

What is a ship design firm, really?

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ABSTRACT

Ship design is a creative process serving a defined objective. This is normally an iterative process with the design being corrected and adjusted many times until it satisfies this objective. Ship design is taking place in a broader business context consisting of stakeholders providing necessary resources and information to enable the realization of a vessel newbuilding project. Activities performed by different actors, such as customers, suppliers and brokers, are organized by and integrated into a ship design firm. This paper addresses and discusses different ways of organizing integrated design-related activities to deliver on the firm's value proposition. A value proposition denotes the promised value to a selected customer, and through its value proposition, a ship design firm provides "superior" solutions to a customer's needs. To enable this solution, a design firm draws on its current resources, including its past knowledge and experiences, and uses these resources in different types of processes, and – in different ways of collaborating with internal and external actors and specialists.

In this paper, we draw on approaches from the field of business strategy to understand implications and trade-offs in different logics of value creation processes, how they can be applied in ship design firms, and their implications.

KEY WORDS

Ship design; firm strategy; resource organization; value activity analysis

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1 INTRODUCTION

Ship design has traditionally been executed by naval architects and marine engineers (Andrews, 2010) with an integrating role for specific disciplines involved in the process. In the past, this activity was mostly done by integrated shipyards, while more recently the ship design role – particularly during the vessel concept ship design phase – has been decoupled from yards and, in the merchant shipping world, is done mostly by firms that are specialized in ship design activities (Semini, Sjøbakk, & Alfnes, 2013; Semini, et al., 2023).

Shipbuilding is still considered, by most parties, as comprising the design of the vessels, the erection of the ships, and finally, the production of all main systems and equipment onboard to eventually constitute an operable floating ship. Shipbuilding, including ship design activities, is a highly competitive global industry. Over the past decades, European shipyards have lost a considerable part of their market share to East-Asian shipyards, especially within the conventional and high-volume cargo-carrying segments, such as tankers, bulkers, and container vessels. In these segments, European shipyards now play a marginal role – a market share of less than 10% of the worldwide annual orderbook (Brett, Gaspar, Ebrahimi, & Garcia Agis, 2018; Semini, et al., 2023). In Europe, and Norway in particular, shipyards and their affiliated or independent ship design firms have focused on a limited set of specialized vessels, but still stand for a good portion of the worldwide orderbook value within passenger vessels, fishing and aquaculture vessels, service vessels, including both the offshore oil & gas service vessels as well as ships for the offshore wind industry. Yet, for most of the European ship design firms the European shipbuilding market is not sufficient, and they also provide ship design services to other international yards. Projects with the European shipyards are typically one-of-a-kind rather than series of ships, which is the case in the Far East. Typically, European ship design firms deliver few, but novel design packages with high degree of innovation – complex and expensive designs.

With the past and current low levels of demand and ordering of ships, yards and ship design firms have been and still are struggling to make sufficient profit margins out of meager order books and falling market shares. Competitiveness is dwindling too. To regain competitiveness – despite other parts of the world benefitting from lower wages, lower material costs, more favorable financial support, more lenient laws, and regulations – there is a critical need for European shipbuilders and independent ship design firms to improve their understanding of why this long-term market trend is happening, what affects their performances and how it can be improved. It is argued by this article that for regaining competitiveness in the ship design firm business segment, a much deeper and broader insight into how value creation and extra profits can be achieved is paramount. Further, it is argued that competitiveness is among other factors, particularly interlinked to the choice and application of strategy models for value creation in that business segment. Therefore, this article looks for ways to improve competitiveness by better understanding the basis for applying one or a mix of the generic strategy models for effective value creation (Fjeldstad & Lunnan, 2022).

This paper is rooted in the DREAMS research project, which has researched these challenges for a couple of years with the goal of improving the competitiveness of Norwegian ship design companies. The project was introduced to the IMDC participants at the Vancouver IMDC 2022 conference (Brett, Asbjørnslett, Garcia Agis, & Erikstad, 2022). In this paper, we would like to share and discuss some of the preliminary findings. The study and this paper take a broader view, stressing that such a study must take a comprehensive approach to competitiveness – with the purpose of the ship design activity to make money and not only produce better and innovative design solutions.

