Master's thesis

NTNU
Norwegian University of Science and Technology
Faculty of Economics and Management
Department of International Business

Lena Førde
Marte Skarbø

Sustainable business model innovation: A multiple case study of three Norwegian firms in the aquaculture industry

Master's thesis in International Business and Marketing
Supervisor: Annik Magerholm Fet
Co-supervisor: Dina Margrethe Aspen
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Preface

This thesis is written as the final part of our master's degree in International Business and Marketing at the Norwegian University of Science and Technology. The study was conducted during the spring semester from December 2021 to June 2022.

Abstract

Purpose – The main purpose of this thesis is to enhance the understanding of how companies innovate their business model (hereafter BM) to become more sustainable.

Design/methodology/approach – To provide an answer to how companies innovate their BM to become more sustainable, a conceptual literature review was combined with a multiple case study where semi-structured interviews represent the primary source of data. Secondary data consist, in addition to the literature review, of documents from case companies, providing information and historical insights. Both in-case analysis and cross-case analysis were applied. The Business Model Canvas (hereafter BMC) is introduced in the conceptual background and is further used as a framework for the analysis of the study.

Findings – The empirical findings indicate that companies innovate their BM to become more sustainable by changing the BM components value proposition, key activities, key partners, and channels. Companies implement sustainability in their BM by measures, mainly regarding environmental and economic sustainability measures. The sustainability measures were classified as incremental changes and improvements rather than radical, disruptive changes. Moreover, it was not identified that any of the case companies used tools. Identified drivers in the sustainable business model innovation (hereafter SBMI) process include contribute to sustainable food production, rising costs, stakeholders' expectations, and increased revenue. The initiator of the SBMI process is value-oriented, has personal motives, and it is driven top-down. Findings suggest that challenges consist of organizational and cognitive barriers such as not getting all employees and managers involved, engaged, and understanding the importance and benefits of sustainability, prioritizing, dependence on technological development, and lack of renewable energy.

Research implications – The thesis addresses the dearth of knowledge on the process of SBMI and the paucity of empirical research in the specific context of firms in the Norwegian aquaculture industry.

Practical implications – The practical utility of the thesis consist of guiding firms that aim to navigate the process of SBMI in their attempt to improve their current BM toward sustainability.

Keywords – Business model, sustainable business model, business model innovation, sustainable business model innovation, multiple case study, Norwegian aquaculture industry.

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Second, we are deeply grateful to all interviewees for donating valuable time to answer our questions and share their knowledge. Without their input, the research would not have been possible.

Lastly, we would like to express our gratitude to our family and friends for their great support throughout the process. Their patience, understanding, and continuous encouragement have truly been remarkable.

Lena Førde and Marte Skarbø Ålesund, June 12, 2022

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List of abbreviations

BM	Business Model
BMI	Business model innovation
CEO	Chief Executive Officer
GATH	Global Aquaculture Tech Hub
KPI	Key Performance Indicator
GRI	Global Reporting Initiative
NGOs	Non-governmental Organizations
R&D	Research and Development
SBM	Sustainable Business Model
SBMI	Sustainable Business Model Innovation
SDGs	Sustainable Development Goals
SoMe	Social Media
TLBMC	Triple-Layered Business Model Canvas
UN	The United Nations

1. Introduction

This section introduces the background of this thesis, followed by the research context, the research method applied and presents the research objective. The end of the chapter presents an outline of the thesis structure.

1.1 Background

The severity of today's grand sustainability challenges such as climate change, economic and social inequity, and resource scarcity are increasingly recognized across the policy, business, and academic domains. It has prompted scientists to describe a new geological epoch, the Anthropocene, where the human impact becomes so profound that it threatens the natural equilibria and resilience of earth systems (Bocken et al., 2019; Ferraro et al., 2015; Steffen et al., 2011). Confronted with planetary boundaries, a limited carrying capacity, and anticipated limitations to growth, there is a risk for humanity to utilize resources faster than they can be regenerated while accelerating climate change and reinforcing social and economic crises (Arrow et al., 1995; Khmara & Kronenberg, 2018; Stark et al., 2017).

To prevent this evolution, the World Commission on Environment and Development (WECED), widely referred to as the Brundtland Commission, introduced the concepts of sustainability and sustainable development and described how it could be achieved in the landmark report "Our Common Future". In 1987, the report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland, 1987). The definition has a triple bottom line, seeking to reconcile economic development with the protection of social and environmental balance. In 2015, the UN formalized and summarized the key sustainability challenges in 17 sustainable development goals (hereafter SDG), related to, amongst others, the reduction of environmental degradation, social inequity, and overconsumption and overproduction (Adams et al., 2016; Bocken et al., 2019; Ritala et al., 2018).

The SDG's urgency resulted in a call for action on individual, societal and organizational levels to evaluate the status quo (Rauter et al., 2017). Porter and Kramer (2011) suggested that these grand sustainability challenges may be viewed as “the biggest business opportunity of our time”. Solving these challenges requires significant innovation efforts at the level of individual products and services, and more broadly at the level of BM and social innovations, and significant system-level transitions (Adams et al., 2016). The formalization of these sustainability challenges encouraged firms to find ways to contribute to sustainable development. It also led to the realization that the challenges can represent significant business opportunities (Adams et al., 2016; Bocken et al., 2019; Evans et al., 2017).

1.2 Relevance of research

As a response to the recognized need to handle climate change, there are increasing academic contributions discussing the need for sustainability-oriented innovations (Adams et al., 2016; Hansen et al., 2009) and SBMI (Boons & Lüdeke-Freund, 2013; Stubbs & Cocklin, 2008). However, the field has grown exponentially with this process, leading to divergence in the views and conceptualizations used (Bocken et al., 2019).

The increased awareness and attention to sustainable development has triggered a demand for new sustainable business models (hereafter SBM). Redesigning the BM may be crucial to radically improve sustainable performance to create more significant environmental and social value while delivering economic sustainability. Business model innovation (hereafter BMI) offers a holistic perspective while incorporating all three dimensions of sustainability (social, environmental, and economic) within business planning (Bocken et al., 2013). Moreover, innovating the BM can be a tool to reduce costs and increase strategic flexibility. Several researchers have described the importance of the deliberate use of BMs and BMI to obtain a competitive advantage. BMI can give higher returns than product or process innovation and benefit from higher risk mitigation and resilience (Geissdoerfer et al., 2018).

With a background in the importance of sustainable development for businesses, this thesis aims to increase BMI knowledge. Generally, there is a lack of research on how firms in practice move to a more SBM and how the BMI process is implemented in practice. Geissdoerfer et al. (2018) identified a research gap in BMI in the implementation of the BMI process, its tools, and its challenges. The lack of case studies regarding this topic makes it difficult for firms to understand how to innovate their BM, identify and design alternatives, and then assess and select an adequate.

Furthermore, the underlying process firms navigate through to arrive at a more sustainable BM is little researched (Zollo et al., 2013). There is also a lack of clarity regarding components of SBMI and its link with BM, BMI, and SBM (Shakeel et al., 2020). Therefore, the thesis aims to enhance the understanding of the underlying theory of SBMI and how the process develops in practice, thereby addressing the theory-practice gap in the SBMI literature.

1.3 Empirical context

This thesis is a multiple case study of three Norwegian firms operating in the aquaculture industry. Aquaculture includes the farming and cultivation of all kinds of organisms in the water (Misund, 2021). Aquaculture is the second-largest export industry in Norway. As the world's most significant producer and exporter of Atlantic salmon and rainbow trout, it has an essential role in producing sustainable food globally (Finansdepartementet, 2019). Norway exported 2 700 000 tons of seafood products in 2020, which corresponded to 105,7 BNOK and amounted to 10 % of Norway's collected export revenue (McKinsey & Company, 2022). The industry is also vital in job creation in districts and along the coast of Norway.

Aquaculture farmers can produce large volumes of high-quality, healthy, and traceable seafood. It is essential to reduce how dependent the human diet is on meat consumption and reduce its carbon footprint, and by 2030, 62 % of all consumed seafood will come from aquaculture (Sintef, 2021). However, production volume has temporarily sunk due to environmental challenges in the industry. These challenges are mainly salmon lice, escapes, food waste, and diseases spread from open-net cages in the coastal marine ecosystem. Therefore, the industry needs to be innovative and transparent to improve its sustainability and public image (Sintef, 2021).

International organizations like the Organization for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO) view aquaculture as an essential industry in the future to meet the need for food of a growing population. Farm Animal Investment Risk and Return (FAIRR) has ranked salmon farming as the most critical sustainable protein source in the food industry. Norway has a unique and complete value chain for the aquaculture industry. There are reasonable regulations for research and education, which ensures biological expertise in breeding and angling for feed and high-tech fish farms. Additionally, at subsequent stages of the value chain, modern slaughterhouses, efficient infrastructure, and targeted marketing contribute to the value maximization of Norwegian fish (McKinsey & Company, 2022).

This thesis decision to examine the process of SBMI in firms in the aquaculture industry is motivated by the mere concepts of SBM and SBMI. Consequently, the thesis aims to be “solution-driven”, providing academic sound and practically applicable insights for the sustainable innovation needed to handle the pressing sustainability issues. The thesis aims to provide insights into different aspects of SBMI.

1.4 Objectives and research questions

Based on the problematization and the empirical emphasis presented, the primary purpose of this thesis is to advance the understanding of the process of BMI. Building on that, the following research objective has emerged:

How do companies innovate their business model to become more sustainable?

To provide an answer to this overarching research objective, the following research questions have been formulated:

1) How do companies implement sustainability in their business model?
2) How have companies used tools in the sustainable business model innovation process?
3) What drivers and challenges do companies face in the sustainable business model innovation process?

1.5 Methodological approach

This thesis combines a conceptual literature review with a qualitative multiple case study. Primary data was gathered through semi-structured interviews with two representatives from the three case companies. Secondary data was collected through a literature review of previously published studies to become familiar with the existing literature on the area of research, aiming to identify controversies, inconsistencies, and unanswered research questions in this area. Other secondary data obtained include documents from case companies, providing background information and historical insight.

1.6 Outline of the thesis

In this section, the structure of the thesis is described.

***Table 1**: Structure of the thesis*

Chapter 1 Introduction	In the first chapter, the context and relevance of the research is presented, along with the methodological approach, research objective and research questions.
Chapter 2 Conceptual background	The second chapter provides the theoretical background for the thesis. It presents the concepts of BM, BMI, and SBM, followed by the theory on tools for BMI, aiming to understand how the research objective and research questions can be answered.
Chapter 3 Methodology	In the third chapter, the methodology including research design, data collection and analysis is presented, along with a critical discussion of research quality.
Chapter 4 Findings from the multiple case study	The fourth chapter presents the case companies and empirical findings from the semi-structured interviews. An in-case analysis, detailing how the case companies have implemented sustainability in their BM, is followed by a cross-case analysis comparing the findings from the multiple case study.
Chapter 5 Discussion of the multiple case study	The fifth chapter discusses empirical findings from the multiple case study in relation to extant literature and the thesis's research objective and research questions.
Chapter 6 Conclusion	In the sixth and final chapter, the main findings of this thesis is presented. This is complemented with implications for theory and practice and limitations for future research.

2. Conceptual background

This section aims to presents a review of relevant academic literature. First, the broad theoretical concept of BM, BMI, and SBM is presented. Second, tools and toolboxes in BMI literature are described. A narrow perspective is adopted, discussing concepts relevant to the thesis's research questions. This section aims to understand how the research objective and questions can be answered.

2.1 The business model concept

This section starts by explaining the BM as a concept and its history. Afterward, several vital definitions are presented along with the selected definitions chosen for this thesis.

2.1.1 Business model development and definitions

In the 1990s, an e-commerce boom introduced new innovative revenue mechanisms. Back then, the BM concept was mainly used by firms to communicate complex business ideas to stakeholders. Eventually, the BM concept developed into a tool for systemic analysis, planning, and communication of the organizational complexity and a strategic asset for competitive advantage and firm performance. Organizational complexity includes the configuration and implementation of administrative units and relevant parts of the organization's environment (Geissdoerfer et al., 2018). After the e-commerce boom, BM's purposes have been to address or explain three phenomena:

1) E-business and organization's use of information technology

2) Strategic issues

3) Innovation and technology management

Still, there is a lack of definitional clarity on the concept (Zott et al., 2011).

Early research by Amit and Zott (2001) aimed to find a common way of defining a BM. They concluded that a BM is "the content, structure, and governance of transactions designed to create value through exploiting business opportunities". Shafer et al. (2005) conducted a literature review to identify the components of a BM to help managers understand the concept. They found a new definition that integrates the earlier work on BMs and is guided by the following two principles. First, the definition should incorporate and synthesize the earlier work; second, it needs to be easily understood, communicated, and remembered. Concluding, a BM is, according to them, defined as "a representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network" (Shafer et al., 2005). Furthermore, the term can be defined as how it "describes the rationale of how an organization creates, delivers and captures value, and provides the organizational and financial architecture of a business and its understanding of its customers and their needs (Teece, 2010).

Moreover, a thorough review of the BM concept was established by Zott et al. (2011). It revealed that researchers disagree on how to define a BM. It was, however, found that there were some common themes of the BM concept. The themes were:

1) The concept is a new unit of analysis

2) It explains how firms "do business" in a system-level and holistic approach

3) The activities of firms have an essential role in how BM has been proposed

4) It seeks to explain how a firm creates value and not only how it captures value

Another way of defining BM is "the conceptual framework for how the company seeks to create profitability – by offering and delivering value that is attractive to the customers and by charging customers in a way so that the business is left with an acceptable profit" (Jørgensen & Pedersen, 2015). A more recent definition was established by Geissdoerfer et al. (2018) while conducting a thorough literature review on the topic, who defined BM as a "simplified representation of the value proposition, value creation and delivery, and value capture elements and the interactions between these elements within an organizational unit".

Zott et al. (2011) found that scholars often use a definition of BM to fit their work and purpose, making it difficult for researchers to agree on how a BM should be defined. When discussing BMs further in the master's thesis, the definition by Osterwalder and Pigneur (2010) will be used:

"The business model describes the rationale for how an organization creates, delivers, and captures value" (Osterwalder & Pigneur, 2010).

This definition is established through the three value elements value creation, value delivery, and value capture. The definition is chosen due to its simplicity, familiarity, and global recognition. Moreover, it is easily understood, communicated, and remembered. Table 2 illustrates an overview of the BM elements value creation, value delivery, and value capture. The nine interconnected components will be explained further in Section 2.4.1.

