperation* and *competition*. As Figure 5.8-5.10 reveal, a SB does not have to compete to the same degree as the SDs or shipyards. The fundamental prerequisites highlighted above represent the network/shop (model A) or network/chain (model B) configuration. If shipbrokers wish to succeed as a value network, their core business is to be an enabler of actors, where scale is the most important driver as described in Fjeldstad and Lunnan (2018). On the contrary, exclusivity could be an important factor to consider for shipbrokers. Which actor do they wish to introduce to their network, and why? If they [shipbrokers] are working on a project that needs a ship designer, the case studies disclose that they, in most cases, will include the designers that already have mature projects.

5.5 Discussion

Chapter 5 presents and discusses our findings; first, we synthesize three business models (value chain, value shop, value network) in the stakeholder domain to anchor our chosen theories to the maritime industry. We describe the shipyard as a value chain, ship designer as a value shop, and shipbroker as a value network. Furthermore, we continue building on the shipbroker-ship designer interaction by addressing each actor's *roles* in PMAs, which resulted in four models (A-D). These models reflect opportunities and potential conflicts between the two by illustrating which actor takes which responsibilities and is driven by which attributes. Second, we demonstrate a shipbroker's position in a network of maritime stakeholders to understand how shipbrokers develop value-added services for their clients. The two points form the basis for our reference model(s); that partly shows a process and partly indicates value configuration models by breaking down the aspects of the process. Finally, we argue that shipbrokers have real options "on" projects, whereas ship designers are more subjected to real options "in" projects, resulting in a fundamental challenge between the two. Following our analysis and results, we must ask whether the research questions (RQs) we proposed in the first chapter have been answered and in what way? As a basis for this final discussion section, we go through each one;

RQ1 What is a good reference model for shipbrokers' processes to develop and approach newbuilding projects?

The findings suggest that manifesting how projects are executed from shipbrokers' perspectives into one single model can be problematic. Mainly because each project is carried out differently and due to all the aspects to consider. Such results cast a new light on how complicated the pre-contract newbuilding processes can be. However, despite all the project variations, there are common elements to recognize, which can be described as a combination of pure process descriptions and different strategic models. The reference models capture which actors are involved, but more importantly, they also indicate which actor has what role. In other words; a good reference model is, in our opinion, a model illustrating the main process steps in a clear and easy-to-understand way while at the same time identifying, revealing, and showing the involved actors' business model.

RQ2 What are the most essential actions to improve the synergies between shipbroker and ship designer?

We recall that synergy is, in simple terms, described as $1 + 1 > 2$. Inside the thesis system boundary, synergy is synthesized into meaning that the combined effort from a shipbroker and ship designer produces a better outcome than if they worked entirely by themselves. As a base case, this is arguably always true. The shipbroker does not normally, have the competence to design a ship, nor does the ship designer normally, hold the same kind of information shipbrokers have - that could be invaluable in the complex maritime industry. While it is necessary to understand that ship designers are not dependent on shipbrokers to contract vessels, shipbrokers (which by nature "only" are intermediaries) depend much more on ship designers, especially in the offshore segment. The results evidence the importance of the two actors' different optionality prerequisites. The case studies and reference models manifest that the shipbroker has the advantage of having more significant optionality and flexibility in project selection and designer selection. If the ship designer does not have or is interested in showing "something" (RQ4), the shipbroker will quickly bring the project to another. Although this particular RQ has been helpful in the process of better learning how shipbrokers and ship designers interact, we believe there is no correct or conclusive answer to the question. In any stakeholder-shipbroker interaction, trust and personal relationship are prerequisites for being able to initiate a project, which the case study revealed. Therefore, the answer from the ship designers' side could be to develop close relationships with shipbrokers they trust can professionally handle their designs. Still, we mean that it does not make sense to state such a thing. Instead, we should focus on analyzing their strategic standpoint relative to each other to determine which activities should be done by which actor and why. From the results, we see that this can vary tremendously on a project-by-project basis. However, this should provide an even more significant incentive to put more effort into understanding the role distribution.

RQ3 What is the best shipbroker role with respect to the ship design process?