Previous papers at IMDC have discussed many technical aspects and considerations around the ship design process as well as design methodologies (Andrews, et al., 1997; Andrews, Keane, Lamb, Sen, & Vassalos, 2006; Andrews, Papanikolaou, Erichsen, & Vasudevan, 2009; Ulstein & Brett, 2012; Andrews & Erikstad, 2015; Andrews, Kana, Hopman, & Romanoff, 2018; Erikstad & Lagemann, 2022). Little emphasis has been placed on the organization of human resources in performing design activities. However, in several IMDC papers it has been stated that naval architects and marine engineers as well as ship design firms must expand their knowledge, expertise, and skills to be able to handle future ship design challenges from a commercial, operational, and technological standpoint (Ulstein & Brett, 2012; Brett, Garcia Agis, Ebrahimi, Erikstad, & Asbjørnslett, 2022).

This paper discusses ship design activities from an organizational and business perspective by discussing strategic aspects around the design team composition. We hope this opens a relevant discussion on how ship design is performed in practice and how a ship design firm can create value for its customers. This has important implications for the type of people employed, their competence and skills and consequently also demands for academic education (Asbjørnslett, Erikstad, Lagemann, & Brett, 2022).

Our paper is structured as follows: Subsections 1.1 to 1.3 introduce the topic and important concepts and definitions. Section 2 presents four strategic models for value creation. Section 3 describes how the two most common strategic models can be applied

to ship design firms, supplemented by two empirical cases. Section 4 compares and discusses the two models, and Section 5 concludes the paper.

1.1 Definition of a ship design firm

Design is a decision-making process that results in the specification of an artifact (Goel & Pirolli, 1989; Simon, 1996). The ship design process can be categorized as a special variant of the design of physically large and complex systems (Andrews, 1998; Garcia Agis, et al., 2019; Ebrahimi, Brett, & Garcia Agis, 2018). The ship design process is typically executed by a team of naval architects and marine engineers, with support and expertise from various other disciplines such as sales, interior design, electrical engineering, and suppliers. If this team is part of a business entity¹, can this organization be termed a ‘ship design firm’? In other words, are all organizations that conduct some ship design activities called a ‘ship design firm’? To our understanding, the answer to this question is ‘no’.

Figure 1 indicates the general ship design process timeline and several relevant stakeholders involved. Each of these stakeholders may employ naval architects, marine engineers, and other experts, and each may engage in the ship design process in one way or another. Yet, we would not call all of these stakeholders ‘ship design firms’. Instead, for this paper, we suggest the definition of a ship design firm as ‘a business entity where ship design constitutes the primary value activity and where a significant integration effort takes place’. To be more precise, we consider only firms that sell the specification and drawings of a ship to be a ship design firm. In other words: If you cannot buy a ship design from it (i.e., a specification, class-approved drawing package and supporting analyses), that firm does not count as a ship design firm for the purpose of this paper. This definition aligns with the idea that systems architecture is at the core of early-stage ship design (Andrews, 2003; Andrews, 2015).