***Table 2**: Overview of the business model components*

Value Creation	Value Delivery	Value Capture
Value proposition	Key resources	Cost structure
Customer relationships	Key activities	Revenue streams
Customer segments	Key partners	
	Channels	

2.2 The business model innovation concept

To understand how companies can renew their existing BM, it is crucial to understand the concept of BMI, which will be discussed in this section. The section aims to describe how the concept was developed and the most relevant definitions. Subsequently, the term BMI for sustainability is defined, along with drivers and challenges for BMI.

2.2.1 Business model innovation development and definitions

BMI is becoming more critical due to increasing and globalizing competition. Many managers are eager to consider significant changes to their BM. Nevertheless, they often do not know how to articulate their existing and desired BM or understand the possibilities for innovation (Taran et al., 2015). The increase in competition might result in managers innovating their products. However, this is insufficient to sustain competitiveness as others easily can copy it. Therefore, it is more critical for firms to innovate in creating, delivering, and capturing value. A new organization can design and implement its SBM from the start. In contrast, an existing organization may choose specific strategies to innovate the ways it creates and captures environmental, social, and economic values (Fet & Knudson, 2022a).

There has been extensive literature regarding BMs, but what constitutes a BMI is still ambiguous. Often, a BMI is framed in changing the value proposition for the customer (Bocken et al., 2014). However, researchers find that BMI consists of more than just altering the product for the customer; it also involves changing "the way you do business" (Amit & Zott, 2001). When addressing definitions of BMI, it was found difficult to know when a change in an organization can be defined as a BMI, as it is rarely discussed in BM theory. Moreover, several researchers (Amit & Zott, 2001; Osterwalder & Pigneur, 2010; Teece, 2010), have stated that BMI is important. However, it does not provide answers on how to achieve it (Taran et al., 2015).

Several researchers have tried to define the term. Boons and Lüdeke-Freund (2013) argue that BMI consists of organizations identifying new value propositions and how to create, deliver, and capture it and that this is the key to unlocking the creation of sustainable business. Moreover, they found that it is the key to delivering greater social and environmental sustainability in the industry system. On the other hand, BMI can be an approach to delivering a needed change through reconceptualizing the firm's purpose and value-creating while rethinking its perceptions of value (Bocken et al., 2014). Geissdoerfer et al. (2018) define BMI as the conceptualization and implementation of new BMs.

Mitchell and Coles (2004) looked at BMI as a process and thereby presented a continuous BMI process claiming that the process consists of at least four simultaneously performed strategies. Considering BMI as a process is further supported by Zott et al. (2011), who see the BM as a driver for innovation and a spring to innovation, and by Taran et al. (2015), who found that BMI can be seen as both a process and an outcome.

Figure 1 presents the four dimensions presented by Mitchell and Coles (2004):

1) *Understand and optimally apply the current BM*: goods and services are supplied in the best possible way by informing all stakeholders of what needs to be done
2) *Establish, understand, and follow an appropriate BMI vision*: identify the benefits and give it to all stakeholders as a guide for developing future BM improvements
3) *Ongoing design and testing of potential BM improvements, replacements, and innovations*: test promising concepts by checking stakeholders' reactions to new benefits and ways of supplying them
4) *Understand and begin installing the next BM improvement or replacement*: specify the next improvement and how it will evolve. It can only occur after the third dimension has begun to regularly offer operating enhancements

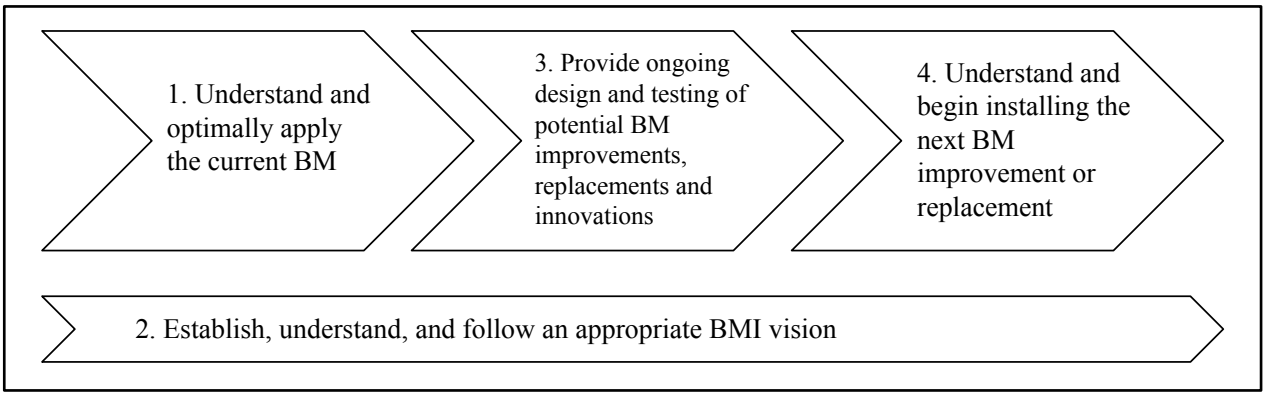

***Figure 1**: The process of business model innovation*

Source: Adapted from Mitchell & Coles (2004)

Keeping the above information in mind, one can see that there are two ways of referring to BMI. The first is when a company creates a new and innovative BM, and the second refers to when a company changes or recreates its existing BM. As such, this thesis defines BMI as:

"The process of changing an existing business model" (Mitchell & Coles, 2004).

2.2.2 Drivers and challenges in business model innovation

The need to innovate BMs can be driven by different internal and external triggers (Demil & Lecocq, 2010; Foss & Saebi, 2017; Teece, 2010).

Internal triggers are located inside the firm and include conscious corporate decisions to adapt BM components and their interlinkages or technologies developed from their research and development (hereafter R&D) efforts (Demil & Lecocq, 2010). BMI is often considered a source of competitive advantage, corporate renewal, and improved financial profitability (Chesbrough, 2007; Chesbrough & Rosenbloom, 2002; Wells, 2013; Zott et al., 2011).

External triggers are located outside the firm and are often summarized under changes in the business ecosystem. Rising costs, technological advances, innovation pressures, market and stakeholder needs, and changes in the competitive or regulatory landscape have all been identified as drivers for BMI in the literature (Bucherer et al., 2012; de Reuver et al., 2009).

Despite the relevance and benefits associated with BMI, the development and realization of BMI are highly challenging and, in many instances, prone to failure (Winterhalter et al., 2017). Challenges in innovating existing BMs can occur as it involves extensive changes in a company's organizational structure that can differ from the mindset that forms the basis of success (Koen et al., 2011). Thus, companies can risk being affected by rigidity in an existing BM (Doz & Kosonen, 2010). Therefore, it is essential to understand what can ease and hinder the implementation of changes in a company's BM.

Barriers to BMI can be categorized as cognitive or organizational (Foss & Saebi, 2017). A crucial cognitive barrier is a biased attitude towards an existing BM, where companies cannot identify any potential outside their business logic (Chesbrough, 2006). Another crucial cognitive barrier to BMI is the lack of strategic understanding from managing a company's existing BM and the prerequisite it is built on (Chesbrough & Rosenbloom, 2002; Mitchell & Coles, 2004). A third significant barrier includes the complexity and uncertainty of the BMI processes. As BMs consists of many related elements, it can be difficult for managers to evaluate the existing BM and new ideas (Osterwalder et al., 2002).

Organizational barriers to changes in BMs include lack of leadership within BMI, and top management should be responsible for this process as they know the operations conducted (Chesbrough, 2006). Further, resilience within the organization can be an organizational barrier to BMI. Different types of stakeholders are involved in innovating a company's BM, which can result in conflicts between departments. Therefore, an agreement within the organization on core values, beliefs, and ideas is essential for collaboration on BMI (Saebi, 2016).

2.2.3 Business model innovation may not be enough for sustainability

A firm conducting a change in its BM may not be enough for sustainability. The presented definition of BM and BMI shows that economic value plays a crucial role in these concepts. Mainly because the nature of a BM is how the firm creates, delivers, and captures value, which makes up the basis of providing economic-rational logic. At the same time, BMI contains all changes in these areas. Moreover, the economic-rational reasoning is insufficient for sustainability reals since it does not consider social and environmental factors (Jonker & Faber, 2019). By seeing these factors as externalities that can be discarded if needed, they are deemed irrelevant to the primary business. The logic fails to embed sustainability into the BM process (Boons & Lüdeke-Freund, 2013).

However, the logic implies short-term thinking that does not go beyond satisfying shareholders' expectations. Therefore, a short planning horizon and missing system scope are critical issues in the BM and BMI concepts (França et al., 2017). In conclusion, BM and BMI can only partly contribute to sustainable development. Thus, firms must assess and reconsider the value logic underpinning the conventional BM concept. The concepts of BMI for sustainability and SBM address the shortcomings. These concepts will be further elaborated in the following subsection and Section 2.3.

2.2.4 Business model innovation for sustainability

There is a lack of clarity, consistency, and theoretical grounding when using the terms BM, BMI, and SBM (Evans et al., 2017). However, there has been pressure on companies to link their BMs with sustainable innovation. This has expanded the literature regarding the terms BM, BMI, and SBMI in the last few years (Shakeel et al., 2020). It is argued that a firm's ability to innovate in the domain of sustainability is a crucial business capability both when it comes to small incremental steps and a radical, disruptive innovation (Adams et al., 2012). BMI is therefore vital when integrating sustainability into businesses.

Schaltegger et al. (2012) define a BMI for sustainability as all supporting voluntary changes or developments of the BM with a strategic intention to solve environmental and social problems. The term is also defined by Bocken et al. (2014), who describe it as innovations that "create significant positive and/or significantly reduce negative impacts for the environment and/or society, through changes in the way the organization and its value-network create, deliver and capture value, or change their value proposition". The two definitions have in common that sustainability needs to be implemented in the core of the BM. For firms with existing BMs, BMI is required in order to tackle the crucial challenges of a sustainable future.

2.2.4.1 Incremental and radical changes

There are several ways of classifying the degrees of BMI for sustainability. Schaltegger et al. (2012) proposed a classification of innovations to match the purpose of creating business cases for sustainability. The classification distinguishes between adjustments, adoption, improvements, and redesign. It was inspired by an earlier classification by Mitchell and Coles (2004). The classification by Schaltegger et al. (2012) is highly recognized, and the four stages are differentiated in the following way:

1) *BM adjustments* include changes of one or a small number of BM components. The value proposition, like modifications of customer relationships, is excluded

2) *BM adaptation* refers to changes that focus on matching competitors' value propositions

3) *BM improvement* occurs when substantial parts of the BM elements are changed, including simultaneous changes of a significant number of components like the customer relationships element

4) *BM redesign* occurs when an improvement leads to an entirely new value proposition, meaning that the underlying business logic and new products/services are offered

Another study proposes that innovations for sustainability can be classified in two ways. Firstly, it is a series of small incremental steps in the right direction. Secondly, there is a need for more radical, disruptive transformations. Therefore, it was found that the different contexts of sustainability innovations are divided into *Operational Optimization* and *Systems Building*. Operational optimizations consist of small, incremental changes. They include firms that diminish harmful consequences of their business activities, i.e., technological innovations that reduce emissions, minimize the use of non-renewable materials, and replace toxic components with renewable. Systems building is radical, disruptive changes and recognizes that reducing elements of unsustainability will continue depleting resources and emitting pollutants. Examples of innovations in this classification are seeking to become increasingly sustainable rather than less unsustainable, wider institutional change and alternative delivery of products and services (Adams et al., 2012).

2.3 Sustainable business model concept

The following sections will give a further explanation and definition of the term SBM, as well as the design and strategy, drivers, and challenges for SBM.

2.3.1 Sustainable business model development and definitions

Early research on SBM and BM for sustainability focuses on models' structural and cultural roots that contribute to corporate sustainability (Stubbs & Cocklin, 2008). The concept of the SBM is to describe how an organization creates, delivers, and captures value, in an economic, social, or cultural context, in a sustainable way. Industries and businesses have used the concept to reach their economic, environmental, and social goals simultaneously (Nosratabadi et al., 2019). Thus, the plan for SBM has been to create value for the triple bottom line; economy, society, and the environment (Dyllick & Hockerts, 2002).

It is possible to use the SBM to incorporate sustainability and integrate sustainability goals in the value proposition, value creation, and value capture activities of businesses (Boons & Lüdeke-Freund, 2013). All nine BM components presented in Table 2 need to be harmonized to make an SBM, but literature has found that the development of SBM is initially concerned with the value creation or delivery component (Laudien & Daxböck, 2017), which is highlighted by how one needs to consider interdependencies between BM components in the SBMI process (Berends et al., 2016).

Although the SBM concept has been researched for a long time and is still expanding continuously, there is no single supported definition of SBM. One approach was made by Wells (2013), who describes an SBM as something that "would assist in the achievement of sustainability by following major principles for sustainability", and the major principles are resource efficiency, social relevance, localization and engagement, longevity, ethical sourcing, and work enrichment. An SBM aims to engage in innovation and a long-term perspective to meet sustainability goals. This has contributed to reducing some of the harmful effects of business activities on the environment and society by finding solutions for firms to meet their economic and sustainability goals simultaneously (Holliday et al., 2002).

Jørgensen and Pedersen (2015) identified two main types of SBMs. The first type occurs when organizations innovate their BM to make their operations more sustainable. The second type is when organizations create new BMs that contribute to solving sustainability issues that the organization did not create. Other research suggests that organizations need to transform their BM to become an SBM. It is not sufficient to only supplement BM with social and environmental sustainability actions for it to be considered an SBM (Stubbs & Cocklin, 2008). More recent studies define SBMs as BMs going beyond delivering only economic value by including consideration of other forms of value for a broader range of stakeholders (Bocken et al., 2013) and BMs that incorporate sustainability as an integral part of the organization's value proposition and value creation logic (Abdelkafi & Täuscher, 2016).

Evans et al. (2017) argue that SBMs have supported businesses to achieve their sustainability ambitions with a focus on creating value. They state that changes to BMs are the fundamental approach to realizing innovations for sustainability but that there is a lack of case studies, making it difficult for firms to understand how to innovate their BM. There is even a higher complexity related to BMI for sustainability. When designing an SBM, the first step is to design sustainable value that incorporates economic, social, and environmental benefits. The second step is to create a system of sustainable value flows among stakeholders while having the natural environment and society as primary stakeholders. The third step includes generating a value network. The authors further argue that the fourth step is to systematically consider the stakeholder interest for mutual value creation, and the fifth step is to internalize externalities through the Product Service System.