Similar to RQ2, it is challenging to pinpoint precisely what is the best shipbroker role in the ship design process because it is a subjective question. From the ship designer's perspective, the shipbroker is, in many cases, perceived as someone who wants the deal to be done as quickly as possible. In these cases, the shipbroker does not contribute to a synergistic relationship. On the other side, the shipbroker's core knowledge is market knowledge. Market knowledge includes elements such as what vessels shipowners are contracting, where they contract them, what specifications the ships have, and deal-specific information. Therefore, shipbrokers can provide a value-added in the ship design process. Case study 1 provided a typical example of how shipbrokers can use their core knowledge to optimize, in a high-leveled technical detail, the ship to fit the operating context for future uncertainty. Hence, the best shipbroking role is dependent on what strategy the ship designer has and, of course, what the shipowner desires. This confirms the imperativeness of adapting the strategy to the actors around. Moreover, we showed the extensive network shipbrokers possess, which can be of high value to the ship designer if appropriately used. The models also indicate, at least implicitly, that shipbrokers strive to be the actor owning the shipowner's problem.

RQ4 Which transaction documents are used between shipbroker and ship designer today? And which should be used to improve effectiveness of the newbuilding process?

Case study 2 describes the results of how projects usually branch out of each other, which shows how important it is to have "something" to show the shipowner. Since many shipowners are not enthusiastic about developing a ship design entirely from scratch, they want a specification revealing the main parameters of the boat. However, they usually want some parameters changed to optimize the vessel for their operating contexts. It is not clear what other documents might improve the effectiveness of the newbuilding process. Still, it becomes transparent that having a standardized yet flexible design allows for better shipbroker-ship designer interactions and cooperation. This gives the ship designer the possibility to enter a tender with less effort and hesitation. As the shipowners usually want a "unique" design, flexible designs could be a reasonable enabler towards being selected for a newbuilding project.

It is challenging to answer the RQs explicitly. However, by reviewing existing theory and applying it in combination with observations, interviews, and workshops, we have developed a foundation to understand the shipbroking role better. In fact, we have thoroughly described the shipbroker's point of view and used this description to address the shipbroker-ship designer interaction. By using a network perspective (Fjeldstad and Lunnan 2018), we have revealed that shipbrokers possess a central network position, having the power of controlling information. Having this control is a result of balancing the strength of weak (Granovetter 1973) and strong ties (Krackhardt et al. 2003). Moreover, the structural holes perspective (Burt 1992) confirms that holding this position is both beneficial and crucial for shipbrokers to obtain their essential market knowledge. Our observations exemplify the strength of strong ties, as shipbrokers are dependent on trust, mutual relations, and meeting others on multiple platforms, e.g., socially, privately, business-related, etc. Moreover, our results demonstrate that synthesizing the three business models: value chain (Porter 1985), value shop, and value network (Stabell and Fjeldstad 1998), into the maritime domain provides a framework to understand better how stakeholders can perceive other actors and adapt strategy accordingly. That is, understanding that there is a difference between: an actor and a role, an actor can be a role, and an actor can take different roles. We argue that the results provide new insight into the relationship between shipbrokers and ship designers and provide a framework that can be further developed, either between the two or between other maritime stakeholders. Though we acknowledge that this thesis does not provide a detailed analysis of a single topic, in part because we originally did not expect the strategy to take up such a large portion and in part because of the lack of previous knowledge about shipbrokers, we suggest several train of thoughts backed up by a great variety of results.

5.5.1 Validity of Results

The results presented in Chapter 4 and Chapter 5 are influenced by the researcher's intern stay at Clarksons and discussions during workshops with Ulstein International. It is important to clarify that the results offered are not meant to glorify, sell, or convince the shipbroking profession to be the most reasonable solution in every project. In fact, most of the newbuilding projects are done directly between shipowners and shipyards(/ship designers) without a shipbroker. To his best ability, the researcher has tried to stay neutral and critical of observations during the completion of the thesis. At the same time, he has not omitted any information to affect the results. Clarksons is by far the biggest shipbroking company globally, meaning that our results most likely reflect the benefits of being a wholly integrated, international shipping service provider. A smaller shipbroking company might recognize or perceive the results in this report differently. Regarding the limitations of only using one shipbroking firm as a source, it could be argued that the models and arguments presented are not supported by sufficient information to generalize in the way we do in this report. Particularly the network models provided; following Granovetter (1973) we have that "the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie." But at what time the link becomes weak (Krackhardt et al. 2003), we have not been able to justify other than the researcher's perceptions after working at a shipbroking house. Finally, one limitation of our implementation of generalized strategic models to describe how the PMAs are performed is also challenging because almost every project is carried out differently by every shipbroker.

Chapter 6

Conclusions

All things considered, this thesis sets out to contemplate alternative strategic models between shipbrokers and ship designers and to assess how these models affect their interaction in Project-Making Activities. In conclusion, we highlight two central elements of why we have developed an underlying framework that could help improve the shipbuilding industry in the long run.