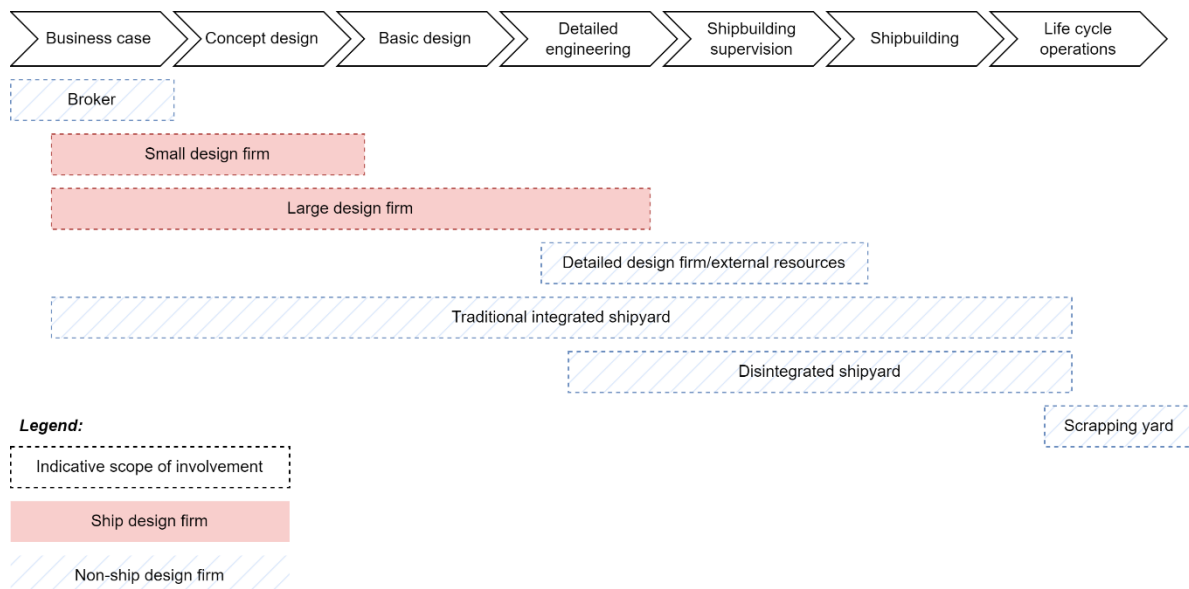


Figure 1: Different actors in the ship life cycle

It should be noted that formerly, ship design was mainly executed at what is here called ‘traditional integrated shipyards’, spanning the whole value chain from early-stage ship design to shipbuilding, maintenance and repair of ships. While this is still common practice in some instances and many countries (Cho & Porter, 1986), diversification and specialization have taken place in many locations. More firms are entering the market that focus their main activities on ship design. These firms’ main activities are design, not shipbuilding. This is especially true for the Norwegian market, where yard activities and market share have been declining over many years (Menon Economics, 2023), but we see independent ship design companies are generally growing by number, revenue and employees – albeit growth was halted after 2015 (inhouse compilation based on data from Proff (2023)). While the Norwegian ship design firms’ global market share is around 3 to 5%, ship designers provide important design and integration competence to Norwegian yards, the maritime cluster (Menon Economics, 2022), and to customers (owners, operators, and yards) abroad. The labels ‘small design firm’ and ‘large design firm’ in Figure 1 relate to the firms’ scope of involvement (concept, basic or detail) in the design process, not directly to their size in terms of turnover or employees

¹ The Oxford English Dictionary (2023) defines a firm as “generally: a commercial enterprise, business, or company”.

as such. A ‘disintegrated shipyard’ (ship factory), in this paper, shall denote a yard that does not undertake substantial design activities itself, but instead focuses on ship production and repair.

1.2 Standardized and customized design and market interaction strategies

Shipyards typically follow different product portfolio strategies with respect to standardization and customization and sometimes a mix of the two. In most cases, customer strategies are then linked to market interaction strategies and the value creation strategy of the company. Ship designers may certainly, also employ such different strategies. One element of this strategy concerns activities covered and their customization. Semini et al. (2014) discuss four different approaches. First, make-to-stock, where products are manufactured to and sold from stock. Second, assemble-to-order, with components produced to stock and awaiting the final assembly to an order. Third, make-to-order, with all components and assembly waiting until an order is placed. Fourth, engineer-to-order (EtO), where the design is completely customized to an order. The four different approaches and their relation to the customer order decoupling point (CODP) are illustrated in Figure 2. The choice of approach has profound implications for what a ship design firm is, its organization, and how it operates.