Schaltegger et al. (2016) proposed a definition of the term based on the present literature at the time. Building on the presented conceptualizations, this thesis will use the exact definition. An SBM is defined as:

"Something that helps describe, analyze, manage, and communicate 1) an organization's sustainable value proposition to its stakeholders, 2) how it creates and delivers this value, and 3) how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries" (Schaltegger et al., 2016).

2.3.2 Sustainable business model design and strategy

To link the theoretical concept of BMI to the emerging SBMs, it is crucial to look into the design of these BMs. One approach toward expanding on the BMI is to design it in new ways. A research paper by Bocken et al. (2013) identified and defined eight SBM archetypes illustrated in Table 3.

The archetypes are:

1) *Maximize material and energy efficiency*, which involves using fewer resources that generate less waste, emissions, and pollution

2) *Create value from waste* that happens when one eliminates the concept of "waste" by turning it into valuable input for other productions

3) *Substitute with renewables and natural processes* to reduce the environmental impacts

4) *Deliver functionality rather than ownership* which can provide services that satisfy users' needs without a physical product

5) *Adopt a stewardship role* which is done by proactively engaging with all stakeholders to ensure their long-term health and well-being

6) *Encourage sufficiency* includes solutions that want to reduce consumption and production

7) *Re-purpose the business for society/environment* occurs when prioritizing the delivery of social and environmental benefits rather than economic profit

8) *Develop scale-up solutions* that deliver many sustainable solutions to maximize social and environmental benefits

An organization might need to combine several archetypes to achieve a sustainable outcome.

Table 3: *The sustainable business model archetypes*

Technological	**Social**	**Economic/Organizational**
1) Maximize material and energy efficiency 2) Create value from waste 3) Substitute with renewables and natural processes	4) Deliver functionality rather than ownership 5) Adopt a stewardship role 6) Encourage sufficiency	7) Repurpose for society/environment 8) Develop scale up solutions

Source: Adapted from Bocken et al. (2013)

Bocken et al.'s (2013) eight archetypes have inspired SBM strategies developed by Geissdoerfer et al. (2018). They identified four ways to incorporate SBM strategies:

1) *Sustainable start-ups* involve creating a new organization with an SBM

2) *SBM transformation* occurs when changing an existing BM into an SBM

3) *SBM diversification* involves creating an SBM without changing the existing BM by developing in-house start-ups

4) *SBM acquisition* consists of acquiring an additional SBM integrated into the organization

The SBM types represent potential outcomes of SBMI that can, for example, include social enterprises, product-service-systems, or circular BMs (Geissdoerfer et al., 2018).

2.3.3 Drivers and challenges of sustainable business model innovation

The possibility of obtaining a competitive advantage and organizational stability while positively contributing to the environment and society is recognized as a critical factor for pursuing SBMI (Bocken et al., 2014; Geissdoerfer et al., 2018; Stubbs, 2017). Numerous studies support that sustainable organizations can achieve a unique competitive advantage. Some of the reasons for this are that highly qualified employees are increasingly attracted to organizations they perceive to be more sustainable, sustainable organizations have fewer capital constraints, and customers are more trusting and loyal toward organizations they deem sustainable (Jørgensen & Pedersen, 2018).

Nevertheless, sustainable competitive advantage may not be the sole factor that encourages SBMI; the motives are often value-oriented and personal (Rauter et al., 2017). Therefore, visionary sustainability leaders who drive a sustainability mindset in the organization are central. Furthermore, consistency between corporate strategy and BM and sustainability-conscious organizational culture and work environment have been identified as internal drivers for SBMI (Stubbs & Cocklin, 2008). A critical external driver for SBMI is changed legal regulations (Rauter et al., 2017). In the event of changed legal regulations, there may be a first-mover advantage for organizations that proactively and voluntarily reduce their shadows (Jørgensen & Pedersen, 2018).

Studies show a correlation between sustainability-driven innovation and long-term financial performance (Stubbs & Cocklin, 2008; Zollo et al., 2013). For sustainability efforts to promote financial performance, they must result in two things at once (Jørgensen & Pedersen, 2018):

1) Help the organization cast less shadow/or shed more light on how the organization reduces its externalities or contributes to reducing others

2) Promote the organization's financial performance by increasing revenues or reducing costs

The literature contradicts whether changes in customer demand are external triggers in the SBMI process. Rauter et al. (2017) attribute customers and competition a relevant role in explaining SBM potential but did not find that the related changes embark the process of SBMI. However, Chesbrough and Rosenbloom (2002) suggest that changes in the business ecosystem that entail the competitive situation, technological innovations, and stakeholder demands are vital in triggering the SBMI process.

When investigating the potential positive effects of incorporating sustainability in the BMI process, it is essential to emphasize results instead of indulgences and prioritize material issues. The literature also suggests that an organization should adapt its efforts according to the objectives they aim to achieve and for whom. Therefore, Jørgensen and Pedersen (2018) found it helpful to distinguish between *push* and *pull* factors for an organization's investments in sustainability efforts. Push factors reflect the negative aspect of the current BM by pushing the organization toward an SBM and can be competitors that offer products/services that are more sustainable, demands from partners, requirements of owners, and pressure from stakeholders. The positive alternative pulls the organization toward SBMI, including customers demanding more sustainable solutions, opportunity to differentiate, achieving first-mover advantage by setting sustainable standards, trends for more sustainable lifestyles, and new technology making it easier and less costly to become sustainable.

As SBMI is founded on the BMI concept, organizations attempting to implement SBMI are confronted with similar challenges (see Section 2.2.3). Nevertheless, these challenges are increased in SBMI by the complexity of implementing sustainability in BMI (Geissdoerfer et al., 2018).

Barriers explicit to SBMI consist of three dimensions (Bocken & Geradts, 2020):

1) *Institutional barriers* focus on maximizing shareholder value, uncertainty avoidance, and short-term thinking
2) *Strategic barriers* include functional strategy, the dominant focus on exploitation, and prioritizing short-term growth
3) *Operational barriers* focus on functional excellence, standard innovation process and procedure, fixed resource planning and allocation, and the incentive system concentrates on short-term goals and financial performance metrics

2.3.3.1 Initiator of sustainable business model innovation

SBMI literature has primarily focused on bottom-up initiation of the SBMI process instead of top-down. The literature has suggested that the leader of sustainability in an organization has motivating factors that are personal and value-based and that there is an active bottom-up process (Rauter et al., 2017; Stubbs & Cocklin, 2008). However, other studies have found that the BMI process is a task of the top management or the Chief Executive Officer (hereafter CEO) (Bucherer et al., 2012; Chesbrough, 2007; Mitchell & Coles, 2004). Winterhalter et al. (2017) argue that the perception of BMI as a sole CEO task is unrealistic in practice due to time constraints and high workload – especially in large, multinational firms. Moreover, another study proposes to allocate a cross-functional team in the SBMI process and that it might enhance management and performance (Fallahi, 2018). Similarly, cross-functional collaboration is central in innovation BMs toward sustainability (Bocken & Geradts, 2020).

2.4 Tools for business model innovation

This section will elaborate on different tools from the literature. There is a lack of standardized tools for firms to use in BMI. The tools highlighted in this thesis are the BMC and stakeholder analysis. Furthermore, additional tools and frameworks relevant for firms innovating their BM are elaborated.

2.4.1 The business model canvas

The BMC is a strategic tool created by Osterwalder and Pigneur (2010), illustrated in Figure 2. It is a templet to help visualize, understand, and communicate a firm's existing BM. The BMC divides the firm's BM into nine interconnected components or building blocks:

1) *Value proposition* refers to the bundle of products or services creating value for the customer in a systematic and sustainable manner
2) *Customer relationship* describes what kind of relationship the company has with each of its customer segments, both regarding the relationship with one customer and the overall customer experience
3) *Customer segment* is whom the company creates value for and defines the different groups a company aims to reach and serve
4) *Key resources* relate to the resources required by a company to deliver the value proposition for the customers, describing the most important assets it requires to make the BM work
5) *Key activities* refer to the activities a company does to deliver the value propositions, thus, the most important thing a company must do to make their BM function
6) *Key partners* describe a company's network of partners and suppliers on which it relies to make the BM work
7) *Cost structure* is the costs belonging to operating the BM, and can easily be calculated after defining a company's key activities, key resources, and key partnerships
8) Revenue streams are the value that the company captures

The nine components are put together in a system, as illustrated in Table 2 and Figure 2 (Osterwalder & Pigneur, 2010).

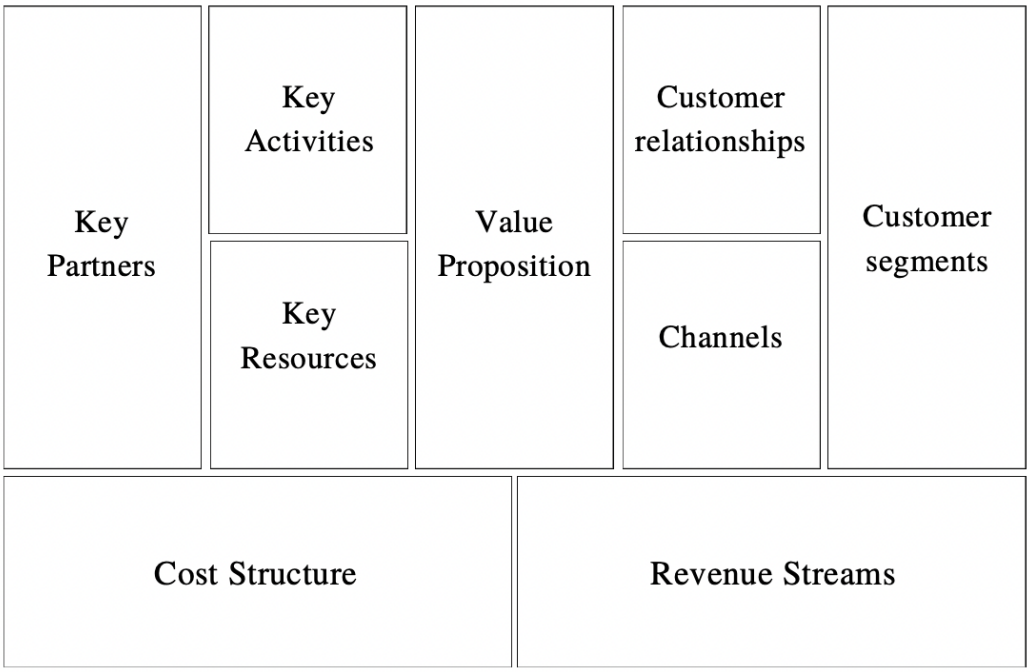

***Figure 2**: Business Model Canvas*

Source: Adapted from (Osterwalder & Pigneur, 2010)

In 2016, an extension of the BMC was introduced by Joyce and Paquin called the triple-layered business model canvas (hereafter TLBMC), which aims to explore sustainability-oriented BMI. The extension includes the economic part of the original BMC while adding environmental and social value creation. The environmental layer is based on the life cycle perspective and aims to see how, or if, the firm generates more environmental benefits than environmental impacts. The social layer captures influences and interactions between the studied firm and its stakeholders. Its goal is to identify the social effects of stakeholder relationships while also finding innovative ways to increase social value creation (and thus reduce negative social impacts). The three layers generate multiple value types since it includes environmental and social, and economical. Using the canvas tool to visually represent a BM, a more holistic and integrated view of the BM is developed and communicated, which supports creatively innovating towards more SBMs (Joyce & Paquin, 2016).

2.4.2 Stakeholder analysis

A stakeholder is defined as someone (either a person or an organization) that is affected by the firm's decisions and actions and has the power to influence its outcome (Freeman, 1984). Examples of stakeholders include governments, competitors, consumers, environmental advocates, and the media, in addition to the traditional stakeholder groups owners, customers, suppliers, and employees (Wood, 1991). Multiple studies regarding SBMs and SBMI find it essential to consider the needs and interests of a wide range of stakeholders through multi-stakeholder dialogue and co-creation (Geissdoerfer et al., 2018; Stubbs & Cocklin, 2008). Stakeholder analysis can give firms and scholars an understanding of how society grants and withdraw corporate legitimacy. A firm's legitimacy could be withdrawn if stakeholders are not satisfied with the firm's performance. That could happen, for example, if customers stop buying products, shareholders sell their stocks, employees quit, environmental advocates sue, or the government reduces subsidiaries or impose unfavorable regulations (Wood, 1991). Analyzing the stakeholders and their interests broadens management's vision of the firm's role and responsibilities beyond profit maximization (Mitchell et al., 1997). A stakeholder analysis is based on the Stakeholder theory, a managerial theory that argues that business can be understood as a set of relationships among groups that have a stake in the activities of that business (Friedman & Miles, 2002).

2.4.3 Materiality analysis

Materiality analysis is an extension of the stakeholder analysis. After identifying the stakeholders, it is crucial to prioritize their expectations. Materiality analysis determines the economic, environmental, and social issues that are most important for the firm's stakeholders (Calabrese et al., 2017). It can be challenging for firms to prioritize their sustainability issues, but conducting a materiality analysis can help give guidelines for screening these. The analysis's main objective is to place issues on a spectrum from less to more important. The issues are divided into financial and sustainable issues, where sustainability materiality has a broad scope and consider issues of concern to all stakeholders. Financial materiality only focuses on issues important to investors (Whitehead, 2017). Including sustainability in the prioritization lets the firm measure, disclose, and be accountable to internal and external stakeholders for the firm and manage impacts on society (Calabrese et al., 2017).

2.4.4 Toolbox for business model innovation

There are several other approaches to improving business sustainability. The CapSEM model is a toolbox for systematically implementing tools to enhance the transition to sustainability (Fet & Knudson, 2022b). It is a stepwise progression where an organization goes through the four levels:

1) Production process change

2) Product and value chain change

3) Organizational change

4) Systems change

The toolbox consists of quantitative and qualitative methods. Moving from one level to the next is a transitionary process where sustainability strategies become more holistic and complete as tools at each level build upon each other (Fet & Knudson, 2022b).

The process starts by identifying improvements through input-output analysis and cleaner production analyses. At this stage, the organization aims to reduce recourse use, energy, water consumption, emissions, and waste, driven by economic incentives. The next level's most important tool for mapping potential improvements of a product's sustainability footprint is life cycle assessment, but supply chain management, carbon and water footprint, design for the environment, and environmental product declarations are also essential. The third level consists of tools like environmental management system, environmental performance evaluation, key performance indicators (hereafter KPI), Global Reporting Initiative (hereafter GRI), life cycle management, corporate social responsibility, and SBM. At this level, the organization aims to translate its BM into a BM with sustainability as a core value by becoming aware of its sustainability performance and learning how to monitor and present it according to international standards. The process ends by involving stakeholders through systems engineering, material flow analysis industrial ecology principles. Stakeholder involvement can be a challenge when introducing holistic sustainability solutions. An organization must consider cultural settings when planning, designing, and sustainable operating systems, or resistance will be met (Fet et al., 2021).

