
Business models as framework for sustainable value-creation: strategic and operative leadership challenges

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Abstract: This study explores leadership challenges related to the operationalisation of sustainable business models in offshore shipping. Based on a comparative case study, the study finds that the business model framework and the business model canvas' building blocks must be adapted and adjusted to the resources and capabilities of the firm and its strategic and industrial context and operation. Another crucial finding is that the processes and relationships between the business model's building blocks – the day-to-day actions and activities in developing, implementing and gradually revising and auditing a chosen business model – are strongly leadership and management intensive. By giving an example of sustainable value-creation, the study contributes to the state-of-the-art of corporate sustainability management and development by illustrating how new business models can be pursued in the maritime shipping industry.

Keywords: business models; business model canvas; sustainability; value-creation; leadership; strategising; innovation; maritime shipping industry; Norway.

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1 Introduction

Marine transportation is a cost-effective, reliable and comparatively environmental-friendly mode of transport, and some 90% of goods are transported by sea. Nevertheless, according to the International Maritime Organization (IMO) and confirmed by independent research (Harrould-Kolieb and Savitz, 2010), maritime shipping accounts for an estimated 3–4% of human-caused carbon emissions (IMO, 2014). While the debate continues regarding to what extent industrial activities impact the environment and what needs to be done about it (Mendonca and Oppenheim, 2007), the maritime industry has been called to action by the Brundtland report’s demand for an increased focus on sustainability¹ (UN, 1987). Accordingly, and in line with many other industries, more sustainable maritime shipping has during the past 10–5 years increasingly become a political, public and business concern. The issue has also been on top of the agenda for national and international organisations representing shipowners, such as the Norwegian Shipowners’ Association (NSA) (Henriksen, 2014) and the IMO (IMO, 2013). This development has stimulated a growing body of literature on *sustainability* (Goodland, 1995; Krishna and Loruswannarat, 2018) and corporate greening (Cohen and Winn, 2007), but despite this growing scholarly interest, management research and practitioners still lack a varied empirical examination of sustainable business practices and the potential for entrepreneurial rents arising from environmental-friendly innovations (Evans et al., 2017).

This study explores leadership challenges related to the development and operationalisation of sustainable business models in the Norwegian offshore shipping industry. On a global scale Norway has a large maritime industry. Its offshore segment is the second largest in the world² and is characterised by high competence and advanced technology. Norwegian maritime clusters, including leading shipping companies, shipbuilding yards, equipment manufacturers, designers, service providers, universities, research and development centres, and regulatory bodies, are among the world’s leading

suppliers of innovative and environmental-friendly solutions (Benito et al., 2003; NSA, 2016). Based on this contextual setting, it is the objective of this study to contribute to science by analysing how three environmentally conscious (Huang and Kung, 2011; Lynes and Dredge, 2006) Norwegian firms engaged in offshore maritime operations in the oil and gas sector chose different business models in their search for more sustainable operations. The study thus responds to specific calls from both the natural and social sciences to gain more knowledge (Lozano et al., 2013) about firm-based technical and managerial actions and activities involved in the process of going green in the maritime industry (Dalsoeren et al., 2009; Gjosæter and Kyvik, 2017; Mansouri et al., 2015).

Based on recent theoretical perspectives on the development of sustainable business models (Lüdeke-Freund and Dembek, 2017), this study specifically has as an objective to explore the role played by technical and managerial resources, competencies, and leadership capabilities in strategising processes aiming at more sustainable maritime operation. The topic is of key importance for companies operating within the offshore shipping industry subject to strong international competition while aiming to deliver cost-effective value-creation in more environmentally sustainable ways, and it shows concrete technological and operational methods for reaching this objective (Harrould-Kolieb and Savitz, 2010). The leadership and management of the *strategic* innovation process and its implementation are relevant also for organisations outside the shipping industry under pressure to operate in an environmental-friendly manner. The study is specifically a response to a need for business cases with the deeply integrated elements of a business model aimed at sustainability (Schaltegger et al., 2012).

The remainder of the paper is organised as follows. Firstly, the conceptual base of the study is elaborated. This leads up to a specification of the research questions sought to be answered by the study. Secondly, the methodological approach is explained, the research design indicated and the empirical data collection process specified. Then the empirical context is elaborated and the findings debated with reference to existing theory, the practical business context, and leadership and managerial actions and activities. Finally, the implications of the study are specified, concluding comments made and directions of future research indicated.

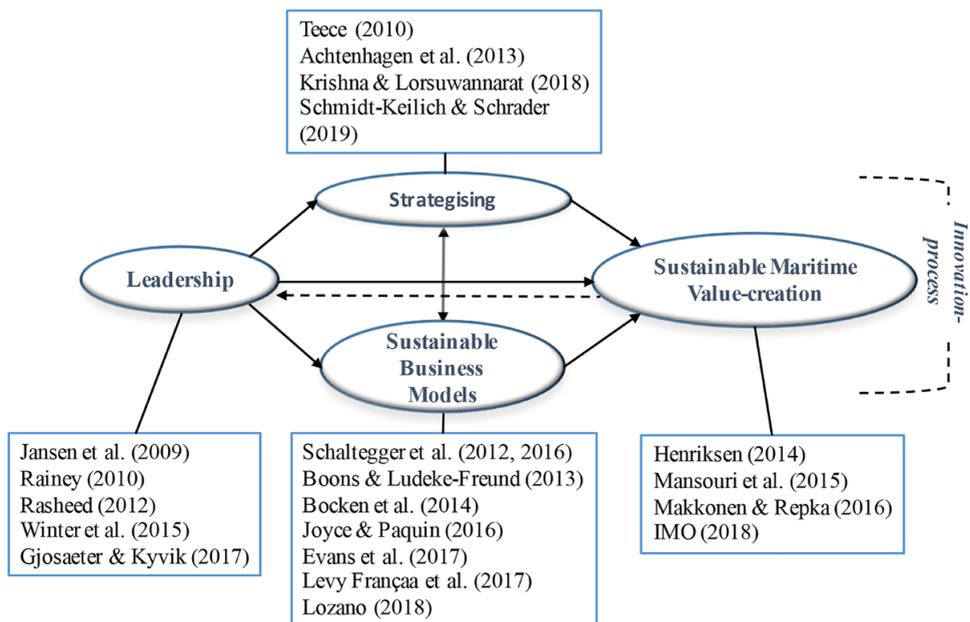
2 Literature review

Business models as a concept developed as part of the business strategy narrative during and after the IT revolution in the 1990s when, in particular, new internet-based businesses gave a boost to the establishment of the concept (Castells, 2001; Chesbrough, 2010; Osterwalder and Pigneur, 2010). The business model concept, however, goes beyond the distinction between traditional and internet-based business strategies and represents a verbal and/or figurative representation of the internal logic which enables a firm to create value for its stakeholders. The business model thus indicates key mechanisms and dynamic relationships of the value-creation process (Osterwalder and Pigneur, 2010). Every firm has a more or less tangible model of how it creates value though it might not be explicitly expressed or referred to as a *business* model. A business model thus reflects the most fundamental aspect of any organised activity by showing what it does, who it exists for (customers, users, partners and other stakeholders forming part of the external environment), which market it serves (segments, customer relationships and channels), how it creates value for customers and owners (value

proposition) and not least how the organisation through key activities, resources and capabilities generates higher income than costs and thus remains profitable over time (Achtenhagen et al., 2013).