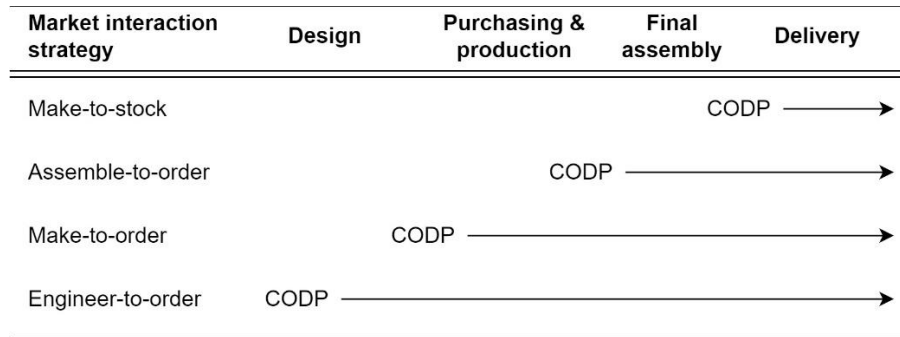


Figure 2: Market interaction strategies and customer order decoupling point (CODP), adapted from Semini et al. (2014) and based on Olhager (2003).

The make-to-order (customize existing design concepts) and engineer-to-order (design solution from scratch) strategies are the most relevant in this context, as they involve design activities as opposed to production and assembly activities (shipbuilding) only. On the surface, there may seem to be a certain overlap with Andrews’ (1986) different degrees of novelty in ship design, i.e., adapting existing designs versus developing radically new technology and system solutions. The difference between the two is that a market interaction strategy describes a designer’s approach towards a customer, whereas Andrews’ degrees of novelty describe the following internal design processes. In this paper, we explore the importance of a fit between a market strategy towards the customer, the novelty of the design solution, and the organization of the ship design process and the role of the team.

1.3 Different types of customer interactions

Closely linked to the market interaction strategies, different types of customer interactions exist. In Table 1, we outline five customer interaction types that are commonly exercised in commercial merchant ship design processes.

Table 1: Customer interaction types

#	Customer interaction	Archetypical request	Typically initiated by	Solution response strategy	Competition
1	Customer design inquiry	“I want to have this ship”	Ship owner	New/existing	Unknown
2	Broker inquiry	“Do you have a solution that can do...?”	Broker or ship owner	Existing	Unknown
3	Tender inquiry	“Can you help us respond to this tender?”	Ship owner	New/existing	Usually known
4	Customer project inquiry	“Can we develop this together with your expertise/knowledge?”	Various	New	None
5	Project-making	“We have an interesting business proposition to offer you - do you want to be part of the initiative?”	Ship designer	New/existing	None

The market interaction strategies are closely linked through the ‘solution response strategy’ indicated in Table 1. A ‘project-making’ customer approach is normally combined with a standardize-to-order market interaction strategy. Thus, a standardized technical solution (StO) is developed, most often, without a customer involvement in the early phases of the project, but one or more takers (customers) may be involved at a later stage in the finalization of the new building project realization. While this inquiry approach is not so common, more often make-to-order strategies (configuration-based design or variant design; CtO) are experienced in the interrelationship with the customers. Interesting to note for our discussion are the differences between re-using existing designs, simple adaptations of these, and designing a complete novel ship from scratch.

In addition to the customer interaction strategy chosen, the overall value creation activities in a ship design firm, i.e., the ship design activities and resources’ organization, may be arranged and performed according to a set of different value creating logics. It is argued in this article, therefore, that these logics have profound implications on the way activities are organized and executed, and what people, knowledge, experience, and tools are needed. The next section presents and analyzes ship design activities considering these models. We will particularly focus on two strategic models for value chain creation: the ‘value chain’ and the ‘value shop’.

2 STRATEGIC MODELS FOR VALUE CREATION

A firm’s strategy can be described as a plan or pattern to attain overall goals (Nag, Hambrick, & Chen, 2007). Reaching strategic decisions, the firm must make three consistent choices (Miles & Snow, 2003):

- i) What products and services to deliver in which markets;
- ii) What activities and resources to utilize to deliver these products and services;
- iii) How to acquire, develop and organize these resources and activities to balance efficient operations and innovation.