3. Methodology

This section describes the chosen methodology and entails how information was collected and analyzed with the overall objective of answering the research questions of this thesis. First, the choice of research design is presented. Thereafter, the data collection and analysis performed are outlined in greater detail. The section ends with a critical evaluation of the methodology, reflecting on research quality.

3.1 Methodological fit and research design

The methodological fit constitutes an overarching criterion to ensure the quality of research conducted. To make a meaningful contribution, the research design must be internally consistent with prior work and the research questions and purpose of the study (Edmondson & McManus, 2007). The research design includes the link between the research question, the data to be collected, and the strategies for analyzing the data (Bell & Bryman, 2018). It also contributes to avoiding situations where the collected data fails to address the given research question and the purpose of the study (Yin, 2016). The choice of research design is driven by the quality and quantity of information that is currently available, or could easily be gathered, on a given question (Gerring, 2007). The research design involves several decisions about the priority given to a range of dimensions of the research process (Bell & Bryman, 2018).

Many writers on methodological issues distinguish between quantitative and qualitative research methods. However, the interconnection between the different research designs is not as discrete as they first appear (Bell & Bryman, 2018). While it is helpful to contrast the two research strategies, they should not be viewed as opposites. Bryman and Bell (2018) suggest six types of research design: experimental design, cross-sectional or social survey design, longitudinal design, case study design, and comparative design.

This thesis aims to enhance the current understanding of how companies innovate their BM to become more sustainable. To provide an answer to this, representing the overarching research objective of this thesis, a conceptual literature review was combined with a qualitative multiple case study in which semi-structured interviews represented the primary source of data.

3.2 Combining a literature review with a qualitative multiple case study

This thesis combined a conceptual literature review with a multiple case study. Appendix A provides an overview of the objectives related to the literature review and the multiple case study, and the corresponding data collection methods utilized. The combined research design is explained in greater detail in the following two sections.

Data is collected through multiple sources. Primary data was collected through interviews with purposefully selected participants from the case companies. Secondary data was collected through a literature review of previously published studies. Other secondary data includes documents from the case companies.

3.3 Literature review

A literature review was conducted to become familiar with the existing body of literature on the subject of this thesis. The literature review aimed to identify what is already known about this area and relevant concepts and theories. Furthermore, it seeks to identify controversies, inconsistencies, and unanswered research questions in this area (Bell & Bryman, 2018). By identifying unanswered research questions, the literature can provide the starting point for developing research questions and refine and develop as the research progresses.

A conceptual review aims “to synthesis areas of conceptual knowledge that contribute to a better understanding of health” (Jesson et al., 2011). In a time when collected, compiled, and archived data is accessible for researchers all over the world, utilizing secondary data for research is becoming more prevalent (Johnston, 2017). Thus, using existing data provides a viable option for researchers with limited time and resources.

The study should be entered with the broadest and deepest theoretical base possible (Timmermans & Tavory, 2012). For a *broad* familiarity with the knowledge base, a conceptual overview of concepts relevant to this thesis was provided, aiming to clarify their meaning and relations to each other. For a *deep* familiarity with the knowledge base, the review focused on concepts pertinent to the thesis's research questions. The search criteria and procedure of the literature are further detailed in the following section.

3.3.1 Literature search

As outlined in the previous section, the literature review consisted of a broad review of concepts relevant to this thesis and a narrow review of concepts pertinent to the research questions, understanding how companies implement sustainability in their BM as well as tools used, and drivers and challenges faced during this process.

Table 4 displays the databases screened, the fields and search strings used, and the types of publications included in the search. A literature search on Scopus and Oria was conducted simultaneously to gain an overview of relevant concepts. After a targeted keyword search in the databases, relevant articles were identified and evaluated. The authors started this process by reading the abstracts of the papers, aiming to identify signs of relevance, and reading the executive summary and conclusions to evaluate the literature. Further, the authors applied the snowball technique by searching for relevant sources in the reference lists of articles identified by searching on Scopus and Oria (Van Aken & Berends, 2018).

Table 4: *Parameters for identification of literature*

Database	Scopus and Oria
Field	Title, keywords, and abstracts
Search string	**BM:** BM, BM definition, BMI, BM AND create, BM AND innovation, BMC, BMI in practice **SBM:** SBM, SBM definition, SBMI, SBM AND create, SBM AND innovation, SBM AND strategy, SBM archetypes, SBMI firm examples, SBMI case study, develop SBM, SBMI in practice **Tools:** BM tools, BMI tools, SBMI tools, BMI analysis, SBMI analysis **Drivers and challenges:** BMI drivers, BMI challenges, SBMI drivers, SBMI challenges, BMI barriers, SBMI barriers, internal factors AND BMI, external factors AND BMI, internal factors AND SBMI, external factors AND SBMI
Type of publication	Peer-reviewed articles, scientific books, articles, webpages

3.4 Qualitative multiple case study

Given that knowledge on how companies innovate their BM to become more sustainable is scarce and extant approaches and theories are partially inconsistent and insufficient to provide a holistic understanding of BMI, qualitative research is conducted. This is supported by several scholars, advocating the beneficial use of qualitative methods for theory building in nascent research fields (Bell & Bryman, 2018; Yin, 2016). As a research method, it predominantly emphasizes an inductive approach, placing observations into patterns. Furthermore, it embodies a view of social reality as a constantly shifting emergent property of individuals' creation (Bell & Bryman, 2018).

Qualitative research focuses on a few cases with many variables and describes situations from participants' perspectives to understand a phenomenon in context. Further, the sampling strategy develops during the study, driven by an inductive logic as the theoretical concepts and ideas emerge (Hignett & Wilson, 2004). Moreover, qualitative research also explicitly embraces contextual conditions such as social, institutional, cultural, and environmental conditions (Yin, 2016). Qualitative research is less intrusive than quantitative research, allowing the researcher to collect data less structured and more flexible. Thus, the qualitative approach is invariably unstructured. According to Walle (2015), the qualitative method is likely better suited for real-life issues that require more than "yes-or-no responses". In situations requiring a detailed understanding of a process and more information is needed to determine the characteristics of what is being studied, or where the information available is in non-numeric form, a qualitative approach is preferred (Jackson & Bazeley, 2019). Consequently, a qualitative research method is the appropriate research design for this thesis.

Furthermore, this thesis adopted a case study method. All case study research starts from the same compelling feature: the desire to derive an up-close or otherwise in-depth understanding of a single or small number of cases set in their real-world context (Bromley, 1986). Yin (2014) defines case study research as "an empirical inquiry about a contemporary phenomenon (e.g., a "case"), set within its real-world context, especially when the boundaries between phenomenon and context are not clearly evident." The case study approach is an intensive study of a single or small number of units (cases) to understand a larger class of similar units (a population of cases) (Gerring, 2007; Yin, 2014).

A significant strength of case study research is that it goes beyond the study of isolated variables, using multiple sources of evidence (Yin, 2014). Accordingly, using multiple sources of evidence results in higher overall quality, making it more likely that case study findings or conclusions are convincing and accurate (Yin, 2014). A case study is well-suited for research objectives related to *how* or *why* a phenomenon occurs, aligning with the thesis's overarching research objective to understand *how* companies innovate their BM to become more sustainable.

Case study research strives to make sense of a phenomenon that is difficult to control and is multifaced and contemporary (Yin, 2014). This aligns with the thesis purpose to gain a holistic understanding of how companies can implement sustainability in their BM as well as tools used, and challenges and drivers faced during this process, representing a vital undertaking for firms to secure competitive advantage and contribute to sustainable development (Bocken et al., 2014; Wells, 2013).

A multiple case study was applied throughout the thesis, undertaken jointly to explore a general phenomenon (Stake, 1995). Yin (2014) indicates that multiple case studies can mitigate some of the shortcomings commonly associated with a case study design, such as lack of replicability, subjectivity, or strong context specificity. A multiple case study compares several cases and relies on a broader range of empirical evidence. This contributes to a higher level of robustness and analytical strength (Bell & Bryman, 2018; Yin, 2014).

As this thesis explores how companies can innovate their BM to become more sustainable, it is concerned with a phenomenon that develops over time (Winterhalter et al., 2017). Therefore, it retrospectively examines three companies' efforts to implement sustainability in their BM.

3.4.1 Case and interview sample

In this thesis, a non-probability, purposeful sampling technique was followed to identify and choose insightful cases (Guba & Lincoln, 1989), consistent with the essence of qualitative research and the case study research applied in this thesis. The sample is evaluated in terms of whether it could contribute to and deepen the understanding of the research objective and questions. A criterion sampling is applied, using predetermined criteria that need to be fulfilled before selecting suitable cases and interviewees (Patton, 2014). First and foremost, the criteria for the case sample were a clear sustainability orientation. Second, the companies' business operations constrained variation in the cases, as they differ in operations in different places throughout the aquaculture value chain network.

In addition to the presented case selection criteria, two additional criteria for selecting interviewees were applied. First, the interviewees should hold a managerial position and demonstrate a strong familiarity with the BMI process within the company. Second, the interviewees should have active participation in the process. Contact with the interviewees was established through e-mail and telephone to create a personal relationship and motivate participation. During the initial dialogue, the interviewees were thoroughly informed about the research, including research objectives and questions and processing and storing of personal data. The interviewees were also provided a consent form to be signed.

3.4.2 Interview design

The qualitative research interview attempts to understand the world from the subjects' point of view, unfold the meaning of their experiences, and uncover their lived world before scientific explanations (Kvale & Brinkmann, 2015). In-depth interviews are administered to a few subjects in an intimate, tailored, and detailed manner and are an essential source of case study evidence because most studies are about human affairs or actions (Walle, 2015; Yin, 2016).

Interviews served as the primary data source for constructing the multiple case study. The semi-structured interview presents the opportunity to understand participants "on their own terms and how they make meaning of their own lives, experiences, and cognitive processes" (Brenner, 2006). Thus, a semi-structured format with an interview protocol to guide the interviews conducted was applied in this thesis (Bell & Bryman, 2018).

The interview protocol, presented in Appendix B, and the interview protocol for the screening interviews, found in Appendix C, served as a structural foundation for the questioning route. The interview protocol contained open-ended questions, allowing the interviewees' freedom to respond in an idiosyncratic manner. Furthermore, secondary data about case companies and interviewees were collected. Documents from the three case companies were analyzed, providing background information and historical insight. The documents support other primary and secondary data collected and provided a means for tracking change and development and getting a clear picture of how the case companies fared over time. Based on the information from secondary data, the interview protocol was tailored to the respective case company before each interview to maximize the quality of the interviews conducted.

Before the interviews were conducted, the interviewers used a script to explain the interview procedure and clarify any questions or concerns by the interviewee (Burke & Miller, 2001). The interviews were carried out in the interviewers' and interviewees' first language, Norwegian, to avoid misunderstandings or language barriers.

In total, nine interviews were conducted. Three interviews served as screening interviews, providing initial information about the Norwegian aquaculture industry and its sustainability challenges. The initial number of interviews was extended to provide more details and fill missing gaps. Thus, the interview process was conducted until saturation was reached and the case and interview sample no longer revealed any new essential information (Miles & Huberman, 1994). The interviews were carried out from the beginning of February to the beginning of April, and the duration was between 17 to 89 minutes. Some of the interviews were conducted face to face, while others were virtual meetings on Microsoft Teams.

Table 5 provides an overview of the interviewees. The names of the interviewees were replaced with numerical IDs. The interviewees all hold a strong managerial position while also demonstrating a strong familiarity and active participation in the BMI process within their firm. They fill the roles of CEO, Chief Marketing Officer, Vice President, and Quality Manager.

***Table 5**: Overview of interviewees*

Interviewee ID	**Organization**	**Interview type**	**Interview duration**	**Study**
1	MMC First Process	Virtual meeting	1x 30 min	Main study
2	MMC First Process	Virtual meeting	1x 36 min	Main study
3	Rostein	Virtual meeting	1x 69 min	Main study
4	Rostein	Virtual meeting	1x 24 min	Main study
5	Hofseth Aqua	Virtual meeting	1x 17 min	Main study
6	Hofseth Aqua	Virtual meeting	1x 72 min	Main study

1	MMC First Process	Face-to-face	1x 89 min	Screening
3	Rostein	Face-to-face	1x 62 min	Screening
5	Hofseth Aqua	Virtual meeting	1x 37 min	Screening

3.4.3 Data processing and analysis

According to Yin (2016), the analysis of qualitative data moves through five phases:

1) Compiling

2) Disassembling

3) Assembling and arraying

4) Interpreting

5) Concluding

Data analysis is likely to occur in a non-linear fashion, going back and forth between different phases (Yin, 2016). Although there are standard analytic practices, there is also a range of ways that one might analyze qualitative data (Lester et al., 2020).

All the interviews were audio-taped and transcribed using Microsoft Word Online. The transcription feature can convert speech to a text transcript separated by speakers, timestamp the audio, and pause and playback the audio. Further, the Computer-Assisted Qualitative Data Analysis System, NVivo, was used for managing, organizing, and analyzing the data. NVivo allows researchers to code data, sort and examine the collected material, and make it easier to identify themes and visualize content (Bazeley & Jackson, 2013).

Coding should be a collaborative effort since multiple minds bring multiple ways of analyzing and interpreting the data (Saldaña, 2021). The authors coded all the interviews using a clear, coordinated coding structure. By coding transcriptions individually, the authors were able to cast a wider analytic net over the data, and it is a way of validating the findings. It also provides an opportunity for clarifying ideas and gaining new insights into the gathered data.

Eisenhardt's (1989) in-case and cross-case analysis was applied. First, each case company was analyzed as an isolated unit in an in-case analysis. This was followed by a cross-case analysis, where all three cases were compared to each other to discover similarities and differences across the cases (Eisenhardt, 1989). The findings from the analyses were supplemented by secondary data obtained.

3.5 Evaluation of methodology

In this section, the research conducted is evaluated utilizing Guba & Lincoln's (1989) four criteria of trustworthiness: credibility, transferability, dependability, and confirmability of the research.