As illustrated in Figure 1, there are several streams of research which inform the process of strategising the development of sustainable business models, on both a conceptual and a practical level. In Figure 1, the processes are indicated by the arrows showing the relationships between strategic *leadership* and operationalisation (mindset and cognitive base for a sustainable business development) through a *strategising* process which includes the actions and activities related to developing and implementing the *sustainable business model*. Finally, the *sustainable maritime value-creation* construct indicates the context in which the processes are operationalised. The broken arrows between the final construct and back to leadership indicate the dynamism of the process and how leadership and management must adapt to and learn from the empirical context. The continuous arrows between the four main constructs (in bold) indicate that the development of a sustainable business model and its practical implementation form an interdependent and simultaneous process which constitutes interdisciplinary and knowledge-intensive activities informed both by theory and by the competence and know-how of practitioners. Below follows a more specific elaboration of each main construct.

Figure 1 Conceptual framework (see online version for colours)



2.1 Leadership

Since the study is based on empirical cases with their real-life managerial, operational and firm-based idiosyncrasies (Zott and Amit, 2010), leadership aspects of the strategic and operational innovation processes were particularly scrutinised considering the challenging maritime context (Gjosaeter and Kyvik, 2017). Prior research confirms the

importance of strategic leadership and management of both explorative and exploitative organisational processes (Jansen et al., 2009a) when seeking new solutions to both existing and new problems, and leadership of sustainable business development forms part of this new leadership-intensive impetus (Rainey, 2010). With particular focus on new sustainable business models, the relevance of leadership in balancing creativity and rationality in business model development is emphasised (Rasheed, 2012). While the relevance of leadership of innovation processes is theoretically well-established (Tidd et al., 1997), Winter and co-authors go beyond this by additionally drawing attention to the educational sector's role and responsibility in creating a cognitive fundament for sustainability and transformation while future managers are still at school (Winter et al., 2015).

2.2 *Strategising*

The strategising construct has to do with strategy implementation, the flow of key actions and activities taking place to convert the vision of a sustainable strategy into organisational practice, a process including strategising *and* innovation. Teece (2010) relates business model innovation to technology, stating: "In short, getting the business model and the technology strategy right is necessary to achieve commercial viability if sustainable competitive advantage is to be built and innovators are to profit from their innovation" (Teece, 2010, p. 184). Others support this perspective, emphasising the need for coherence between leadership, culture and employee commitment in shaping key strategic actions (Achtenhagen et al., 2013) – in other words a correlation and potential causality between the leadership construct and strategising and that "there is thus clear linkage between the business model of a firm and its innovative activities" (Boons and Ludeke-Freund, 2013, p.6). Similarly, Krishna and Lorsuwarnarat (2018) in a recent paper point out the relevance of an organisation's dynamic capabilities in the sustainable innovation process, the interactions with stakeholder sustainability orientation, market orientation, exploration and exploitation regarding innovation, thus confirming the importance of strategising in a firm's development of a more sustainable business model.

2.3 *Sustainable business models*

Gradually during the last decades business models have become increasingly oriented towards sustainability and the following has been proposed as a definition of a sustainable business model: "Innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society through changes in the way the organisation and its value-network create, deliver value and capture value (i.e., create economic value) or change their value propositions" (Bocken et al., 2014, p. 3). Noting that the definition is ample and may be seen to include several complex and overlapping knowledge areas, it is no surprise that the theoretical approach to sustainability is equally ample, with both conceptual and empirical studies. It is argued that the stream of publications focused on sustainable business models started with Stubbs and Cocklin's (2008) paper which outlined their ideal type of sustainability-oriented organisation comprising different structural and cultural attributes, such as developing community spirit, investing in employees' trust and loyalty, and engaging in sustainability assessment and reporting. They also advanced propositions about

sustainability-oriented business models dealing with an organisation's purpose and goals, its performance measurement approach, the need to consider all stakeholders, how nature should be treated, whether the organisation's leaders drive the necessary cultural and structural changes to implement sustainability, and whether a systems-level, as well as a firm-level perspective should be employed (Schaltegger et al., 2016).

A number of studies focused on sustainable business models have since been published on a multitude of aspects and in varied empirical contexts, but with the joint objective of establishing sustainable business models as a new and emerging field of research (Bocken et al., 2014; Boons and Ludeke-Freund, 2013; Evans et al., 2017) to stimulate both further academic progress and practice-based theory development. The topic is also frequently coupled with the triple bottom line (Willard, 2012) with a focus on how sustainable business models implicitly and explicitly incorporate a triple bottom line approach and consider a wide range of stakeholder interests, including environment and society (Bocken et al., 2014).

With reference to sustainable business model development, several scholars have referred to the *business model canvas* as a tool to link creativity and rationality in the search for new sustainable solutions (Osterwalder and Pigneur, 2010). Joyce and Paquin (2016) extend the original canvas by adding an environmental layer based on a lifecycle perspective and a social layer based on a stakeholder perspective and refer to respectively horizontal and vertical coherence in more holistic business model development. Similarly, other scholars also adapt the creativity techniques of the business model canvas to support business model innovation and design for strategic sustainable development, as it is "considered as one de-facto standard support for traditional business model design" (França et al., 2017, p.157), and in line with Lozano (2018), who states the need to integrate organisational approaches, the empirical part of this study will explore empirically how firms' flow of strategic activities and actions forms part of the development of more sustainable business strategies.

Conceptually, business models indicate central mechanisms and key relationships in the configuration of an organisation's value-creation activities and processes (Osterwalder and Pigneur, 2010). Further, Margretta (2002) characterises business models as verbal storytelling or a configurative representation explaining how an organisation creates value, while other scholars emphasise that, in a holistic perspective, it is the value-creation processes and the activities involved in these which are the essence of the business model (Amit and Zott, 2001). Casadesus-Masanell and Ricart (2010) point out how a business model indicates the inner logic for how a firm operates and creates value for its stakeholders. The perspective is thus extended from a unique focus on customers and users to also include external stakeholders forming part of the firm's ecosystem, including the relationships with partners and suppliers in the product and factor markets (Zott and Amit, 2010).