These choices are partly interdependent. That is, to offer a low-priced product or service, for example, the firm must pursue low-cost resources and activities, whereas costly technology development may be needed for novel and unique designs. It should also be noted that the competitive advantage is only temporal (McGrath, 2013) and a firm needs to continuously monitor and critically evaluate its choices with respect to aspects i) to iii).

To examine, study, and understand activity systems and the drivers of cost and customer value, Porter (1985) introduced the value chain, outlining a “manufacturing” logic, focusing on economies of scale, capacity utilization, and activity linkages as core cost and value drivers. This configuration framework was later expanded by Stabell and Fjeldstad (1998), introducing the “value shop” and the “value network”, building on the long-linked, intensive, and mediating technologies topology by Thompson (1967). Furthermore, Fjeldstad & Lunnan (2022) introduce “value access” as a fourth value creation model. Value access means appropriating value by offering customers access to shared resources, e.g., cloud computing or “management for hire”. Each of these models focuses on different sets of activities, different dynamics between these, and different drivers of cost and value. Table 2 provides an overview and comparison of the different value creation models.

Table 2: Value creation models

	Value chain	Value shop	Value network	Value access
Business problem¹	Transforming inputs into products (production-based) ¹	(Re)solving customer problems (Problem solving-based) ¹	Linking customers directly and indirectly (Network-based) ¹	Providing access to resources ³
Deliverables created¹	Products ¹	Solutions ¹	Services ¹	Access to resources ³
Business-logic method¹	Sequential ¹	Cyclical, spiraling ¹	Simultaneous, parallel ¹	Continuous ³
Value creation strategy¹	Achieve scale and focus on efficient linkages between activities ¹	Make optimal use of human capital and reputation ¹	Create superior connectivity and ability to carry products and services ¹	Secure resources and their quality ³
Activities¹	Inbound logistics Operations Outbound logistics Sales and marketing Service ¹	Problem finding Problem solving Solution choice Execution Control/evaluation ¹	Network promotion Contract management Service provisioning Network infrastructure ¹	Acquiring resources Managing resources Manage customer interface ³
Frequent activity tradeoffs²	Differentiation vs. cost leadership Integration our outsourcing ²	Knowledge depth and scope ²	Open source vs. walled garden. Broad vs. specialized ²	Focused vs. Specialized ³
Sources: ¹ Sjøvåg (2022), Table 3.1 ² Fjeldstad & Haanæs (2001) ³ This paper				

In ship design activities, the ‘value chain’ and ‘value shop’ appear to be the most common value creation models and will be examined and exemplified in the following section. The ‘value network’ and ‘value access’ configurations are less common as explicit and individual strategies for ship design activities as such, but for some appear as complimentary value creation strategies for supporting, additional products and service deliveries. Maritime examples for these two models do exist, however: Broker activities are typical instances of a ‘value network’ configuration. DNV’s Veracity platform (DNV, 2023) may be seen as an example of ‘value access’, with elements of a ‘value network’ as it enables third-party app developers to link with customers. Moreover, a ‘project-making’ type of customer interaction in ship design shares many elements with a ‘value network’ logic.

3 VALUE CHAIN AND VALUE SHOP EXAMPLES OF DESIGN FIRM STRATEGIES

In this section, we will first outline the two value configuration logics of a ‘value chain’ and a ‘value shop’ and illustrate these two logics with examples from two different ship design firms. One of the ship design firms more often uses the logic of a ‘value chain’, whereas the other one uses the logic of a ‘value shop’. The description of the illustrative cases is based on a total of 17 interviews with employees from the two firms. The semi-structured interview setup covered a pre-defined set of topics, while giving the interviewees the opportunity to elaborate. The interviews were conducted mostly by one interviewer, who asked questions and simultaneously took notes to document the interviewees answers. After the interview, the answers were analyzed and condensed by the interviewer into one summarizing document.