3.5.1 Research quality

Credibility, which echoes internal validity in quantitative research, refers to how this research can be trusted by critical readers and are congruent with reality (Bryman & Bell, 2011). Triangulation, internal control, and member checking were applied to enhance the credibility of the research. The authors triangulated the primary data obtained during interviews with secondary data gathered, such as documentation, sustainability reports, annual reports, KPIs, and other digital documents. The multiple sources of evidence were compared to each other to support the thesis findings. This can assist in mitigating the risk of informant bias (Guba & Lincoln, 1989). The interviews were audio-taped and transcribed immediately after the interviews were conducted. Both authors reviewed the transcriptions for internal control, focusing on correctly interpreting the answers from the interviews.

Furthermore, both authors coded all the interviews individually in NVivo using a coordinated coding structure to validate the findings. Further, member checking was performed by making a draft version of the BMC available to the interviewees (Guba & Lincoln, 1989). The feedback from interviewees was used to correct potential errors and validate our understanding.

Transferability parallels external validity in quantitative research and refers to the extent to which findings can be generalized or are transferable to another setting (Bell & Bryman, 2018). A study has a high level of transferability if the conclusions of one context can apply to other contexts and settings. The context-specific nature of case studies with small sample sizes is typically not suited to allow universal conclusions to be drawn for a larger population (Yin, 2014). The case companies examined in this thesis are of different sizes but operate in the same industry. This may increase the transferability. However, the interview objects are selected non-random, which makes the external validity questionable (Bryman & Bell, 2011). The authors did not attempt to achieve a statistical generalization. Nevertheless, an analytical generalization can be assumed as patterns were identified across cases in the cross-case analysis in section 4.4. Furthermore, the authors aimed to provide contextual information to assist the reader in determining if the findings can be transferable to another setting (Bell & Bryman, 2018).

Dependability is principally concerned with whether this thesis's findings are consistent with the data collected and could be repeated (Guba & Lincoln, 1989). According to Bell and Bryman (2011), the process must be stable and consistent over time for the study to have a high degree of dependability. To ensure dependability in this thesis, the methodology is presented in Chapter 3 and Appendix A to provide a clear overview of the research process. The authors have justified the research design and delineated the choices of data collection and analysis, describing the identification of relevant literature, case and interview sample, and how primary and secondary data were collected and analyzed. Furthermore, documentation of the methodological choices taken in different stages of the research process and the interview guide are attached in Appendix A, Appendix B, and Appendix C to strengthen the dependability.

Confirmability examines how personal beliefs, values, or theoretical predispositions impact the research process and the analysis of the findings (Bryman & Bell, 2011; Guba & Lincoln, 1989). A triangulation of multiple data sources was applied and discussed in assessing the credibility to increase confirmability in the research. To ensure that the research subject was explored in a sufficiently diversified manner, the authors were exposed to varying theoretical perspectives (Guba & Lincoln, 1989). The working definitions for BM, BMI, SBM, and SBMI were based on several characteristics and definitions presented in the conceptual background to prevent a dominant theoretical tendency.

4. Findings from the multiple case study

This section starts with a brief introduction to the Global Aquaculture Tech Hub (hereafter GATH) and the selection of case companies. Then, the case companies and their BMs are depicted using the BMC presented in Appendix D, E and F. Moreover, this chapter provides an in-case analysis of how the cases of the companies have innovated their BMs to become more sustainable. Finally, a cross-case analysis is conducted by comparing the cases to determine their similarities and differences. The findings of this study rely on the primary data, which was collected through semi-structured interviews. In addition, two interview partners from each case company took part in semi-structured interviews. Secondary data, including annual reports, sustainability reports, and other digital materials, were collected from the case companies and also added to the primary data. The thesis is concerned with how SBMI is a process that develops over time and thereby retrospectively examines the three cases' efforts to implement sustainability in their BMs.

4.1 Global Aquaculture Tech Hub

The case companies are founding members of GATH. GATH aimed to be an international competence hub for aquaculture in Northwest Norway and was founded in 2021 by several key actors within the aquaculture industry, such as Sølvtrans, MMC First Process, PatoGen, Cflow, Optimar, Hofseth Aqua, Rostein, Salmon Evolution, Møreforskning, Norconsult, Normex, and Atlantic Sapphire. Several GATH members are world-leading companies, and the common attribute among all the companies is that they have their center of gravity on Sunnmøre. Moreover, the aquaculture hub aims to create an attractive region for customers, partners, R&D, students, and the labor force, secure regional competence and recruitment, facilitate collaboration, and increase value creation (GATH, 2022).

4.1.1 Selection of case companies

This thesis explores three primary cases of the companies (subsequently referred to as "the case companies": (i) MMC First Process, (ii) Rostein, and (iii) Hofseth Aqua. This section will shed light on the case companies by highlighting various characteristics, which are briefly summarized in Table 6.

All the case companies were examined to fulfill the case sampling criterion presented in section 3.4.1. As a result, the cases have a clear sustainability orientation, variation exists in their business operations, and they operate at different places throughout the aquaculture value chain.

***Table 6**: Case company profiles*

Aquaculture category	**Case actor**	**Location**	**Established**	**Number of employees**	**EBITDA (2020)**
Equipment/ technology supplier	MMC First Process	Fosnavåg, Ålesund, Haugesund	1997	202	31 961 000
Well boat company	Rostein	Harøy, Ålesund, Tromsø	1996	258	361 954 000
Fish farming company	Hofseth Aqua	Tafjord, Stranda, Ålesund	1975	120	-13 839 000

Source: (Proff, 2022a, 2022b, 2022c)

Figure 3 illustrates the role of case companies in the GATH network and their relationships with each other. This illustration aims to demonstrate the parts of the aquaculture network in which the cases operate, but it is not a complete value network since it does not accurately represent each company's value chain.

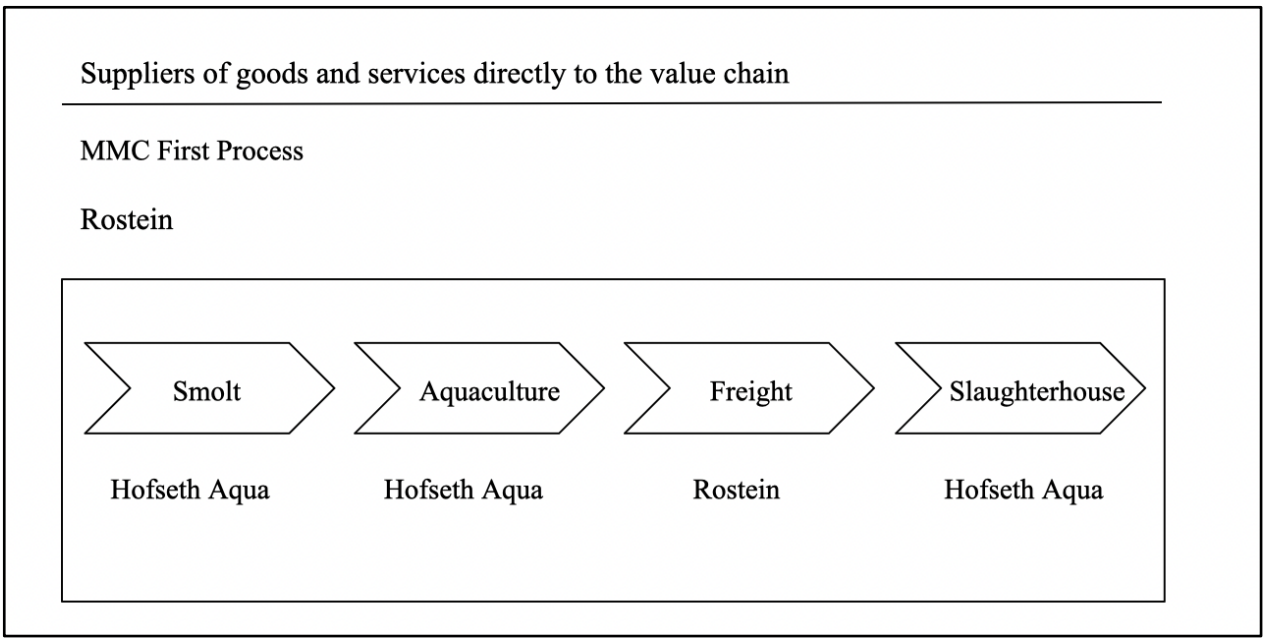

***Figure 3**: Illustration of the case companies' roles in the aquaculture network*

The three case companies are stakeholders of each other by being either a supplier or a customer. Firstly, MMC First Process is a supplier to both Rostein and Hofseth Aqua. Secondly, Rostein is sporadically a supplier to Hofseth Aqua and a customer of MMC First Process. Thirdly, Hofseth Aqua is a customer of MMC First Process and sporadically a customer of Rostein.

4.2 In-case analysis

The following section conducts an in-case analysis and analyzes the case companies as an isolated unit. The findings of the analysis are based on the interviews and supplemented by the secondary data, and the analysis was done in three stages. First, the companies and background information about each case company are introduced. Second, an explanation of their BMs based on the BMC is described (presented in Appendix D, E, and F). Third, the case companies' process of innovating their BMs to become more sustainable, including sustainability measures, tools, drivers, and challenges is explained. Finally, the findings are summarized in Tables 7, 8, and 9, provided at the end of each case.

4.2.1 MMC First Process AS

The first case company, which is MMC First Process, is located in three places along the west coast of Norway, with their head office in Fosnavåg. The firm offers a complete and sustainable system in the form of solutions for handling, processing, and cooling services to the seafood industry, onshore, onboard, and aquaculture worldwide (MMC First Process, 2022).

4.2.1.1 Business model

MMC First Process's BM creates revenue streams from selling solutions and competence to customers who handle biomass. Moreover, their communication channels with their customers are based on word of mouth, social media (hereafter SoMe) (primarily Facebook and LinkedIn), digital communication, and existing business networks. Their cost structure consists, first and foremost, of deliveries from suppliers, purchases of goods, R&D, and location.

Moreover, MMC First Process provides solutions to their customer segments, such as well boat companies, land-based farming, pelagic fishing boats and handling, and shipyards. The firm's key method of maintaining and managing its customer relationships is through being a market-driven organization that delivers services and provides solutions according to its customers' requirements. Furthermore, its service and aftermarket department is important for handling customer relationships. The key resources of MMC First Process are the human resources, which include skilled personnel and competence, but also their patents, capital, and machinery. In addition, the key activities of MMC First Process consist of how the firm maintains and creates customer relationships and produces and designs solutions that fulfill customers' requirements. Finally, producers and suppliers of equipment and customers are the key partners of the MMC First Process.

The following section explains the important characteristics of MMC First Process that play a crucial role in the innovation of their businesses.

4.2.1.2 Innovation of the business model

Sustainability in BM

MMC First Process builds its BM around sustainability by considering sustainability in the whole value chain and as an integrated part of its strategy. The BM of MMC First Process revolves around fish welfare and ensures that its customers are capable of sustainable fish handling to provide high fish survival rates. When implementing sustainability in its BM, MMC First Process started with its value proposition: to make its customers the best in the world in sustainable handling of the sea's most important food resource. Moreover, the firm's key activities, producing and designing solutions, are closely related to its value proposition and crucial in making it sustainable. Therefore, sustainability has been implemented in their key activities through several sustainability measures, described in the following sections. In addition, MMC First Process has also implemented sustainability in their channels by, among other things, primarily having video consultations with their customers instead of traveling by plain to them. Additionally, if problems occur for customers located far from Sunnmøre, MMC First Process provides camera spectacles with video support to be able to assist them virtually. This feature significantly reduces the environmental footprint and the traveling cost related to maintaining a high quality of customer service.

Furthermore, the firm has incorporated sustainability into the BM component of key partners who consist of producers and suppliers of equipment and customers. Therefore, sustainability has been threaded through supplier selection. The firm uses its market power to influence its partners and suppliers to become more sustainable by choosing the most suitable partners and suppliers. As a result, the firm has increased its turnover by 150 % in the last four years, gaining high market power and thereby the possibility to influence its suppliers. Moreover, the firm has high demands for its suppliers to act sustainably and chooses suppliers with the same long-term mindset regarding reducing emissions and not having unnecessary waste in production. Thus, the primary goal of MMC First Process is to make its value chain as sustainable as possible.

Sustainability measures

For environmental sustainability measures, MMC First Process arranged clean-up of the coastline and the local community in Mjølstadneset, limited their travels, recycled all steal, installed paper pressers on all locations to recycle paper, and used supplier selection to identify the most sustainable choice for suppliers selection. Moreover, social sustainability measures include gradually hiring more women and arranging tours of their production sites for young women. In addition, MMC First Process helps developing countries with low-cost fish handling solutions and provides competence. Thus, the firm has taken economically sustainable measures, such as spending time and money on the GATH cooperation. The firm stated that the steps and changes they have made were incremental. When making extensive and radical organizational changes, MMC First Process believes that so much resistance occurs that it is impossible to efficiently implement all the required sustainability measures at once.

Tools

A BMC was not created, and the firm did not use the CapSEM model to identify how to implement sustainability in their BM. However, the firm used a consulting firm to determine the most impactful SDGs. In addition to using a consulting firm, MMC First Process gathered the whole management team to identify the areas of the production process and value chain that require sustainability measures. The management team, in collaboration with the consulting firm, chose seven of the SDGs to create operative sustainability-focused KPIs. Afterward, the management team sought various departments' assistance to specify the KPIs and build the firm's sustainability culture. Thus, identifying KPIs resulted in an effective monitoring and performance measurement of the novel BM before and after the BMI process to become more sustainable.

MMC First Process conducted neither a stakeholder nor a materiality analysis. However, the firm can identify its most important stakeholders. Moreover, their most influential stakeholders have expectations about the firm operating at a profit and having a favorable reputation so it can eventually be sold. Consequently, their shareholders expect the firm to have sustainable production since they believe it is easier to sell a firm that already focuses on sustainability than one that does

not. Another stakeholder group identified in the interviews is their customers, who only expect to have functioning equipment, but no expectations regarding sustainability were identified. The firm added that consumers might not be an important stakeholder group presently but suppose it will change in the future. Therefore, the firm believes a change in consumer demand will occur, making it crucial for consumers to know that their food is produced sustainably and ethically. Moreover, the firm stated that Sunnmøre, which is the region the firm belongs to, is an important stakeholder with expectations for the firm to have a responsible production.

Drivers and challenges

As elaborated in the previous paragraph, several drivers of MMC First Process were identified in the interviews, such as their stakeholders, specifically their shareholders and consumers. The possible change in consumer demand through large population twists where consumers want to know that their food is produced sustainably is a major driver for the firm. Therefore, the firm aims to provide consumers with food made with the lowest CO_2 imprint possible so potential customers will prefer their fish instead of other food produced with a higher CO_2 imprint. Consequently, a driver for the SBMI process is to solve a potential need in the future market. In addition, offering sustainable food to a growing population and obtaining a competitive advantage were also considered drivers for the SBMI process. Lastly, examining the temperature rise through climate change and its impact on fish welfare was also considered a driver for the firm to start implementing sustainability in its business operations.