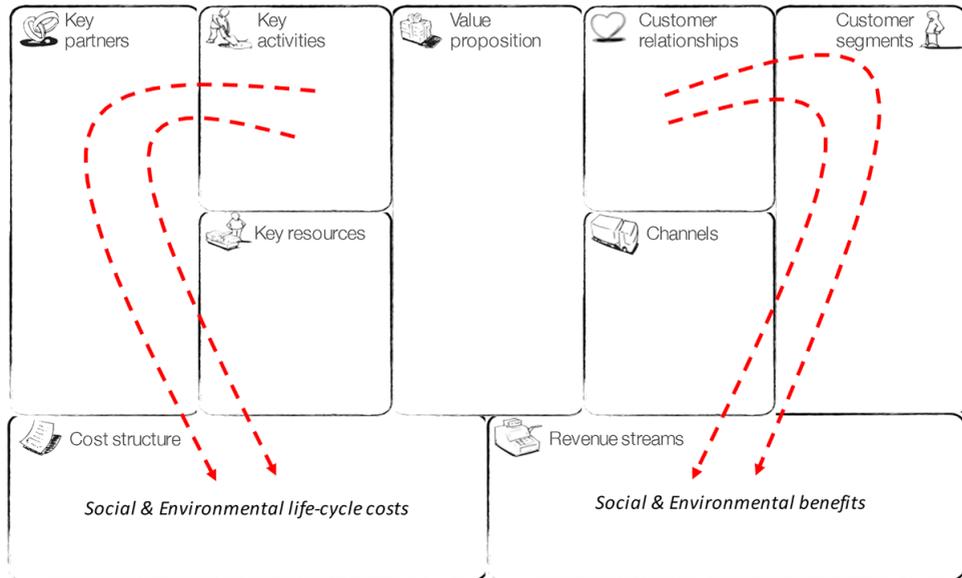
An organisation must, however, also have access to resources to create value and an organisational structure which enables it to produce and deliver value in an efficient and profitable manner. Business model development and continuous evaluation of the interaction between the building blocks of the business model thus represent a *blueprint* of the stages from idea to market, and it is the sum of and interaction between these building blocks which are the key elements of a business model and which frequently are referred to as the business model *canvas* (Osterwalder and Pigneur, 2010). To create, deliver and capture value in an environmentally sustainable manner presents a

new and major challenge for most organisations (Rainey, 2010), implying that the business operation should be executed with minimum negative environmental impact (Porter and Kramer, 2006) and ideally that the objective of environmental sustainability should be achieved by positive and empowering interactions between profit and sustainability (Daily and Huang, 2001). “Given its wide adoption and ease of use for multiple types of users, the business model canvas is an ideal foundation to expand upon by integrating sustainability” (Joyce and Paquin, 2016, p.4).

In a situation in which an organisation experiences pressure, both from external stakeholders and from society in general, to develop its existing business model towards a more environmentally sustainable one, various strategic options will usually occur (Bocken et al., 2014; França et al., 2017; Lüdeke-Freund and Dembek, 2017; Schaltegger and Wagner, 2011). The easiest, but also least development-oriented approach, is to avoid the challenge by moving business operations to a geographic, environmental and legislative context where the pressure to operate in an environmentally sustainable manner is less intense. The other possibility is to do as little as possible but stay within current laws and regulations in line with the *regulative* pillar in institutional theory (Scott, 2014). As a third option, the firm may adjust its business model beyond the minimum legal and regulatory requirements to meet expectations and demands of key customers, users and external stakeholders. The latter corresponds to Scott’s *normative* pillar, implying that the firm satisfies external expectations, but without a deeper commitment to environmental sustainability. The fourth option represents a fundamental redesign of the business model which, with reference to Scott’s framework, represents the *cultural-cognitive* pillar, implying development of a sustainable business model and a deep commitment to its objectives well beyond minimum compliance with current legislation, regulations and social expectations.

With reference to the firm’s strategic context and the business model canvas as a strategic tool, it is recognised that the interplay between the canvas’ nine building blocks is not specifically oriented towards developing sustainable businesses; it is nevertheless well-established that the business model canvas allows for triple bottom line development by extending the canvas with blocks, including the social and environmental costs (negative impact) and the social and environmental benefits (positive impact) of a business model (Osterwalder and Pigneur, 2010). Other scholars (Joyce and Paquin, 2016; Lozano, 2018; Rasheed, 2012; Szekely and Dossa, 2017) have, in line with this, suggested adaptation of the business model canvas to accommodate the demand for an increased focus on sustainability. Joyce and Paquin (2016) suggest a three-layer adjustment in the business model canvas with one extra layer for each element in the triple bottom line, claiming that this is easy to implement in practical solutions. Other scholars (França et al., 2017) also conclude that the business model canvas and the design and development of a sustainable business model are fully compatible and in line with this reasoning. Based on this, the further elaboration focuses on developing a business model with the joint objective of sustainability and profit using the business model canvas as a conceptual tool. As illustrated in Figure 2, each of the business model’s building blocks are developed and adjusted so that both the cost structure and the revenue streams reflect a strategy which is cognitively and operationally conscious about the external environment and acting accordingly.

Figure 2 The business model canvas adapted to include social and environmental effects (adapted based on Osterwalder and Pigneur, 2010) (see online version for colours)



2.4 Sustainable maritime value-creation

With reference to the final construct of the conceptual framework illustrated in Figure 1, more sustainable maritime shipping has increasingly become a pressing social, managerial and technological challenge (IMO, 2018; Makkonen and Repka, 2016), not least among Norwegian firms within the offshore maritime sector (NSA, 2016; Reve, 2009). The IMO in 2018 adopted aims to phase out greenhouse gas emissions from shipping as soon as possible in this century and by at least 40% by 2030. Reduced emissions will be the combined result of new technologies, improved operations and alternative fuels, a process jointly supported by international and national maritime bodies (Henriksen, 2014), technical inspection societies, and suppliers. Based on this development, many shipping companies are exploring ways to reduce emissions, and several scholars have explored different ‘multi-objective optimisation’ strategies to improve sustainability in maritime shipping based on a trade-off between economic and operational objectives (Mansouri et al., 2015). Others have analysed the challenges faced by the maritime industry as a result of stricter environmental regulations, arguing that environmental regulations in fact also will enhance firms’ competitiveness by leading to innovation (Sampson et al., 2015). Nevertheless, a recent literature review (Makkonen and Repka, 2016) reports a lack of clear consensus on the economic and innovative inducement impacts of environmental regulations on maritime transport. Scholars confirm that too little is known about the successful adoption of sustainable business models (Evans et al., 2017) and the leadership challenges related to how to practically reach both the profit and the sustainable objectives within an organisational context.