The activities of firm A and B can to some extent be described by one of the two value creation logics. In practice, however, both firms do adapt and mix the logics to a certain extent, dependent upon the type of customer inquiry received. Such a mix can be observed within and across projects. That is, within one project, a firm may predominantly follow a ‘value chain’ logic for instance, while still employing elements of the ‘value shop’ logic to a limited extent. Across projects, the firms may also switch between strategic approaches and in that sense adapt their value creation logic to the nature of the project and customer inquiry and thereby, mix the two whenever meaningful.

3.1 Design firm A – example of the applied value chain logic

In a typical value chain framework, the ship design firm follows a sequential logic, which often relies on standardization. The design processes can be portrayed as a chain of interlinked and linearly organized activities, where the work performed in one activity builds on the work done in the prior activity. The work is done by separate units, and specialized. In principle, there should be no need for feedback loops, the process is one-directional. This type of design firm is akin to an assembly line and is therefore also called a 'project factory' approach, in this paper.

At the initiation of each project, the project manager divides the project into specific parts identified by discipline. The project manager oversees the combination and coordination – the linkages between – these parts and information exchange. Ideally, the boundaries between disciplines are as clear-cut and as specific as possible, following a seamless handover between different disciplines. Each discipline is handled by a group of specialists, who do not necessarily need to know what other specialists do, if the interfaces between the parts of the design are clear, well-specified, and structured. The design process can follow a sequential and established logic, where each part is done according to allocated time and clear specifications. The customer, normally, takes no part in the execution of the design work processes, as the various tasks are clear and well understood by the naval architects, marine engineers and other specialists involved. Therefore, this process only works well if the project-specific expectations and requirements are clearly defined, documented, communicated, and understood prior to the design process execution and the naval architects and marine engineers are well trained and experienced in their work disciplines.

This logic can be illustrated by design firm A. Design firm A employs about 40 people directly engaged in the design activities, many of them with a specific discipline training and experience and/or shop floor background from a shipyard. The firm engages normally in projects with a concept and basic design scope. To engage in the latter one, a "winning" or an accepted customer concept design is a prerequisite. For both design phases – concept and basic – the firm's activities can be described with a value chain logic (similar to a project factory): In concept design, the project team usually consists of seven people with different roles. Two out of seven have an integrating function, and five out of seven work within their specific discipline. Each discipline uses its own specialized set of tools. Although employees are located on the same floor, they typically have separate offices combined with separate meeting rooms and more informal social areas. In the basic design phase, the design team is typically enlarged, and each discipline follows its own pre-defined and specific workflow. This work process triggers a lot of coordination meetings and mini seminars.

Design firm A has a long tradition in the design of complex vessels of medium size. Most of these vessels can be classified as service vessels. Examples in the most recent past are service offshore wind vessels (SOV), expedition cruise vessels, fishing and aquaculture vessels, or cable laying vessels. Common for all these vessels is that they have complex operational patterns and systems to integrate on a small to medium-sized vessel, typically up to 160m. The vessels are typically built as one-offs or in small series. Design firm A makes use of all five types of customer interactions (Table 1). Over time, a considerable design portfolio has been built up. The firm proactively develops this portfolio/catalog, both to strengthen inhouse knowledge and to be able to offer standardized, but customizable solutions to certain customers, such as for customer approach #2 (Broker inquiry: "Do you have a solution that can do...?"). To cut response time in a tender process, catalog solutions may serve as a starting point for most customization or adaptation work.

3.2 Design firm B – Example of the applied value shop logic

In a typical value shop framework, the design firm follows a logic of problem-solving. The design a customer demands is unique and does not currently exist. Every new project starts a creative process, where the main idea is to match customer preferences with the design in a novel way. Customers may have non-standard requests that cause ripple effects among different disciplines involved in design, and initially, the main elements of these must be identified. At times, the customer may not be clear on her exact demands and needs to explore the feasibility of these together with the design firm. The interaction between the customer and the design firm is normally handled by the most senior experts in the firm. These seniors have deep and broad knowledge of the major disciplines and have skills in customer communication. In this process, important stakeholders, such as customers and major suppliers are involved in early discussions and in offering comments to early design suggestions, promoting an interactive (as opposed to the sequential value chain logic) value creation logic. The process is characterized by feedback loops and trials until the main elements of the design are settled. Then, the detailed work may be handed over to specific disciplines and sometimes junior engineers (yet, with deep knowledge in one discipline). In such a value creation logic strategy, it is important to stop the process and revert back to start if surmountable problems occur and incorporate more deliberate customer and expert feedback along the way.