First, we have qualitatively described and conceptualized shipbrokers' networks using Social Network Analysis by applying the Strength of Weak Ties theory and Structural Holes theory. While a stakeholder can only have so many strong ties, shipbrokers try to develop those with actors who can provide them the best information possible. Our analysis highlighted that a consequence of shipbrokers' positions in a network structure gives them information control because of a non-transparent global industry with many structural holes between actors.

Second, many different actors are needed in the shipbuilding industry to carry out the central aspects of the value creation processes. All of these actors must choose a strategy that they can do isolated. However, ultimately, an actor must think about matching its strategy with those it is working with. Depending on the strategy, it can be easier or more difficult to work with others. We have in this thesis described the findings of nine various value configuration strategies between a shipbroker and a ship designer by looking at combinations of value chain, value shop, and value network interactions between the two. Four models (A-D) were elaborated in more detail and used as a basis for further developing the framework.

Essentially, the interaction between a shipbroker and a ship designer will be characterized by each player's strategic position relative to the other. Each actor makes a theoretical choice, almost in a game-theoretical approach, where the goodness of this choice depends on what the other surrounding actors do. While we do not conclude what the most symbiotic interaction between the two is, we claim to have developed a basis for understanding drivers, prerequisites, and roles better in the Project-Making Activities.

6.1 Further Work

Based on the results and discussions presented in Chapter 5, and the above conclusion, we identify a need for further work. This thesis offers and introduces a great variety of frameworks and topics. Some of which should be further investigated, in our opinion;

- Perhaps the most novel finding, and even a starting point for further theory development, are the possible combinations of strategic model configurations for shipbrokers and ship designers (model A-D). Further investigating drivers and roles where stakeholders work on the same projects is a step toward casting a new light on truly understanding the industry's value chain.

- Building on the above point; explore the reference models presented in section 5.3 in more detail by splitting out each aspect to further understand the project-making attributes such as roles, tasks, actors, responsibilities, etc.
- Mapping shipbrokers' networks in a quantitative matter with proper data sources would make up a fascinating study and provide more knowledge (particularly towards DREAMS) of the shipbroking profession.
- This thesis takes a shipbroker's perspective on the shipbuilding activities. However, taking a ship designer's perspective on the same activities is recommended to further examine potential areas of conflict, symbiotic relationships, and other interaction attributes between shipbrokers and ship designers.

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Appendix A

The Specification

The primary purpose of the specification is to describe functions and systems in delivery (Hagen 2021). As the project matures, the specification typically moves from *brief* → *outline* → *detailed*, as described in the table below (Hagen 2021; Hagen and Erikstad 2014).

Type	General Description	Typical Level of Detail	Typical size
Brief, pocket plan	Functions, main characteristics and key performance indicators	Typically the uppermost level in WBS* or not connected to WBS. 10-15 chapters	1-10 pages
Outline	Functions, performance, and main technical solutions	Typically medium level in WBS*. 30-50 chapters	100-200 pages
Detailed (contract)	Detailed performance and technical solutions, often including individual choices on material and equipment	Typically lowest level in WBS*. 150-400 chapters	200 + pages

* WBS: Work Breakdown Structure, way of organizing activities for planning, work order, and project follow-up. Part of SFI, which is the standard coding system in shipbuilding.

Furthermore, Hagen and Erikstad (2014) describe three starting points in developing the specification(s) that are summarized in the below table. There are also many cost-drivers associated with developing the specification, such as; over-specification, Previous errors, internal inconsistencies, and obsolete technology.

Means	Description
From template	When the project is based on a more or less standardized project type SD
From copy	When the new project is similar to a previous project, like series production with minor changes
From scratch	When the project is in nature new (highly CD)

Appendix B

Interview Guide

Forhåndsavtal hvilke(t) prosjekt man skal snakke om.
Pre-arrange which project(s) to be addressed.

<u>Innledning:</u> Takk deltaker for å stille til intervju. Informer om at intervjuet blir tatt opp, men at deltager når som helst kan reservere seg mot opptak. Minn på at deltager blir anonymisert og at sensitiv informasjon blir utelatt.
<u>Introduction:</u> Thank the participant. Inform about the session being recorded by the interviewer, reservation against recording, anonymization, and sensitive information not being included in the report.