Based on the literature review the following research gaps are identified:

- While management literature establishes a clear linkage between the business model of a firm and its innovative activities, “empirical research, e.g. following a case study approach, will be needed to shed some light on the state-of-the-art of corporate sustainability management, sustainable organisational development and sustainable innovation in daily business” (Boons and Ludeke-Freund, 2013, p.23).
- The business model innovation literature states a lack of examples of *delivering sustainability* and reports that “in some cases, industrial practice appears to be ahead of academia in exploring and developing novel business models” (Bocken et al., 2014, p.47).
- “The current literature on experimentation with business models demonstrates a gap in the knowledge regarding the drivers of successful business model innovation and the methods by which new business models can be safely pursued” (Evans et al., 2017, p.8).

In response to this research gap, the empirical part of the study seeks to show how interdisciplinary knowledge in sustainable business model development may, in line with current research, “help avoid the risks of becoming yet another academic niche or silo, or just another tool in the management toolbox, but also provide a more powerful vehicle for making business sustainable” (Lüdeke-Freund and Dembek, 2017, p.1677). And on a more general level, the study aims through a comparative case study to show how a firm in the competitive maritime industry “captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organisational boundaries” (Lozano, 2018, p.1162). It also aims to show how the business model canvas can be used as a tool to ensure that essential business model aspects are not forgotten and to show how it adds a means for realisation of novel sustainability strategies (França et al., 2017). Finally, the study aims to show how interdisciplinary collaboration is successfully involved in the development of sustainable business model innovation and thus to show how “future scholarly work might analyse how the involvement of sustainable embedded lead users (SELU) in an innovation process should be implemented” (Schmidt-Keilich and Schrader, 2019, p.109). Thus, based on increasing interest both in academia and in practice for how to develop and operationalise sustainable business models, but still with relatively few empirical studies (Birkin et al., 2009; Lüdeke-Freund and Dembek, 2017; Schaltegger and Wagner, 2011), the following research question is posed for further empirical exploration:

Using the business model as a conceptual framework, what are the key strategic and operative leadership challenges related to the development of a profitable and sustainable business operation within the maritime offshore industry?

3 Methodological approach

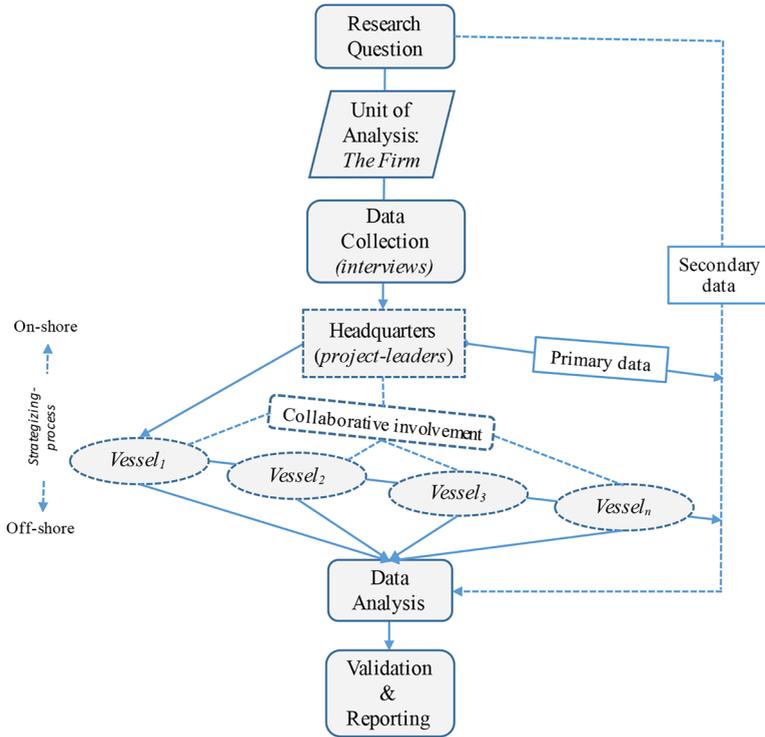
To collect empirical data on business models as a conceptual framework for the development of profitable and environmentally sustainable value-creation, a qualitative approach was deemed appropriate (Denzin and Lincoln, 2000; Ghauri and Grønhaug, 2002; Patton, 2002) to capture interactions, views, perceptions, opinions and the dynamic

processes within the three firms selected to be part of the study. Further, a case study design (George and Bennet, 2005) was chosen to develop an understanding of strategic and operative leadership challenges as experienced in the processes of developing a simultaneously environmental-friendly and profitable business (Brown and Duguid, 2000). The firms forming the empirical base for the development of the business model case studies (Yin, 2014) are three well-established Norwegian offshore service companies.

In case companies *A* and *B*, data was collected through interviews with 10 key informants in each of the organisations. The interviews were made partly on-board the vessels and partly onshore at the headquarters of the firms. Some interviews took place in 2014 and some in the period 2015–2016 (when the ships were in a nearby port). The interviews were done based on a semi-structured interview guide, allowing the interviewers to develop and explore key topics, elements and activities forming part of the environmental-oriented innovation processes, with the aim of substantiating key leadership challenges related to implementing the strategies aiming at combining environmental sustainability and profit maximisation. To validate the interview data, the transcripts were subsequently followed up with telephone conversations with project leaders playing a central role in the strategy processes in each of the firms. Simultaneously, the data collected was triangulated with varied secondary data from both internal and external sources.

For case company *C*, qualitative data and narratives in the form of secondary data were based on Revang and Olaisen (2014), a study which explored in depth and holistically the leadership challenges forming part of the strategic and operative activities during the implementation of the firm's business model. The methodology in this case followed an explorative case-study approach with a strong ethnographic influence (O'Reilly, 2012) in the interpretation of the data. The research design is illustrated in Figure 3. The data collected during the study's empirical phase was interpreted in three stages: firstly, individually by each of the researchers, subsequently jointly, and finally in a review process with key informants present to adjust the interpretations and with the objective of keeping the empirical findings objective.

In line with prior research (Lozano, 2018), the canvas model was used as a basis for the comparative analysis of the case companies. Taking into account the Scandinavian organisational setting of the case companies in which employees, public authorities and funding agencies most often are key stakeholders in a firm's ecosystem, as both regulator and administrator of various funding incentives and networks, an additional building block – *collaborative involvement* – was added both to the design of the study and to the canvas. This was done to reflect the work and management ambience of the case companies' open and flat organisational structure (Gustavsen, 2000). This added building block was also deemed reasonable granted that the canvas model traditionally might be seen to give insufficient protagonist value to how strategic processes need to be cognitively anchored and thus *owned* by employees (Schmidt-Keilich and Schrader, 2019) as a key element of a work-life development which encourages participation and involvement in sustainable strategic development. In line with findings from other studies, this includes elements of exploring in the form of concrete innovative strategising activities and actions that formed part of how the organisation's leaders practically led to involve and motivate experienced and knowledgeable employees to take responsibility in planning and implementing strategic changes as part of the business model development (Rasheed, 2012).