Design firm B consists of about 20 people directly engaged in design activities. Most of these have a master-level education in naval architecture, resulting in a workforce with consistently high and homogenous academic training. All naval architects are trained on a small set of tools. These tools partly consist of commercial software, and partly of special in-house developments.

In concept design, the project team typically consists of three to five people in total, with one senior naval architect as a project leader. Due to their relatively homogenous skills, one person can have different roles in different projects. To promote and further develop this versatile and homogeneous skillset, it is common practice to rotate the roles among employees over time. All people work on the same floor and in open plan office facilities.

Firm B is an established designer for large, offshore energy vessels applied in segments such as wind turbine installation vessels (WTIVs) or foundation installation vessels (FIVs), and heavy lift and other specialized vessels (HLVs) for the offshore oil & gas industry. These vessels are typically somewhat larger in size, more expensive and tailor-made one-offs. Firm B is usually contacted by customers to develop tailor-made solutions. While the firm also maintains its own design portfolio, the firm's target segment is characterized by tailor-made, one-off solutions as opposed to potentially small series. Vessels in this segment are, on average, more expensive and the engineering hours – particularly concept design hours – amount to a smaller proportion of the overall costs of the vessel.

4 DISCUSSION

The two value creation logics we have outlined may both provide competitive value propositions to customers. A 'project factory' model is normally more cost- and time-efficient on known designs and when market conditions are good – many inquiries that need quick turnaround time for response – much dependence on continual high production throughputs, whereas the 'value shop' model offers highly customized designs for special missions and is less sensitive to consequences of good and bad market conditions. The project factory approach is also less demanding w.r.t the qualifications of the engineers involved – a few well-seasoned naval architects can handle several less trained engineers. On the other hand, it requires more organizational structure and management – more formalism. The value shop model requires more experienced and fuller-fledged naval architects and marine engineers, i.e., project managers being capable of both handling the upstream sales interaction and the downstream managing the project efforts until delivery of the design package.

If we consider our two examples of solutions (firm A and B), both operate on a project basis. That is, a temporary project team is assembled individually for each project – whether paid for or not, and whether a concept or basic design scope – from the pool of available employees within each company (relatively constant over time). The skillset and composition of this human resource pool differs between the two design firms, and this is reflected in the project team composition. Firm A employs specialists in each discipline that focus on a specific part of the design process. For firm A, it is vital to have a clear overview of the design project, and design the interfaces where activities are handed over to the next discipline. Firm B's work force is less discipline-specific and has a more versatile background. Their skillsets, tools, and collaborative shared workspace facilitate a more problem-oriented working style in line with the value shop logic.

The main challenge of a 'value shop' type of logic is to as quickly as possible come up with a concept design solution that is agreeable to the customer and feasible for all other stakeholders. This implies that the initiation of a value shop project is crucial, and that handling and coordinating initiatives from all stakeholders finding a solution is the key (Brett, Gaspar, Ebrahimi, & Garcia Agis, 2018; Garcia Agis, et al., 2019). Our illustrative example shows that firm B has succeeded with this collaborative and less streamlined working style in the conceptual phase, reporting good experience and high satisfaction with this value configuration logic. Firm A's more streamlined 'project factory', in turn, showed more variety in terms resource consumption and deviated more often from its original plan in the conceptual design phase. A possible explanation for this is that the conceptual design phase can be more successfully approached by 'architecting' (Brooks, 1995; Maier, 1996; Maier & Rechtin, 2000; Andrews, 2012; Andrews, 2018) instead of a streamlined 'engineering' approach, as the V-model and others suggest.