1. **Kan du beskrive hvordan prosjektet startet?**
   Can you describe how the project started?
   (a) **Hvem var pågangsdriveren?**
   Who initiated?
   (b) **Hvem var involvert?**
   Who was involved?
   (c) **Hvordan foregikk prosessen?**
   How was the process
2. **På en skala fra 1-10, hvor viktig er en skipsdesigner i meglerbransjen?**
   On the scale from 1-10, how important is a ship designer in the broking industry?

   1...10

   (a) **Kan du utdype?**
   Can you elaborate?
3. **Hva var utfordringene knyttet til samarbeidet med skipsdesigner/megler?**
   What were the challenges related to shipbroker/ship designer collaboration?
4. **Hva fungerte bra?**
   What worked well?
   (a) **Hvorfor?**
   Why?
   (b) **Hvorfor ikke?**
   Why not?
5. **Må skipsdesignerene ha transaksjonsdokumentene på plass for at megler skal kunne jobbe med dem?**
   Are the transactional documents are prerequisite for the broker to be collaborating with a ship designer?

6. **Oppstår det ofte konflikt mellom megler og designer?**
   Is there usually a conflict between shipbrokers and ship designers?

7. **Hvordan tilpasser Kina seg markedet?**
   Have China started making their own design?

8. **Hvordan ser du utsiktene til norsk skipsprosjektering?**
   Do you think Norwegian ship design firms will survive?

9. **Hvor viktig er tillit i bransjen?**
   How important is trust in this business?

   (a) **Har du eventuelt et eksempel på hvorfor?**
   Do you have an example illustrating why?

10. **Hva er de største utfordringene knyttet til dagens situasjon i bransjen?**
    What are the main industry challenges in today's situation?

Appendix C

Miscellaneous

C.1 Two cases of Ulstein Business Models

What product to provide the market depends on multiple factors (Mazzeo 2002). For a ship design firm, such factors could be current and futuristic market scenarios, in-house knowledge and experience, or whom it interprets as the customer. Ulstein Design and Solutions (UDS) has investigated two different cases where a shipbroker is included as a stakeholder. The first model is shown in Figure C.1 and identifies the shipowner as the customer. UDS provides the complete design package, including concept design, basic design, and detailed design. UDS must pay the broker a fee, independent of whether the project was first pitched by the broker or the other way around. In return, UDS does not have to handle (potentially) demanding customers. They also have little in-house competence in the so-called *business-to-pleasure* sales, i.e., private customers in the yacht market.

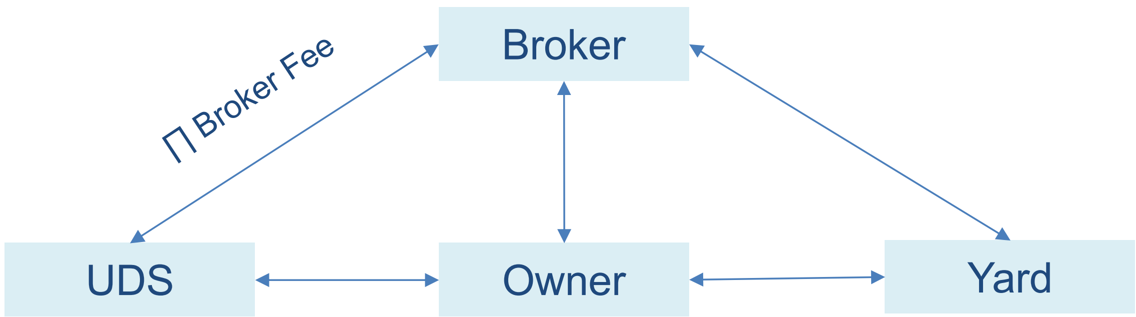


Figure C.1: Shipowner as customer (Ulstein International, 2022)

The second model is seen in Figure C.2, which handles the shipyard as the customer, not the shipowner. In such cases, UDS sells design packages to shipyards, leaving the yard responsible for finding customers. The yard could already have customers or have customers in mind, but in other cases, they rely on brokers to "deliver the word" to the market. Nevertheless, now the yard is responsible for handling the customer, which can be both beneficial and risky for UDS.