Figure 3 Research design (see online version for colours)

4 Empirical context

Case company A was established as a fishing firm in the beginning of the 1960s by two brothers. As the oil and gas industry commenced in the North Sea early in the 1970s, the firm reoriented its strategy towards the growing offshore service market. In 2014, the firm had a fleet of 50 vessels including construction, anchor handling and supply ships and approximately 1800 employees working on- and offshore. The company has gradually expanded the operation, with current activities in several markets worldwide. The firm has earned an image of having a strong environmental commitment.

Case company B was also established as family-owned fishing business in the beginning of the 1960s, and in a similar fashion to case company A entered the offshore service market during the 1970s as the oil and gas industry in the North Sea developed. In 2014, the firm had a fleet of 25 vessels, among these seismic, subsea and supply ships, and a total of about 900 employees. Similarly to case company A, the organisation is today engaged worldwide in the offshore service market. Also, this firm has been recognised as being at the forefront of technology development focused on more sustainable maritime operations of offshore service vessels.

Case company C is a more recent entrant in the offshore service supply market. It was established in 1996 with one fishing vessel and two supply ships. In 2014, the firm was a global operator within the offshore shipping market with 21 high-technology supply vessels and was the world's sixth largest within the offshore subsea/construction

segment. This company has also been a pioneer in adopting high-technology innovations, amongst others by implementing diesel-electric propulsion on platform supply ships and hybrid engines on anchor-handling vessels. The firm reportedly was also the first to use a magnetic bow-thruster on a supply ship. Case company C's business philosophy has been to optimise the balance between a gradual renewal of the fleet and a simultaneous resource-efficient use of technology to achieve sustainable and profitable growth. The key characteristics of the three case companies are summarised in Table 1.

Table 1 Comparable characteristics of the case companies (2014)

	<i>Case company A</i>	<i>Case company B</i>	<i>Case company C</i>
Number of vessels	50	25	21
Type	Construction service; anchor-handling tug supply; platform-supply	Platform-supply; subsea; seismic	Platform-supply; subsea; construction service
Fuel (M/E ¹)	MDO ²	MDO 79%/LNG ³ 21%	MDO
Main market	World wide	World wide	World wide
Number of employees (approximate)	1800	900	370
Ownership	Family controlled publicly listed company	Family controlled publicly listed company	Family controlled publicly listed company
History	Liner/deep-sea shipping	Fishing ships	Fishing ships

¹Main engine.

²Marine diesel oil.

³Liquified natural gas.

5 Results

Based on the empirical context, below follows a presentation of how the findings contribute knowledge as to how strategic and practical leadership are combined to develop and operationalise a more environmentally sustainable business model.

5.1 Business model as conceptual framework for sustainable value-creation

5.1.1 Case company A

The business concept of company A is focused on *operating* the fleet of vessels to maximise earnings, but this in a sustainable manner. Sustainable operation is achieved by changes in the fleet's operating procedures which result in reduced consumption of marine diesel. To implement this change in operating procedures, the firm in 2009 initiated an internal campaign which firstly had the objective of reducing the emission of nitrous oxide (NO_x), but subsequently also carbon dioxide (CO₂). More sustainable operation was achieved by fuel-saving manoeuvres effectuated on-board the vessels in form of what was tagged as 'green operations' – defined as a reduction in fuel consumption of 0.5 m³ (500 litres) achieved through a single action of operational optimisation per day. Seven categories of green operating manoeuvres were concretised

in collaboration between the crew and land-based personnel. These included fuel-saving optimal speed during longer sea transits, minimised use of bow-thrusters, reduced use of deck lighting, minimum use of engines during operations, anchoring while waiting, green dynamic positioning and a balanced optimisation of the vessel's four engines. The 'green operations' business concept simultaneously had the secondary effect of reducing other costs due to less wear and tear on the four main engines on each ship, while it also caused the firm to be profiled in the press and in external marketing as a green and environmentally responsible maritime operator.

As the firm gained experience in the development of the new business model, the fuel-saving target was increased to 10–20%. In addition, the campaign started in 2009 was further developed by the introduction of the *climate-neutral operation* (CNO) concept. Through CNO, the firm offered clients the possibility of entering into freight contracts which allowed the fuel saving achieved through green operations to be split 50/50 between the client and donations to the Norwegian Rainforest Fund.³ The donations to the rainforest fund compensated for the operations' harmful emissions and thus satisfied the firm's strategic ambition of providing climate-neutral offshore services.

The new *modus operandi* based on the developed business model resulted in fuel saving and a reduction in maintenance costs of between 25% and 30% (figures from 2016) without new technology investments. Additional effects were positive national and international media coverage and the inclusion of the firm, already in 2014, as one of only three Norwegian firms and the only shipping company with the highest score on the exclusive climate performance leadership index.

5.1.2 Case company B

The business concept which was the framework for realising profitable and sustainable offshore service in case company B was based on a strategy of using LNG (liquefied natural gas) as fuel instead of marine diesel. Using LNG as fuel was less costly and also led to reduced harmful emissions, particularly CO₂. In collaboration with Innovation Norway,⁴ a local shipyard and a network of technical consultants within the regional maritime cluster, the firm in 1999 initiated an innovation process with the objective of developing the world's first LNG-fuelled offshore vessel. In 2003, the ship was delivered from the yard ready for operation, and during the next 10 years the firm ordered four additional LNG-fuelled vessels, partly financially supported by the same Norwegian public funding agency promoting green shipping.

The cost saving as a result of the firm's business strategy was in 2016 estimated to be in the order of 20–25% compared to marine diesel, with a similar reduction in maintenance and repair costs due to the new power plants on-board the ships. In addition, the technological innovation strategy had as a result that the firm gained a corporate image as a technology sustainability pioneer both nationally and internationally.

5.1.3 Case company C

The long-term business strategy of case company C is to continuously be in the forefront of technological and operational development in the industry and thus assure a profitable and sustainable business development. It is the objective to meet this ambition by continued investments in innovative environmentally focused technology and to simultaneously dynamically develop and integrate operational procedures, actions and

activities both on-board and onshore in line with new marine technology. The firm's value proposition is consciously aimed at the most technologically advanced segment of the offshore service market. The strategic and operational logic of the firm was to remain 'forever young' (Revang and Olaisen, 2014), and the strategy implied implicit and explicit mechanisms to balance a short-term focus on operational profit with a longer-term return on investment. Notably, the chosen business model and operational strategy imply that the service is not always the cheapest but is focused on delivering top operational quality combined with supreme practice in the actual execution of offshore services.