Fjeldstad & Lunnan (2022) suggest that the chosen value creation model must fit the other strategic choices, e.g., resources and market positioning, of a firm, in addition to factors such as culture and practice. This is also suggested by Porter (1996) as the notion of "strategic fit" between different activities. Thus, when discussing the two firms' value creation logics in the conceptual design phase, the relation and fit to its other activities, its market positioning (target segment and customer interaction types), and its resources must not be neglected. Neither should general time-dependent circumstances be forgotten: In periods with high market activity, firm A reported good experience with the 'project factory' value creation logic. This was possibly due to a high level of similarity between different designs and high project turnaround, which enabled an efficient utilization of personnel and expertise. In this situation it was much easier to divide tasks and standardize interfaces, simply based on prior experiences. Thus, there was much less need for an initial consultation with the customer because the task was assumed clear. In periods with lower market activity and higher demand for unique designs, firm A has been forced to expand into other market segments in order to keep the business going and utilize its personnel. Under such circumstances, the firm lacks the experience needed to standardize the workflow and may also enter projects where the customer wants a unique design. In this situation, the 'project factory' is more problematic.

5 CONCLUSIONS

In this paper, we have characterized a ‘ship design firm’ as ‘a business entity where ship design constitutes the primary value activity and where a significant integration effort takes place’. By this definition, the ship design firm is thus fundamentally different to a shipyard, where ship erection constitutes the primary value generation activity. We have shown that the difference between the two can – in certain cases – also be seen in the value creation logic, i.e., the internal configuration of the firm’s activities and personnel: The value creation logic at a shipyard, with relatively well-defined and sequential tasks, can almost always be described as a ‘value chain’ logic. In contrast, ship design firms – in particular in the concept phase – often operate with less streamlined, iterative problem-solving activities that can be described as a ‘value shop’ logic. Our two example firms have shown that a seemingly streamlined ‘value chain’ logic creates friction in the conceptual design phase. A likely reason is that the nature of the problem (Andrews (2011) “wicked”; Pettersen et al. (2018) “ill-structured”) conflicts with well-defined and streamlined processes in a ‘value chain’. The ‘value chain’ does, however, work well in ship design when project turnover is high, as it enables an efficient utilization of resources. To exploit these scale effects, it seems to be necessary to have well-defined tasks with clear interfaces. This can be achieved by strategically focusing on projects with a high similarity in the conceptual design phase, or by a higher share of activities in the more well-defined basic design phase.

Our illustrative examples and the discussion are based on the comparison of only two firms. To strengthen or discard our illustrations, a larger number of case studies as well as a quantitative study would seem useful. Moreover, our analysis has primarily focused on the conceptual design phase in both firms. For both firms, a successful concept design is seen as necessary to win projects with a basic design scope. Both firms adapt their value creation logic to the different demand of such projects. However, successfully employing different value creation logics within the same firm and with potentially the same people may pose challenges. The explicit switch between the two logics within the same firm should therefore be further investigated. Finally, we have described the ‘as-is’ state of two design firms as examples of the two most common value creation logics. In order to improve competitiveness and develop ‘to-be’ states, the application of the remaining logics ‘value network’ and ‘value access’ should be critically examined (Sjåvåg, 2022).

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CONTRIBUTION STATEMENT

Benjamin Lagemann: Conceptualization; formal analysis; investigation; resources; data curation; writing – original draft; visualization. **Randi Lunnan:** Conceptualization; methodology; writing – original draft; supervision; funding acquisition. **Per Olaf Brett:** Conceptualization; methodology; validation; writing – original draft; supervision; funding acquisition. **Jose Jorge Garcia Agis:** Conceptualization; validation; resources; writing – review & editing; supervision; funding acquisition. **Astrid Vamråk Solheim:** Investigation; writing – review & editing. **Stein Ove Erikstad:** Conceptualization; writing – review & editing; supervision; project administration; funding acquisition.

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