MMC First Process found involving and engaging all employees and managers the most challenging part of the SBMI process. This results in not getting their employees and managers to understand that sustainable food production at a low CO_2 is beneficial for the firm in the long run. Specifically, the management team found it challenging to prioritize meetings about sustainability over business operations that directly increase profit. Therefore, the management team spent their evenings and nights having sustainability meetings and sometimes assembled several meetings with the same agenda since not everyone could attend the first.

Another challenge for the firm was the dependency on suppliers' technological advances. It is important to note that MMC First Process is dependent on cars for transporting and therefore has a goal of only using electronic vehicles by 2025. However, the goal is challenging to meet since most working vans currently have a limited electronic capacity to cover long distances. The findings of the first case company, which is MMC First Process, are summarized in Table 7.

4.2.1.3 Summary of findings from the in-case analysis

***Table** 7: Summary of findings for MMC First Process*

Findings	**MMC First Process**
Changes in BM	Value proposition Key activities Key partners Channels
Sustainability measures	Clean-up of coastline and local community Limitation of travels Recycling Supplier selection Focus on recruitment of women Help developing countries with systems and competence at a lower price Collaboration in GATH
Classification of changes	Operational optimization Incremental
Tools	No tools used
Drivers	Shareholders Competitive advantage Climate change Change in consumer demand

	Contribute to the production of offering sustainable food
Challenges	Get employees and managers involved and engaged Prioritizing Need technological advances from suppliers

4.2.2 Rostein AS

Rostein is one of the leading well boat companies in the world; still, continuous improvement and innovation are central to the business. It offers smolt and harvested fish transport, treatment and sorting, as well as counting salmon and trout. Rostein has three main offices, its head office is located in Harøy, and its two other offices are in Ålesund and Tromsø (Rostein AS, 2022)

4.2.2.1 Business model

Rostein's value proposition is transporting, processing, and sorting alive fish. Their revenue streams consist of time-charter, framework contracts, and spot market. The three categories are different contracts the firm offers its customers to generate revenue. Their communication channels with their customers are based on their e-mails, phone numbers, industry fairs, and word of mouth. However, they also use webpage and SoMe for communication and advertisement. Moreover, the cost structure of Rostein consists of its personnel, boat crew, operation, fuel, and maintenance.

The firm's customer segments are divided into three categories that also serve as the revenue streams: (i) time charter, (ii) framework contracts, and (iii) spot market. To keep the loyalty of its current customers and attract new customers and thus build customer relationships, the firm goes to industry fairs and delivers goods at agreed price and time to get a good word of mouth. Additionally, Rostein aims to find effective working methods and then implement them when delivering their value proposition to their customers.

Moreover, Rostein also supports its customers' growth with the excellent boat capacity when production is increased. There are five key resources of Rostein: (i) crew, (ii) well boats, (iii) equipment, (iv) partners, and (v) shipyard. The most important key activities are innovation and transportation, processing, sorting, and treatment of alive fish. In addition, Rostein has several key partners, including Larsnes Mek (shipyard) and fuel, equipment, system, service, and design suppliers.

4.2.2.2 Innovation of business model

Changes in BM

Rostein's primary focus for sustainability of current BM is to consume the least fuel and get its ships as effective as possible. The firm uses logistics, shore power, and supplier selection to produce the least possible CO_2 footprint. Moreover, Rostein has systematized its sustainability efforts through Rostein Zero by evaluating what has been successful and what they can do differently in the future. The firm has implemented sustainability in its value proposition: transporting, processing, and sorting fish. The firm has created innovations to process and transport fish more sustainably, as well as focusing on reducing fuel and using the shortest route possible in transporting fish. This goes hand in hand with the firm's key activities, transportation and processing of fish, and innovation.

Furthermore, Rostein has also implemented sustainability in its channels by using logistics to find the shortest route for transporting fish from one area to another. Additionally, the firm has great expectations for its key partners regarding sustainability. Primarily, Rostein has expectations for its shipyard, Larsnes Mek, but it also considers sustainability in selecting other suppliers.

Sustainability measures

Rostein has taken several measures for environmental sustainability. For example, older well boats in Rostein's fleet are shorter than today's standards and therefore do not have space for inserting new technology. Instead of discarding the older well boats, they have lengthened them and thereby prolonged their lifetime. Moreover, Rostein introduced the world's first hybrid well boat in 2020. In addition, the firm focused on primarily shopping products in the region to have the shortest possible value chain. For social sustainability measures, the firm has focused on hiring more women and sponsoring local teams and organizations.

Some economic measures are that Rostein has invested in new firms that work with innovative technology in fish farming and increased the number of jobs in their local community. When asked if the changes they have made to implement sustainability in their BM were incremental or radical, Rostein stated that their new hybrid well boat was radical but that the other changes were incremental.

Tools

Rostein has tried to identify where they have the most significant emissions in their production and business operations. However, they have not used any specific tools for this. Furthermore, when asked how they chose sustainability-focused areas, they stated that the site is selected based on the most opportunities and where the company could make the most efficient difference by investigating the most significant emissions. Rostein also specified that being able to document low emissions and low environmental footprint gives them a competitive advantage. Therefore, they believe that it is likely that the carbon footprint for farmed fish will be calculated and indicated based on the emission created from production and transport up until the point of sale in the future, and which vessel that transports the fish will affect the overall emission.

The firm did not conduct a stakeholder or materiality analysis but believes that its most important stakeholders are its local community and key partner Larsnes Mek. They have expectations that the firm contributes to the local community and that they continue using their services. In addition, the firm does not believe that its most important stakeholders have any specific expectations regarding sustainability, but they want the firm to have a long-term strategy. Another mentioned stakeholder is Norway since the aquaculture industry is vital for giving work to Norwegian residents on the coast and generating revenue. Their customers are another crucial stakeholder because they are the key to revenue, but the firm's customers do not have sustainability expectations. Lastly, several Non-governmental organizations (hereafter NGOs) investigating fish welfare are stakeholders with sustainability expectations the firm aims to meet.

Drivers and challenges

One of Rostein's drivers for moving to a sustainable BM is internal competition in the aquaculture industry between various technologies. The competition has made various firms stop using diesel generators and produce salmon with less energy than before. So, obtaining a competitive advantage is another driver for the firm. In addition, their employees' motivation is boosted by working in a place where food production is sustainable and future-oriented instead of something that destroys the environment.

Moreover, the firm believes that salmon will be central in offering sustainably produced food to a growing population in the future. Lastly, the firm stated that revenue is a significant driver, especially considering the rising fuel costs, which can help elevate revenue by reducing fuel usage.

Having too short well boats in the old fleet is another challenge Rostein encounters in implementing sustainability in their BM. Their old well boats are too short and have no available space for the new technology needed to increase sustainability. Additionally, they work a lot on testing new technology, and getting it to work is difficult. Often, they must dismantle it and put it on land at the last minute when they had planned to use it. As a result of this, investments are lost on failed technology. Thus, the firm aims to overcome the challenges by lengthening its old well boats to create space for new technology that can contribute to saving fuel and reducing emissions. They are also collaborating with their suppliers and trying different technologies. The findings of the second case company, which is Rostein, are summarized in Table 8.

4.2.2.3 Summary of findings from the in-case analysis

***Table 8**: Summary of findings for Rostein*

Findings	**Rostein**
Changes in BM	Value proposition Key activities Key partners Channels
Sustainability measures	Redesign of old well boats Worlds first hybrid well boat Use local suppliers Hire more women Sponsoring local organizations Investing in tech-firms Collaboration in GATH
Classification of changes	Operational optimization Incremental
Tools	No tools used
Drivers	Stakeholders Competitive advantage Contribute to the production of sustainable food

	Increased revenue
Challenges	Old well boats are too small for new technology Implementation of new technology

4.2.3 Hofseth Aqua AS

Hofseth Aqua is a fully integrated fish farming company with operations including all areas of the seafood value chain, from smolt and farming to processing and sales. Moreover, all their operations are close to each other, ensuring efficient transport of their fish from smolt to slaughterhouses (Hofseth AS, 2022). The firm is Norway's leading processor of salmon and trout (AKVA group, 2022).

4.2.3.1 Business model

The value proposition of Hofseth Aqua is based on farming fish (Atlantic salmon, fjord trout, and Atlantic cod) with low environmental impact. Their revenue stream comes from selling farmed fish. Hofseth Aqua used various channels for communication, such as their web page, digital communication, industry fairs, and word of mouth. The firm's most significant costs are the costs of fish feed, treatment, and training personnel.

Customer segments consist of large food chains worldwide, and the most prominent food chains are in the USA and Japan. The most important way for the firm to keep their existing customers and get the attention of new customers and thus create strong customer relationships is by thinking long-term and being a reliable supplier. Three primary key resources are (i) capital, (ii) skilled personnel, and (iii) a competent workforce. The key activities of Hofseth Aqua are their work on following up on certifications and fish farming. Moreover, several key partners include feed producers, well boat companies, smolt suppliers, service boats, contractors, and equipment and technology suppliers.

4.2.3.2 Innovation of the business model

Changes in BM

Hofseth Aqua considers sustainability as already integrated into the core of its strategy since it is included in every part of its value chain. In their BM, the firm focused on implementing sustainability in its value proposition and channels. Furthermore, Hofseth Aqua's value proposition is to offer salmon and trout that are guaranteed to be produced in the most sustainable environment. Their channels have been thoroughly reviewed to increase sustainability. Previously, Hofseth Aqua sold their fish through car transport and plane, but now it is primarily sent by ships with lower emissions. Furthermore, their key activities consist of fish farming, where they implement measures to make it the most sustainable fish farmed and follow-up on sustainability certifications. The firm has implemented sustainability in the component of key partners by preserving a strict supplier selection.

Sustainability measures

Some of Hofseth Aqua's environmental measures can be witnessed by knowing that their sea facilities are connected to shore power instead of a more regular diesel generator, and they have started to recycle Styrofoam boxes. The firm also has two collaborative projects, with Inseanergy to test solar panels and NORCE (Norwegian Research Institute) to estimate spawning stock targets or harvesting potential to investigate wild salmon stocks. Social sustainability measures include following the Global Gap and Aquaculture Stewardship Council's strict social practice standards that take care of the employees regarding health, safety and the environment, and their rights. However, no economic sustainability measures were clarified during the interviews. The firm informed that the changes involved with moving from fossil fuel to electricity were radical, while the other changes that involved process and production were incremental.

Tools

Hofseth Aqua did not establish a BMC or used the CapSEM model but used their available knowledge related to their activities. Hofseth Aqua used consulting firms to seek help in handling sustainability issues. All significant decisions on the firm's structure and future were thoroughly evaluated using consulting firms. Specifically, the firm has looked into the areas where more contributions are required in production. For example, feed is the most crucial factor in farming that contributes to the most emissions, and thus the firm reduces carbon emissions by collaborating with the feed supplier. Therefore, Hofseth Aqua needs systems for environmental safety and continues to identify priority areas for further improvement.

Hofseth Aqua also neither conducted any stakeholder analysis nor materiality analysis. However, the firm believes its most important stakeholders are its customers, who expect them to be transparent producers. Additionally, the government was mentioned to be a stakeholder in the firm. Their expectations consist of the firm being stable and producing and exporting fish sustainably and ethically. The firm's employees are also a stakeholder group that is crucial for the firm. Their employees' expectations revolve around the firm thinking long-term and making responsible choices.

Drivers and challenges

For Hofseth Aqua, expectations from stakeholders are a crucial driver for the firm. Specifically, youngsters and youth politicians concerned with sustainability who will sometime in the future govern resulting in possibly changed legal regulations is a crucial driver. Additionally, climate change is an important driver. Suppose the temperature in the ocean increases by three degrees. This would impact Hofseth Aqua greatly as it would affect their business operations and, thereby their value proposition. Therefore, contributing to offering sustainable food to the population is another driver for the firm in the SBMI process.

Electricity is the primary challenge for Hofseth Aqua. The main challenge is that there is a lack of available renewable energy in the inner mountain range. The firm is currently using a local power network. However, it is already overloaded and old; therefore, the firm faces electricity deficiency. Therefore, if the firm continues to use electricity, the company needs to upgrade the entire line, making the construction contribution very high.

To sum up, Hofseth Aqua believes that the lack of available capacity is a challenge for many firms operating in aquaculture. The firm works closely with its network provider; for example, they have four new facilities in Storfjord operating solely on electricity. The fifth facility was not able not to be made entirely electric and is, therefore, a hybrid. The findings of the third case company, which is Hofseth Aqua, are summarized in Table 9.

4.2.3.3 Summary of findings from the in-case analysis

Table 9: *Summary of findings for Hofseth Aqua*

Findings	**Hofseth Aqua**
Changes in BM	Value proposition Key activities Key partners Channels
Sustainability measures	Use of shore power Recycling Collaborative projects Implementation of Global Gap and ASC Collaboration in GATH
Classification of changes	Operational optimization Incremental
Tools	No tools used
Drivers	Stakeholders

	Climate change Contribute to the production of sustainable food
Challenges	Lack of electricity capacity in the fjords

4.4 Cross-case analysis

In the cross-case analysis, findings from the in-case analysis are depicted, and all three case companies against each other are compared to find their similarities and differences.

4.4.1 Implementation of sustainability in business model

Changes in BM

All the firms stated that sustainability is an integrated part of their strategy and demonstrated that there is room for sustainability in their current BM. The case companies have long-term perspectives and aim to make changes to become more sustainable over time. However, the case companies have different ways of implementing sustainability in their current BM. For example, MMC First Process aims to build its BM around sustainability. Rostein and Hofseth Aqua, on the other hand, implement sustainability in parts of the BM where it may have the most significant impact.

Nonetheless, the three firms have implemented sustainability in their value proposition, channels, key activities, and key partners. Even though it was identified that all the firms started by implementing sustainability in the same components, their approach was different. Some reasons might be because the firms have had different time perspectives in the SBMI process and different drivers. For example, MMC First Process focused on implementing sustainability in the value proposition component of their BM, which resulted in natural changes in the other components of their BM. On the other hand, Rostein and Hofseth Aqua started by focusing on the outcomes of the production areas that can significantly contribute to reducing emissions. This resulted in the implementation of sustainability in their value proposition and the rest of the current elements.