5.2 Leadership challenges in strategising sustainable value-creation

Case A: Leadership challenges related to the implementation of a sustainable and profitable business model based on green operating innovations.

The key of the business model of case company A is the 50/50 split of the cost saving of green operations between the clients and donations to the Norwegian Rainforest Fund in line with the UN's system for climate quotas to compensate for the ships' harmful emissions. Through this arrangement, the firm's clients were made partners in a sustainable business model, while at the same time the objective of profitability was met by reduced fuel consumption and reduced maintenance and repair costs. In this way, the firm gained a competitive advantage while at the same time building an image nationally and internationally as an environmental-friendly and sustainable offshore service provider.

The development and operationalisation of the business model, however, required execution of green operations as often as was deemed possible taking into account nautical and safety-related operational conditions. A central leadership challenge was thus to motivate and engage officers and crew in decision-making, activities and actions on-board the vessels to operate in a more environmentally sustainable manner. This was achieved by initiating a campaign to actively engage and involve the captains and chiefs of the vessels in the development of innovative maritime procedures, nautical practices and manoeuvres with the objective of saving fuel and other operating costs. As a result of these initiatives a total of 150 proposals for how the firm might save diesel were received, and these ideas were eventually classified into a portfolio of seven practical and measurable green operating procedures which served to systemise and organise their implementation at sea. In the next round of the campaign, a competition among the ships to execute the most green manoeuvres was established, and the winning ship each quarter won incentives in the form of a premium to a welfare fund on-board. In addition, the officers and crew of the three ships with the most green operations each quarter won T-shirts printed with the legend 'green innovation champion', and all ships which executed more than 200 green operations each year gained the right to fly a green flag on the ship's mast as a sign of top-level environmental achievement.

The operationalisation of the business model thus implied a dynamic activity system which thoroughly supported the CNO concept in the form of a participation which motivated and led to ownership of the various daily activities and actions, through both internal and external processes forming part of the model's various building blocks. As part of the overall leadership challenge, this meant high-quality communication of the firm's strategic green ambitions vis-à-vis both officers and crews on-board the vessels,

but it also required a good continued dialogue and collaboration with customers and key stakeholders to implement and maintain the strategy and business model.

Case B: Leadership challenges related to implementing a sustainable and profitable business model based on technological innovations.

Case company B's strategy to attain a more sustainable operation was to replace diesel with more environmental-friendly LNG propulsion on five vessels. At the time of the innovation LNG was also relatively less expensive than diesel fuel, thus saving fuel costs. The firm's technological innovations harmonised well with its values as a responsible organisation caring for the marine environment – values with roots in the founder's vision of making maritime activity and transportation more environmental-friendly. Because of its complexity and advanced technology, the ambition of developing LNG-powered vessels was characterised by one key informant as the firm's 'moon landing project', and it appeared to be particularly motivating for the firm's engineering staff.

The technological LNG thrust however required substantial investments and close collaboration with external technology providers forming part of the regional maritime cluster. As a consequence, one particular leadership challenge was to obtain a reasonable return on the added capital expenditures which the LNG strategy required, while operating in a competitive international market that entailed competing with other firms that operated both less costly and less environmental-friendly tonnage.

The firm's clients are large international operators within the oil and gas industry which have the primary aim of obtaining transport and support solutions at the lowest possible cost and, as one informant expressed it, "not always caring much about environmental issues". Thus, an image as an environmentally conscious firm and supplier of more sustainable offshore services did not automatically result in higher earnings, and it turned out to be challenging to get customers to pay for the extra costs of developing the LNG technology. In addition to this dilemma, the technology was developed in an open innovation environment in which eventual competitors could also get access to the technological knowledge developed.

Case C: Leadership challenges related to implementing a sustainable and profitable business model based on continuous optimisation of investment and operating processes.

The strategic ambition of case company C is to deliver the best operational practice in the offshore service sector based on the three action criteria 'smarter, safer and greener'. Notably, the objective did not imply competing based on lowest price, but rather on delivery of offshore services which were as sustainable and technologically advanced as possible given the current state of technological development. This also implied a continuous optimisation and balancing act between the timing of investments and operational decision-making, internally with regards to renewal of the fleet and cost control in production and logistical processes and externally in the form of customer and stakeholder attention.

From this, it can be seen that a key leadership challenge was to manage the balancing act between internal and external efficiencies, amongst others by developing, managing and monitoring mechanisms which assured continuous renewal and innovation. This required a long-term leadership perspective where a short-term focus on profitability had to be replaced by business model building blocks which enabled the firm to continuously deliver smart, safe and green offshore services of top quality at a competitive price. Knowledge in the areas of contract negotiation, service projection and pricing thus

became a combined key activity and key resource for the firm, as it was realised that a careful functional power trade-off between ship management, operation and the firm's technological environment was crucial to avoid functional misalignments.

Key elements of the three case companies' business models developed to achieve more sustainable offshore services are summarised in Table 2.

Table 2 Key elements of business models aiming at sustainable maritime operations

	<i>Case company A</i>	<i>Case company B</i>	<i>Case company C</i>
Key partners	No formal external partners. All processes based on the firm's internal innovation-processes.	Technology firms primarily within the regional maritime cluster. Innovation Norway ¹ , Nox-fund ²	Suppliers of new and innovative technology solutions.
Key activities	Maritime transport-, support operations and related innovative strategising processes.	Technology-driven innovative change in main-engine propulsion from diesel fuel to LNG ³ .	Rapid acquisition and adoption of new environmental-friendly technology. Continued optimised balance between exploitation (operation) and exploration (new technology).
Key resources and capabilities	Maritime competence combined with leadership- and managerial capability to optimise internal operational and nautical competence and combining this with the development of a business model enticing customers to act environmental-friendly. Managerial innovations – no capital expenditures.	Maritime competence. Technical innovation-drive oriented towards more sustainable maritime operation using LNG for propulsion. Capacity to make technical investments to implement <i>green</i> strategy.	Maritime competence combined with a leadership- and managerial drive to optimise technological innovation as early adopters to minimise pollution of the marine environment. Capacity for required technical investments to maintain high quality services and minimise emissions.
Cost-structure	Reduced consumption of diesel fuel and maintenance (wear and tear) costs.	Reduced consumption of diesel fuel, increased use of LNG and higher capital expenditures.	High capital expenditures to be able to deliver high-level operational quality.
Value proposition	Climate-neutral operation realised through 50/50-sharing of fuel savings between customers and donations to the Norwegian Rainforest Fund.	Reduction in fuel-consumption and maintenance costs by changing to LNG-fueled main engines.	Optimal balance between operation and investments based on the criteria: <i>Smarter, safer and greener.</i>
Customer relationships	<u>Direct</u> : Close collaboration with customers and suppliers to achieve sustainable operations on profitable terms.	<u>Indirect</u> : General image as technology-based environmental innovator. Challenged by how to get customers to pay for innovations.	<u>Indirect</u> : Challenged by how to get paid for technological innovations required for high quality services.