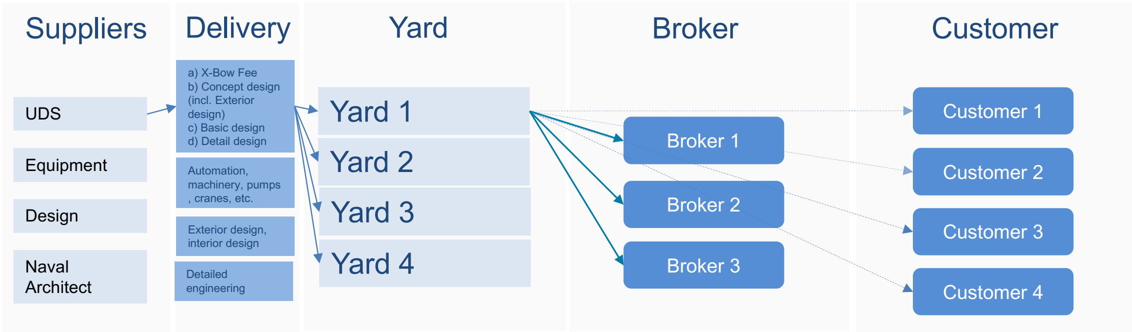
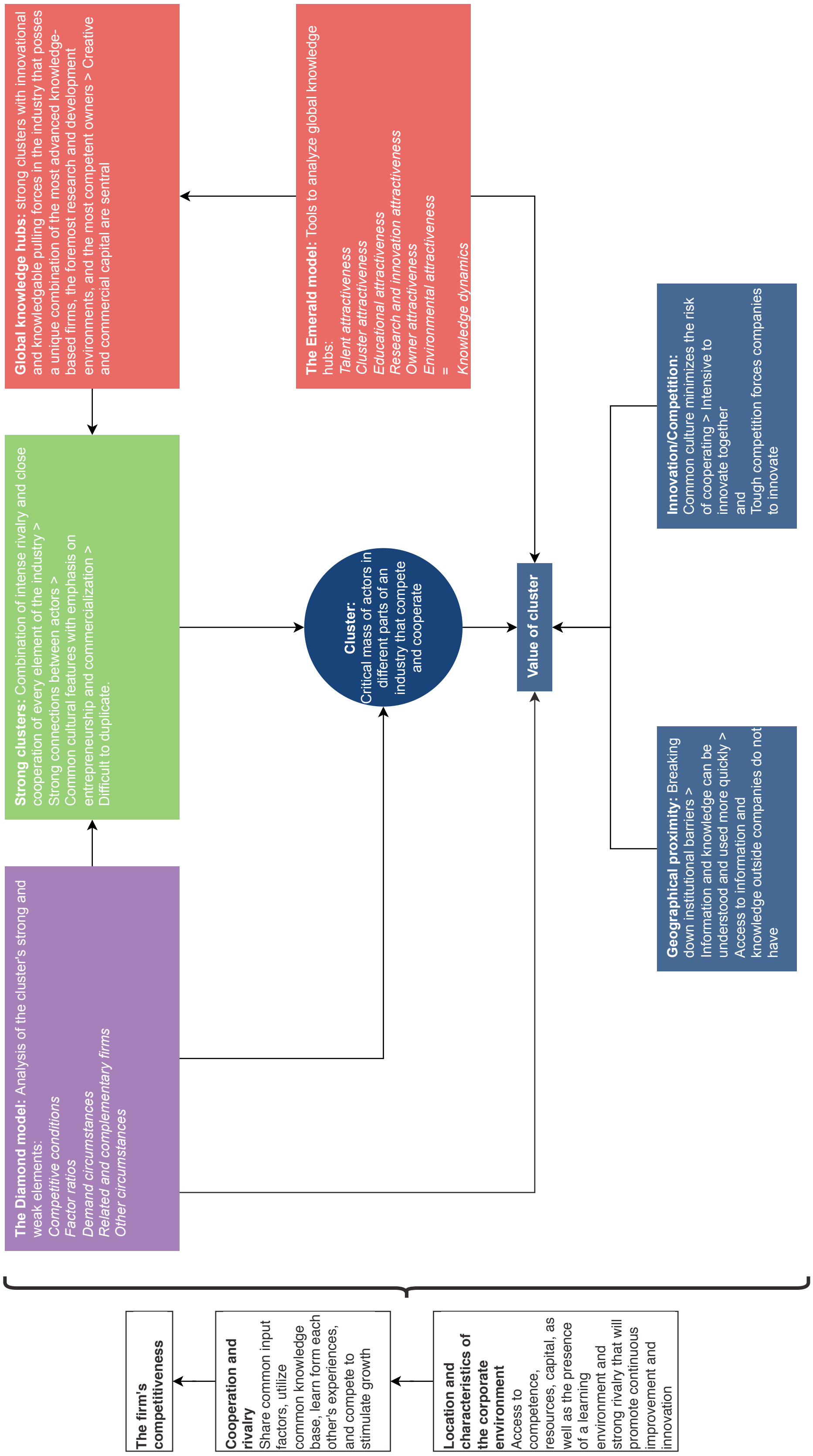