Comparing and contrasting the techniques of the case companies implementing sustainability in their value proposition, channels, and key activities, is difficult. This is because all the three firms are different since they are in different parts of the aquaculture value chain network. For example, MMC First Process implements sustainability in their channels by doing video consultants. In contrast, Rostein focuses on logistics planning, while Hofseth Aqua is switching transportation from airplanes to ships. However, the case companies implemented sustainability in their key partners similarly. They used their market power to select suppliers and other partners that take sustainable production seriously and have a long-term perspective.

Sustainability measures

All three firms could explain several environmental measures they have taken to become more sustainable over time. The interviewees found it easier to discuss practical tasks they have done rather than specific changes in each of the components of their BMs. Thus, it is challenging to compare the sustainability measures since the cases are in different parts of the aquaculture value chain and, therefore, have various key activities. However, similarities include recycling and concentrating on fish welfare. The rest of the measures for environmental sustainability are specific to the case companies in terms of their position in the aquaculture value chain. The case companies gave examples of some social sustainability measures they have done. For example, two firms mentioned aiming to hire more women, while the third firm emphasized having a high standard while taking care of the rights of their employees.

Furthermore, only two firms gave examples of sustainable economic measures, but they differ from each other. For example, MMC First Process's economic sustainability measured include investing in GATH, while Rostein's example discussed investing in new firms to reduce the industry's negative environmental impact.

When asked if the measures they have already done are incremental or radical, most firms concluded that most of their measures were incremental. Rostein and Hofseth Aqua particularly mentioned one measure they classified as radical innovations, but other measures were found to be incremental. Nonetheless, all the firms agreed that fundamental impressionable changes must be incremental since it is difficult to get their owners and employees to agree to the changes if they are significant and radical changes.

4.4.2 Tools in the sustainable business model innovation process

The case companies have incorporated sustainability into their BM in different ways. The BMC was not used in any of the case companies examined. However, all interviewees had a clear idea of the firm's nine components in the BMC. The authors' illustrations of the cases' BMC are present in Appendix D, E, and F. Even though none of the firms had illustrated the canvas, all the firms had reflected on some parts of it. For example, they were clear on what activities related to the specific components and which activities were implemented sustainability.

None of the firms did a stakeholder or materiality analysis, but they could identify their most important stakeholders. It was found that the cases had several similar stakeholders with some of the same expectations. For example, MMC First Process stated that its owners believe the firm needs to focus on sustainability since it is challenging to sell a firm that does not focus on sustainability. Moreover, the other two firms stated their employees as crucial stakeholders.

Some of Hofseth Aqua's employees' expectations consisted of having a secure workplace that is economically sustainable and has the appropriate ethical principles. Moreover, Rostein mentioned that working with something good instead of something that ruins the environment and is considered bad by others positively influences employees' motivation. Furthermore, several NGOs engaging in animal welfare, biodiversity, or environmental emissions that may harm wildlife in the sea are essential stakeholders with expectations the firms need to consider.

Finally, Rostein mentioned key partners as important stakeholders as well, but they do not have any expectations regarding sustainability; instead, Rostein has sustainability expectations regarding their key partners.

In the big picture, the case companies considered Norway and their local region as crucial stakeholders with their expectations. Seafood and aquaculture are Norway's second most significant export industries, and it is vital for future generations regarding work, food, and tax revenues. Another important stakeholder is the region of Sunnmøre, where the firms are located. Since they belong here, the firms aim to "do good" for Sunnmøre. The region expects the firms to contribute to the growth, value and job creation, and other activities in the region.

All firms agreed that their customers are important stakeholders. For example, since MMC First Process is market-oriented, they rely on a good relationship and collaboration with its customers. Moreover, Rostein also has a customer-oriented organization that is service-minded with its customers. Their customers are key to their revenue streams. Hofseth Aqua also mentioned their customers as one of their most important stakeholders, whose expectations are that their production is done sustainably. They expect a change in consumer demand in the future, where customers request transparency regarding emissions of food production.

Toolboxes such as the CapSEM model were not used by any of the cases. However, two firms stated that they had used other consulting firms to seek help in the process but used the consultants differently. For example, MMC First Process used consulting firms to select the SDGs to focus on and create their sustainability report. In contrast, Hofseth Aqua used consulting firms in all significant decisions, especially on the firm's structure and future. So, consulting firms were involved in two out of the three cases. Additionally, Hofseth Aqua stated that they determined their efforts based on available knowledge. At the same time, Rostein said that they used analysis to identify the most significant emissions the production.

4.4.3 Drivers and challenges in the sustainable business model innovation process

The case companies all state that one of their primary drivers for implementing sustainability is to contribute to sustainable food production with the lowest possible emission. Another similar driver for all the firms was stakeholders' expectations, which was sustainable production. For example, MMC First Process and Rostein both stated that an essential driver for the SBMI is the possibility of obtaining a competitive advantage. Moreover, all case companies argue that sustainability is value-oriented and driven by personal motivation for both management and interviewees. For example, if temperatures rise, it can cause immense problems for the companies as it affects the conditions for fish farming. However, MMC First Process was the only firm that mentioned the possible change in customer demand to be a driver. At the same time, rising fuel costs, internal competition, and increased revenue were only mentioned by Rostein as drivers for the SBMI process.

The interviews suggested that the SBMI process was initiated top-down by the CEO or another managerial position. Additionally, most interviewees stated that one person triggered the process but could not steer the process of SBMI alone. There were several reasons for this, but mostly because one person did not have the capabilities to see the firm's impact and those with experience in the different departments. As a result, the initiators requested cross-functional support from the rest of the management team and employees of other departments who possess relevant knowledge or capabilities. Therefore, the case management groups helped identify the areas to focus on, but the details were established at the department level. All in all, it is shown that the case companies did not have management systems to handle the implementation process.

The three case companies described their challenges while implementing sustainability in their BM differently. This might be explained by the fact that the companies have different business operations, and the challenges could largely depend on their activities.

However, two of the companies stated similar challenges. For example, MMC First Process and Rostein described the lack of technology and failed technology as a significant challenge in the SBMI process. MMC First Process illustrated how suppliers currently do not produce technological equipment, e.g., commercial electric vehicles that can cover long distances. Therefore, the company is dependent on suppliers to develop and produce such equipment with technological advances.

In contrast, Rostein described how their well boats do not have available space for new technology to increase sustainability, and adopting new technology is also challenging. Moreover, MMC First Process stated that a challenge faced during SBMI is the involvement and engagement of all employees and managers to understand the importance and benefits of sustainability. They must prioritize time and efforts to implement sustainability over the company's sole purpose, profit. Furthermore, Hofseth Aqua stated that constrained electricity capacity in the fjords on Sunnmøre is a major challenge. Limited electricity capacity makes it challenging to electrify facilities and locations. Therefore, the transmission lines need to be upgraded in the area, and construction contributions are very high.

4.4.4. Summary of findings from the cross-case analysis

***Table 10**: Summary of findings from the cross-case analysis*

Findings	**MMC First Process**	**Rostein**	**Hofseth Aqua**
Changes in BM	Value proposition Key activities Key partners Channels	Value proposition Key activities Key partners Channels	Value proposition Key activities Key partners Channels
Sustainability measures	Clean-up of coastline and local community Limitation of travels Recycling	Redesign of old well boats Worlds first hybrid well boat	Use of shore power Recycling Collaborative projects

	Supplier selection Focus on recruitment of women Help developing countries with systems and competence at a lower price Collaboration in GATH	Use local suppliers Hire more women Sponsoring local organizations Investing in tech-firms Collaboration in GATH	Implementation of Global Gap and ASC Collaboration in GATH
Classification of changes	Operational optimization Incremental	Operational optimization Incremental	Operational optimization Incremental
Tools	No tools used	No tools used	No tools used
Drivers	Shareholders Competitive advantage Climate change Change in consumer demand Contribute to the production of sustainable food	Stakeholders Competitive advantage Increased revenue Contribute to the production of sustainable food	Stakeholders Climate change Contribute to the production of sustainable food
Challenges	Get employees and managers involved and engaged Prioritizing Need technological advances from suppliers	Old well boats are too small for new technology Implementation of new technology	Lack of electricity capacity in the fjords

5. Discussion of the multiple case study

This section discusses the proposed three research questions presented in Section 1.2 and presents the main findings of its overarching research objective and how companies innovate their business models to be more sustainable in relation to previous literature.

5.1 Implementation of sustainability in business model

This section aims to answer the first research question of this thesis, how companies implement sustainability in their BM, through empirical findings from the interviews and the conceptual literature review.

Existing BM

The process of implementing sustainability in any company's BM is a continuous and challenging procedure. This thesis has presented the case of three companies' BMs to illustrate how they create, deliver, and capture value. Findings suggest that all case companies believe that sustainability is already an integrated part of their BM. Still, when investigating each of the components in their BMs, it was found that the cases have implemented it in only four components: value proposition, key activities, channels, and key partners. Furthermore, findings revealed that the implementation of sustainability in the value creation component happened in the beginning while innovating the BM. The results align with recent literature stating that BMs' development is initially concerned with the value creation or delivery components (Laudien & Daxböck, 2017). Moreover, the findings support the literature and highlight the need to consider the interdependencies between BM components in the SBMI process (Berends et al., 2016).

BMI

While changing their existing BM, the firms are doing a BMI, which is the process of changing an existing BM (Mitchell & Coles, 2004). The current literature suggests that the process consists of a minimum of four simultaneously performed strategies presented in Figure 1. The first strategy is executed by the case companies since they have informed their stakeholders about what needs to be done for their BM to succeed, even though it might not be all stakeholders. Only MMC First Process partly executes the second strategy, which is to establish a guide for developing future BM improvements and innovations. However, the third strategy is achieved in all case companies since the possibilities of their innovations are specified to stakeholders, but they are not tested.

Moreover, previous literature highlighted that this is not the case for most businesses. The case companies are not in the process of accomplishing the fourth strategy since the case companies did not prioritize stakeholder benefits through their goods and service. This is supported by literature and stated that it could only occur after the third strategy has begun to regularly provide enhancements. The findings do not align with literature that states that the continuing BMI process requires at least four of these strategies to operate simultaneously.

Sustainability in the BM components

To implement sustainability in their existing BM, the firms are all in the process of SBMI (Bocken et al., 2014; Schaltegger et al., 2012). Most case companies classified all their measures for SBMI to be incremental. Using the classification of Schaltegger et al. (2012), the innovations can be regarded as BM improvements. BM improvements occur when substantial parts of BM components have been changed. For the case companies, several BM components have either been changed completely or improved to become more sustainable.

The value proposition of the case companies has not been changed completely, but the case companies have included sustainability in their existing value proposition. So, the case companies still offer the same products and services, but now more sustainably. Moreover, the key activities of the case companies have been changed by implementing several environmental and social measures to implement sustainability in their value proposition. Additionally, they have substantially changed their channels by changing how they transport fish and send equipment. They only incorporated sustainability in the component of key partners by aiming to select sustainable suppliers. Furthermore, using the classification by Adams et al. (2012) that focuses on activities, it is found that the case companies' innovations are operationally optimized since the case companies aim to reduce and diminish harmful consequences of their business activities. Finally, the measure of technological innovations to reduce emissions, which all cases had conducted, is an example of such innovation.

It was found that, except for key partners, the firms have differently implemented sustainability. However, the interviewees did not state why case companies decided to start with the value proposition components. One possible reason is that value proposition might be the most accessible component to describe and communicate to stakeholders through media, websites, and SoMe. Furthermore, key activities and channels are components directly related to the value proposition; therefore, it is challenging to implement sustainability in one BM component and not the other two components.

Additionally, key partners might be easy for the selected firms to influence since they have the power to choose their partners. Therefore, it might be possible that the firms have the most significant benefits of implementing sustainability in their value proposition compared to other components. In other words, implementing sustainability in the component of value capture, which consists of cost structure and revenue streams, is challenging to communicate and describe to stakeholders.

Furthermore, it can also give the impression that the firm uses sustainability for economic growth. Another possible explanation is that all the case companies belong to the same industry and therefore think alike when choosing areas to begin with sustainable choices. Thus, it is also possible for all firms across industries to start with the value proposition when implementing sustainability in their BM.

Moving from BM to SBM

By implementing sustainability in the case companies' BM, they aim to gain an SBM. According to the definition used in this thesis, an SBM is divided into three-part. The first part is how an organization's sustainable value proposition is described, analyzed, managed, and communicated to its stakeholders (Schaltegger et al., 2016). The case companies have implemented sustainability into their value proposition and have described and communicated it to their stakeholders to a certain degree. This is communicated through media, on their web page, and on SoMe.

The second part of an SBM is how a firm describes, analyzes, manages, and communicates how it creates and delivers value (Schaltegger et al., 2016). The case companies have changed the component channels, which consists of how they deliver their value proposition in a sustainable manner. The case companies have described the measures thoroughly, including what has been done and what will be done in close proximity. However, it cannot be said that the firm has analyzed, managed, or communicated how sustainability had been implemented in the element value delivery. Finally, the third part of the SBM is how a firm describes, analyzes, manages, and communicates how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries (Schaltegger et al., 2016). How the firms capture economic value is well described, analyzed, managed, and communicated as far as the authors know. However, it is not done while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries.

The process of SBMI

SBMI is defined in the literature as to when a firm changes or develops its BM with the strategic intention to solve environmental and social problems, but also when a firm generates positive and/or reduces negative impacts on the environment and/or society by making changes in the way they create, deliver, and capture value (Bocken et al., 2014; Schaltegger et al., 2012).

Furthermore, Geissdoerfer et al. (2018) found four ways to incorporate SBM strategies. Based on their classification, the case companies have incorporated the third strategy: sustainable business model transformation. This strategy is applied when an organization changes its existing BM into an SBM. This is accurate for all the case companies since they have only changed their current BM and have not created or acquired a new SBM. It is argued, through Chapter 5, that all case companies have changed their BM enough for it to be considered an SBM through SBMI. Moving from a BM to an SBM has been done by implementing sustainability into components of their BM. The case companies have implemented sustainability into four BM components described further in this section.

Based on the definition of SBMI and that all the firms have made changes in the core of their BM and made several measures to become more sustainable, it is argued that all the three case companies are in the process of SBMI while implementing sustainability in their BM (Bocken et al., 2014; Schaltegger et al., 2012). However, the firms are at different levels of the SBMI process and have different plans for the continuation of the integration of sustainability. In addition to integration at various levels, the companies have integrated sustainability to varying degrees. In this context, the varying degree refers to the extent to which sustainability is integrated. In other words, none of the firms has integrated waste management of all materials in all processes or integrated waste management only for one type of material in a single operation. Furthermore, there are differences regarding integration related to the three dimensions of sustainability. For example, the case companies focused on the social dimension to a various degree compared to how much they focused on the environmental dimension.