Table 2 Key elements of business models aiming at sustainable maritime operations (continued)

	<i>Case company A</i>	<i>Case company B</i>	<i>Case company C</i>
Channels	Standard in the industry (ship-brokers and direct contacts). Donations to the Norwegian Rainforest Fund offer the firm added positive publicity/ <i>green</i> image-building.	Standard in the industry. Positive public image as <i>green</i> technology innovator.	Standard in the industry. General image as environmental-conscious supplier of offshore-services.
Customer segment(s)	Owners-/operators of oil and gas fields.	Owners-/operators of oil and gas fields.	Owners-/operators of oil and gas fields.
Revenue stream	Long-term potential through contract renegotiations based on image as <i>green</i> business innovator.	Long-term potential through contract renegotiations based on image as <i>green</i> technology innovator.	Long-term potential through contract renegotiations due to advanced technology and high quality service.
Collaborative involvement (employees, partners, customers)	Employees on all levels invited to participate and contribute with ideas for operational innovations. Firm establishes symbolic incentive-system for <i>green</i> operation on board the ships (and donation to welfare-fund).	Firm's technology-environment (engineering staff and chief engineers) key resources in the innovation process.	Technology-competent employees active drivers of innovation process and strongly involved in ship-building, maintenance- and freight negotiations in collaboration with key suppliers.

¹Norwegian public funding agency.

²The Nox (Nitrogen oxide) fund is a Norwegian government fund established to accelerate efforts to cut Nox emissions and enable investments in low and zero-emission solutions.

³Liquified natural gas.

6 Discussion

With reference to the research question of what are key strategic and operative leadership challenges related to the development of a profitable and sustainable business operation within the maritime offshore industry, the three case companies chose very different strategies and practical leadership to effectuate the objective of delivering a more environmentally sustainable offshore service. Operating in the same market and having a relatively similar background to the other two firms, case company A implemented a value proposition founded purely on managerial innovation (Tidd et al., 1997), as reflected in updated nautical and operational procedures which resulted in increased sustainability in terms of fuel saving and reduced maintenance and repair costs. Particularly, company A developed a *management-intensive* innovative business model which included developing and commercialising the CNO concept, where the monetary value of the fuel saving was split between the customers and the Norwegian Rainforest Fund. With reference to Table 1, company A implemented an innovative new business model based on, firstly, involving and thus motivating employees both onshore and offshore in developing the sustainability idea and, secondly, converting them to leader-doers (Schmidt-Keilich and Schrader, 2019) by changing operating and nautical

procedures on-board the vessels. Thirdly, the firm managed to market the idea so well that key clients accepted the new way of doing sustainable business in collaboration with the firm. Notably the strategy was effectuated without capital expenditure.

Case company B developed a value proposition of positioning itself as a provider of more sustainable offshore services by replacing marine diesel with LNG for propulsion. The business model required high technological competence as a key resource and the capability to convert internal knowledge to practical solutions (von Hippel, 1978, 1994) in collaboration with external technology providers in the maritime cluster. However, the chosen strategy was *capital intensive*, and it turned out to be challenging to capture a reasonable return on investments, partly due to a lack of commercial incentives vis-à-vis customers and partly due to a lack of international regulations and legislation (Sjaafjell, 2015). A more restrictive legal framework would have boosted the demand for more sustainable shipping services and would have made it significantly easier to demand a higher freight rate for the cleaner LNG-fuelled services.

From a strategic perspective, two further observations may be made. The first is that the developed LNG technology was the result of open innovation processes (Brunswick and Vanhaverbeke, 2015; Chesbrough, 2003) which makes the technology also available for competitors and thus does not assure a long-term competitive advantage for the firm. The second observation is that the empirical data may indicate that case company B, based on its successful technological innovation path, may suffer from a success paradox (Audia et al., 2000; Christensen, 1997) where the main strategic focus was to follow a technological innovation path (Sydow et al., 2009; Teece et al., 1997) and with relatively less focus on creativity and commercial exploitation of the business model (O'Reilly III and Tushman, 2008) – i.e., the right-hand side of the business model canvas. Eventually, the success paradox may actually have been further stimulated by the positive media attention the firm received as a result of the LNG innovation (Lovallo and Kahneman, 2003), making it hard to later change the strategic course. Effectuating the value proposition eventually required an ability to balance business profit with the innovation required for sustainable value-creation facilitated by dialogue, interactions and contributions from different disciplinary competence areas (Boons and Ludeke-Freund, 2013). In the context of case company B, the empirical findings indicate that an efficient inclusion of marketing and financial know-how may have been in short supply during these interdisciplinary processes.

For case company C, a central and ambidextrous challenge (Jansen et al., 2009b; O'Reilly III and Tushman, 2008) was the implementation and continuation of a holistic application of resources and capabilities between innovation, operation of the fleet (actual running of the ships at sea and in port) and capital expenditures related to the renewal of the fleet. Development in the form of innovation processes required experimentation and active learning, while an operational focus required a focus on exploitation, replication, efficiency and control. The focus on a profitable and sustainable business model thus required processes which balanced the investments in new technology with a focus on economic margins and short-term operational efficiency. As was the case with case company B, with the objective of smart, safe and green technological maritime offshore solutions, the lack of international environmental regulations and legislation (Sjaafjell, 2015) made it challenging for case company C to obtain a sufficient premium for delivering sustainable offshore services.

Considering how a business model framework may be used and developed as an analytical tool with a focus on sustainable maritime operations, in line with prior findings

the empirical findings of this study indicate that the framework is a useful complement to existing strategic thinking (França et al., 2017; Lozano, 2018). As also pointed out by Osterwalder and Pigneur (2010), the business model canvas tool may easily be adapted to accommodate triple bottom line business models by adjusting the canvas' building blocks to take into account the social and environmental costs and the social and environmental benefits of a business model. Some scholars, however, have argued that the business model framework, compared to textbook strategic analysis (Grant, 2002), pays insufficient attention to the external analysis of markets and competitors' responses to strategic moves, and that it must be further developed with reference to the analysis of internal resources and firms' dynamic capability to meet the challenges of new and unplanned change (Ghezzi, 2014). Others have also claimed that the framework does not sufficiently explore risk related to technologically oriented strategic development of sustainable operations (Margretta, 2002).