Figure C.2: Shipyard as customer (Ulstein International, 2022)

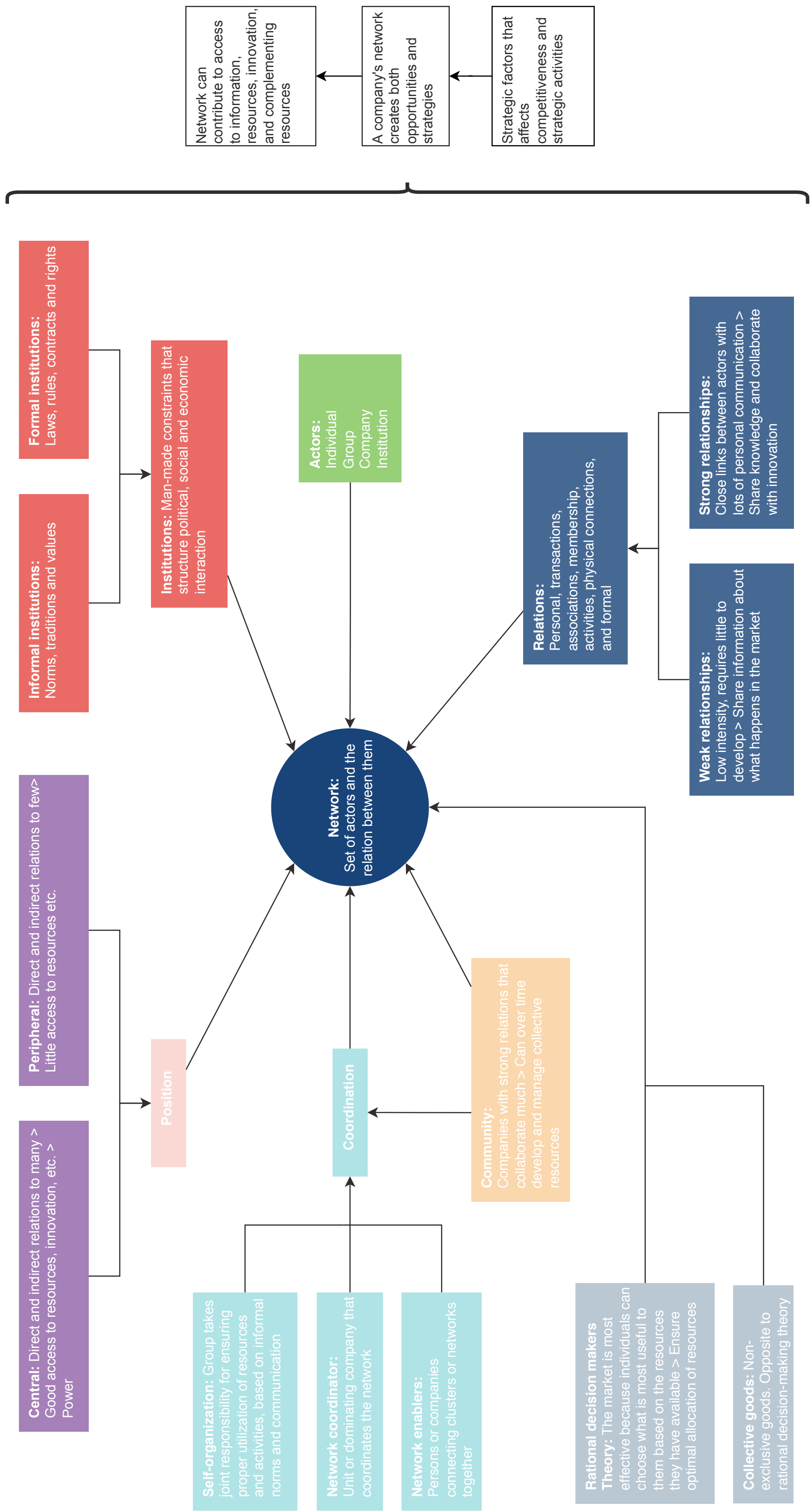
C.2 Cluster Mind Map

Translated and taken from Fjeldstad and Lunnan (2018).



C.3 Network Mind Map

Translated and taken from Fjeldstad and Lunnan (2018).



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