Duly recognising recent research on *business models* (Teece, 2010; Zott et al., 2011) and *sustainable business models* (Evans et al., 2017; Joyce and Paquin, 2016; França et al., 2017; Lozano, 2018; Lüdeke-Freund and Dembek, 2017; Szekely and Dossa, 2017), the empirical findings of this study confirm the usefulness of the business model framework for environmental business model development. However, they equally emphasise that individual activities and actions of strategising must be carefully planned, managed and directed to engage the various knowledge disciplines taking part in the innovation processes. The findings also indicate that the collection and interpretation of empirical data must be cognitively balanced and triangulated based on a rigorous strategic analysis considering both internal and external strategic benchmarking criteria to avoid biases (Gavetti and Rivkin, 2007; Langley et al., 2013) in developing and regularly updating the business model. Thus “continuous environmental scanning is more important than ever because of the growing complexity of the economic landscape (e.g., networked business models), greater uncertainty (e.g., technology innovations) and severe market disruptions (e.g., economic turmoil, disruptive new value propositions)” (Osterwalder and Pigneur, 2010, p.200).

The need to dynamically update the business model by making rigorous judgements on both current *and* future business scenarios is well illustrated in the development of the three case studies at the core of this study, which all faced a major crisis when hit with dramatically lower oil and gas prices in 2015–2016. During this period case company A faced a dramatic refinancing operation in which the original owners reduced their ownership and new capital was provided by external investors. The firm has also in the aftermath of the refinancing merged with a second firm to position itself as a larger and stronger consolidated entity facing the international markets. During the crisis, case company B restructured its operation by reducing the fleet by several vessels, raising new equity through a private placement and going through a debt conversion, while case company C has gone through a major restructuring and refinancing process to secure a consolidated position when the market again strengthens.

7 Implications and concluding reflections

Using business models as a conceptual framework, this study explores and debates strategic and operational leadership challenges related to developing and operationalising a business model which has as an objective to deliver a more sustainable offshore service.

The theoretical and empirical elaboration indicate that the business model concept is useful for identifying, evaluating and understanding the interrelationship between strategic factors of a new business venture (Teece, 2010) and also for recognising key activities for implementing strategic ambitions (Zott and Amit, 2010). The empirical data of the study illustrates how a combined strategy of profit and sustainability can be developed and operationalised in very different manners depending on the firms' individual idiosyncrasies, competence, leadership and prior strategic paths (Nelson and Winter, 1982; Teece et al., 1997). Business case A, without new technology, illustrates how it is possible through managerial creativity and leadership to innovate to achieve the ambition of creating, delivering and capturing value without harming the environment. Through managerial innovation, the business model 'locked in' (Zott and Amit, 2010) the customers as partners in the value-creation process through a self-strengthening win-win arrangement and serves as a good example of how "a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model" (Chesbrough, 2010, p.354).

Representing a case of *managerial* innovation, case A thus serves as a reminder that a strategy following Scott's (2014) *normative* pillar can be very effective even if it lacks 'fancy' technology.

Business cases B and C, on the other hand, may be interpreted as being positioned within Scott's *cultural-cognitive* pillar oriented towards a green technology change, which is a price-worthy while without doubt a more long-term and risky objective. This latter observation may also be seen to reflect itself in the fact that customers were not outright willing to pay more for environmentally sustainable offshore services as long as this was not a national or international legal requirement. New IMO guidelines agreed to in 2018 commit the shipping industry to reduce its carbon emissions by at least 50% by 2050 and crucially establish a stepping stone towards decarbonisation of the maritime industry (IMO, 2018). This agreement will likely in the longer run gradually benefit firms which are in the forefront of the development of sustainable technologies and eventually lead to an increase in the price of offshore services so that shipowners (like case companies B and C) will be compensated for the incremental cost of providing more sustainable offshore services.

In this study the business model canvas (Osterwalder and Pigneur, 2010) was used as a tool to evaluate and analyse key strategic elements, activities and processes in producing and delivering a profitable and sustainable offshore service, and various adjustments of the building blocks of the business model canvas were debated. Particularly with reference to a Scandinavian business context, it is recommended, in line with both Lozano (2018) and França et al. (2017), to add a building block focused on the interrelationships with key stakeholders, among these particularly external partners, but also individual knowledge-employees and their employee organisations in addition to key public support agencies.

This study has particularly explored leadership challenges related to the operationalisation of sustainable strategies in offshore shipping. The study's main implications are that the business model framework, including the canvas' building blocks, should be adapted and adjusted according to the resources and capabilities of the firm, the strategic and industrial contexts, and the cultural setting within which the firm operates. A second crucial implication, particularly with reference to business case A, is that the processes and relationships between the business model's building blocks – the day-to-day actions and activities in developing, implementing and gradually revising and

auditing a chosen business model – are strongly leadership and management intensive (Rainey, 2010). Through this comparative case study, the study's main contribution is that it sheds light on the state-of-the-art of corporate sustainability management, sustainable organisational development and sustainable innovation in the maritime shipping industry and the relevance of strategic and operational leadership to achieve more sustainable operation. It contributes with examples of delivering sustainability and serves to confirm that industrial practice appears to be ahead of academia in exploring and developing novel business models. Finally, the study serves to illustrate the drivers of successful business model innovation and how new business models can be pursued, and it serves as a demonstration of how this process can be led and managed.

8 Limitations and future research

Based on an empirical study limited to only three Norwegian firms, the findings may not be generalised; however, the challenges discussed herein may be indicative for other firms and firms in other industries facing similar challenges when balancing the complex operational and ethical trade-offs between short-term business profits and the social requirement for increased environmental sustainability. Granted limited empirical research on the theme, the study's findings contextualise the leadership challenges related to environmental innovation and may be replicated in new business contexts and further developed in an educational context in line with current research ideas related to the relationship between education and sustainable development (Lozano et al., 2013; Winter et al., 2015). The findings also serve to indicate the relevance of interdisciplinary competencies (Lozano et al., 2013; Strober, 2011) in the development of sustainable business models and may form part of educational programs or in-firm training of business and engineering students.

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Notes

¹The Brundtland report defines sustainability as "the ability to meet the needs of the present, without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

²The Norwegian maritime industry accounted for approximately 5.5% of Norway's GDP in 2012, and the maritime industry is the country's second largest export industry after the oil and gas sector.

³<https://www.regnskog.no/en/> (webpage Rainforest Foundation Norway – 16 July, 2018).

⁴<https://www.innovasjon Norge.no/en/start-page> (Innovation Norway's webpage 16 July, 2018).