Implementation of sustainability in the BM is a long and continuous process that is different for firms at this phase. There may be several reasons why the process is so dissimilar for the case companies. One explanation might be that the case companies are all currently at various stages of the process, considering the number of measures integrated and their strategic plans for future sustainable development. Still, all the case companies are progressing in a forward direction even though at various speeds.

Additionally, it was found that the case companies differ in the level of integrating sustainability in the triple bottom line: social, environmental, and economic. All the three case companies have the most significant focus on environmental and economic sustainability. Many measures that influence the environmental level also result in financial profitability for the firm, i.e., switching to renewable energy sources and reducing emissions.

Based on the findings in Section 4.4.1 and the discussion presented in this section, firms start implementing sustainability in their BMI at different time horizons. However, all the case companies implement sustainability in the value proposition component, which results in implementation in key activities, channels, and key partners. One specific, correct way of innovating a BM to become more sustainable was not identified since it depends on the management team, the industry, and several other external factors like customers, competitors, and partners. It was, however, identified that firms take incremental steps in the innovation of their BM for sustainability, even though some of the innovations and measures can be considered radical changes by some.

5.2 Tools in the sustainable business model innovation process

This section investigates findings from interviews in relation to extant literature to answer the second research question, how companies have used tools in the SBMI process.

BMC

The case companies' BMCs have been illustrated in Appendix D, E, and F to describe the cases' existing BMs. None of the case companies had illustrated their BMC, but the authors of this thesis could illustrate it since the interviewees clearly knew how to articulate its BM and how the nine components intersect. The BMC helps visualize, understand, and communicate the case companies' BMs and focuses on the firms' economic part of the business (Joyce & Paquin, 2016). The case companies could have used it to investigate where they have already made sustainable changes in their BM and to find more areas for further development. It could also help the case companies visualize and communicate what sustainable changes they have already made to their stakeholders. Hence, their stakeholders could further understand what measures the firm has already taken. Possibly, it could give the cases a better reputation amongst their stakeholders.

Stakeholder analysis

The findings revealed that none of the case companies had conducted a stakeholder analysis by identifying their stakeholders and analyzing their interests. Nonetheless, the case companies clearly knew their stakeholders and their interests. According to the literature, it would be beneficial for the case companies to conduct a stakeholder analysis to ensure their legitimacy and broaden their vision of the firm's role and responsibilities beyond profit maximization (Geissdoerfer et al., 2018; Mitchell et al., 1997; Stubbs & Cocklin, 2008). Furthermore, findings revealed that the case companies had several identical stakeholders, such as shareholders, the local community, and partners. However, a stakeholder analysis would likely display several other persons and organizations affected by the firm and have the power to influence it, i.e., the media, which can significantly impact the firm's reputation.

Additionally, a stakeholder analysis could give a clearer picture of which expectations stakeholders have for the firm, and vital expectations that could help the firm's legitimacy could also be unfolded (Wood, 1991). Even though the case companies have not conducted a stakeholder analysis in accordance with the literature (Geissdoerfer et al., 2018; Mitchell et al., 1997; Stubbs & Cocklin, 2008), it can be still argued that the tool is used in practice. All three case companies had a clear picture of their stakeholders and their expectations of the firms. However, it is impossible to conclude that their impression is correct without conducting a stakeholder analysis independently of the findings from the interviews described in Section 4.4.2.1. Therefore, it is difficult to conclude whether firms know about their stakeholders and expectations in this phase of the SBMI process.

Materiality analysis

The extension of the stakeholder analysis, materiality analysis, was not conducted by any of the case companies. According to the literature review, firms find it difficult to prioritize their sustainability issues, but it is crucial when making sustainability choices, and a materiality analysis gives guidance in this process (Whitehead, 2017). However, the interviewees revealed that the cases had not reflected much on each stakeholder's expectations. Mostly, the answers were in general terms and did not give specific examples of expectations from each of the case companies' stakeholders. In other words, after reciting all possible stakeholders, the interviewees stated that their expectations include sustainability. Therefore, it was not said which sustainability issues were the main concerns of each stakeholder. Since none of the firms had done either of the analyses and had only minorly reflected on specific issues they were concerned with, one can argue that it is in accordance with literature that firms find it difficult. Conducting an analysis that divides issues into financial and sustainable while also placing them on a spectrum from less to more important could help firms know which issues were important for which stakeholders and which were the most important (Calabrese et al., 2017). All in all, without the analysis, the case companies are incapable of measuring, disclosing, and being accountable to internal and external stakeholders for the firm's ability to achieve the SDGs and manage impacts on society than they would with the analysis. In conclusion, firms do not know all expectations of all their stakeholders and do not know how their stakeholders prioritize their expectations at this phase.

The CapSEM model

The CapSEM model is a stepwise model consisting of methods for improving business sustainability and illustrating an organization's level regarding sustainability performance and systemic scope (Fet & Knudson, 2022b). Unfortunately, none of the case companies had used any of the tools or methods included in the model, and it is impossible to correctly place any of the cases at the accurate level. However, it can be argued that all three cases are somewhere between Level 2 and Level 3. Level 2 is when an organization uses mapping tools to improve a product's sustainability footprint, and the results can be applied within supply chain management (Fet & Knudson, 2022b). Moreover, Rostein and Hofseth Aqua are closest to Level 2 since both have started increasing sustainability across products and their value chains in different ways.

Rostein and Hofseth Aqua have not done the life cycle assessment analysis but have done other analyses to reveal where they have the most emissions in their production and thereby replace the material with a high impact factor with less environmental impact. Moreover, both cases focused on using supply chain management to find transportation that contributes to reduced emissions. The two firms in question implement sustainability from project to project by investigating where they can reduce the most emissions in each project. However, both firms do not have an overall strategic plan. Level 3 includes tools used for organizational strategies and systems to improve sustainability (Fet & Knudson, 2022b). All the case companies are on the verge of establishing organizational strategy, but findings suggest that MMC First Process has come further than the other two cases and therefore is closer to Level 3 in the CapSEM model. In addition, the firm started focusing on sustainability from the market perspective and an organization's level. Finally, the company implemented sustainability with a plan that included starting at the top and then forming details in the relevant departments by establishing KPIs for reporting purposes.

5.3 Drivers and challenges in the sustainable business model innovation process

The section aims to answer the third research question, what drivers and challenges do companies face in the SBMI process, by investigating findings from the interviews and the literature on drivers and challenges.

Drivers

Several internal drivers in the SBMI process were identified in the findings, and some were similar for all three case companies. For example, one internal driver for two case companies was that they wanted to gain a competitive advantage. The internal driver is in accordance with the literature since SBMI is considered a source of competitive advantage, and competitive advantage is an internal trigger since it is located inside the firm (Bocken et al., 2014; Geissdoerfer et al., 2018; Stubbs, 2017). Furthermore, the literature has also found a correlation between sustainability-driven innovation and long-term financial performance (Stubbs & Cocklin, 2008; Zollo et al., 2013). Moreover, literature on SBMI state that the possibility of obtaining a competitive advantage while also obtaining a positive contribution to the environment and society is a critical factor needed to pursue SBMI (Stubbs, 2017).

Moreover, research suggests that sustainable organizations achieve a competitive advantage by obtaining highly qualified employees who are attracted to organizations they perceive to be sustainable, have few capital constraints, and gain loyal customers (Jørgensen & Pedersen, 2018). However, the literature has concluded that sustainable competitive advantage may not be the only factor that drives SBMI since the motives may often be value-oriented and personal (Rauter et al., 2017). In addition, findings from the interviews suggest that all the case companies' main driver for SBMI is to contribute to sustainable food production with the lowest possible emission. Thus, literature on internal drivers seems to be in accordance with firms' internal drivers in this phase.

External drivers for one case company in the SBMI process included rising fuel costs and increased revenue. The SBMI process can represent cost savings for the cases since fuel prices have increased and are expected to rise further. One sustainable way of reducing costs that Rostein and Hofseth Aqua have already initiated is to minimize fuel use by electrifying facilities previously driven by diesel generators with batteries and solar panels. Furthermore, other external drivers for the case companies were stakeholders, like their owners, employees, and government expectations on sustainability issues and customer demand changes. This is in line with literature on external drivers, which identifies rising costs, technological advances, innovation pressures, market and stakeholders' needs, and changes in the competitive or regulatory landscape as potential external drivers for BMI (Bucherer et al., 2012; de Reuver et al., 2009). Expectations from the government were identified to be an external driver for one firm so the firm in question has already prepared for a possible change in legal regulations. The literature suggests this to be a critical external driver as well, since it may result in a first-mover advantage for firms that proactively and voluntarily reduce their environmental footprint (Jørgensen & Pedersen, 2018). Identifying changes in customer demand as an external trigger in the SBMI process contradicts Rauter et al. (2017). They found changes in customer demand only relevant to exploiting SBMI potential. However, it is in line with Chesbrough and Rosenbloom (2002), who recognize changes in the business ecosystem as important in driving the SBMI process.

The driver for change can be classified as a growth opportunity or a threat. In SBMI literature, the distinction is referred to as either a *push* or a *pull* factor. Push factors are negative aspects of the existing BM that push the firm into becoming more sustainable (Jørgensen & Pedersen, 2018). Examples of this in the case of companies are how key inputs, like fuel, become scarcer and thus more expensive and pressure from key stakeholder groups like shareholders. In contrast, pull factors represent positive aspects of alternative SBMs (Jørgensen & Pedersen, 2018). Customers' demand for more sustainable solutions might result from trends for more sustainable lifestyles, which is both a pull factor and a mentioned driver for the case companies. Moreover, the opportunity to differentiate which is a pull factor can contribute to the cases gaining competitive advantage, which was a driver for all three the case companies.

Challenges

The case companies faced several challenges in the SBMI process. One cognitive barrier found in literature is a biased attitude towards an existing BM where companies cannot identify any potential outside their existing business logic (Chesbrough, 2006). Additionally, literature has found that one challenge in BMI is that the changes in organizational structure are different from the mindset that forms the basis of success (Koen et al., 2011). One of the cases mentioned that their main challenge was getting all employees and managers involved and engaged and understanding the importance and benefits of sustainability. The mentioned challenge can align with literature on cognitive barriers for two reasons.

Firstly, the employees could not identify a potential outside of how they usually do business and therefore were not involved, engaged, and able to understand the importance and benefits of incorporating sustainability in their existing BM. Secondly, the employees have one idea of how to gain success and profit, but including sustainability does not fit into this idea. Therefore, it was challenging for the initiator to change their mindset into thinking sustainability is a part of being profitable. Furthermore, it is stated in the literature that resilience within the organization can be an organizational barrier to BMI (Saebi, 2016), which is increased by implementing sustainability (Geissdoerfer et al., 2018). Therefore, the literature on cognitive and organizational barriers, in general, seems to align with the challenges firms face in practice at this stage.

According to literature, one organizational barrier is a lack of leadership within the BMI process which can be solved by having the top management responsible for the process (Chesbrough, 2006). Moreover, implementing sustainability in the BMI process is even more complex (Geissdoerfer et al., 2018). However, the findings did not reveal that the cases faced any organizational barriers besides resilience. It may be because in all three case companies, the initiator for implementing sustainability was part of the management team in their firm. Hence, the top management was responsible for the process and knew the operations. The management team was, therefore, a large part of moving the process in a forward direction. Finally, the literature on organizational barriers does not align with which barriers occur to firms in practice at this phase.

The challenges the case companies faced were not entirely in line with the literature on SBMI barriers. The institutional barrier, focus on maximizing shareholder value (Bocken & Geradts, 2020), was not an issue for the case companies since shareholders already had expectations of the firms to operate sustainably. Additionally, the strategic barrier of prioritizing short-term growth and the operational barrier of incentive system focused on short-term goals (Bocken & Geradts, 2020) were not specified by the case companies as issues. The explicit reason the cases do not face challenges described in SBMI literature was not found during the interviews. However, findings from the interviews state that some of the owners are planning on selling their firms. In other words, MMC First Process and its shareholders believe it is challenging to sell an unsustainable firm. Therefore, since shareholders were a major part of these potential challenges stated in the literature, a reason why companies were unaffected might be because the shareholders think in the long-term and do not only focus on maximizing profit short-term.

5.4 Innovation of business model to become more sustainable

This section aims to investigate the overall objective of the thesis, how companies innovate their BM to become more sustainable. The objective is explored through the literature presented in Chapter 2, the findings presented in Chapter 4, and the discussion presented previously in Chapter 5.

In addition to analyzing the case companies' implementation of sustainability in their BM, how they have used tools in the SBMI, and what drivers and challenges they have faced in this process, the overarching research objective of how companies innovate their BM to become more sustainable is characterized in the following section.

The interviews reveal different approaches to how a company can innovate its BM to become more sustainable. All the case companies have innovated their BM by changing their existing BM. This is in accordance with Mitchell & Coles (2004), who defines BMI as the process of changing their current business model. They have integrated sustainability in different stages of the SBMI process. In addition to integrating at various levels, they have also integrated sustainability to multiple degrees.

Initiator of the SBMI process

Based on findings from the examined case companies, one can conclude that implementing sustainability in the BM is a long and continuous process for firms. The findings indicate that the process of SBMI is initiated top-down. Extant SBMI literature describes the motivating factors behind SBMI to be personal and value-based and explains the central role of visionary sustainability leaders that drives a sustainable mindset in the organization (Rauter et al., 2017; Stubbs & Cocklin, 2008). Moreover, this was applicable for all three cases examined, where employees in a managerial position initiated the process. All the case companies described the same personal and value-oriented motives from owners and employees in managerial positions to innovate their BM to become more sustainable. This is in line with evidence from conventional BMI literature, which diagnoses BMI as a task of the top management or the CEO (Bucherer et al., 2012; Chesbrough, 2007; Mitchell & Coles, 2004).

Moreover, the findings indicate that the initiating actors in the cases of MMC First Process and Hofseth Aqua quickly realize that they require cross-functional support from employees of other departments. This turns the navigation of the process of SBMI into a cross-functional undertaking (Bocken & Geradts, 2020). Furthermore, the literature suggests that the BMI process to be a sole CEO task is unrealistic in practice – especially for large, multinational firms (Winterhalter et al., 2017), which is in line with the findings in this thesis. Thus, it is also supported by literature that finds allocating a cross-functional team enhances the management and performance of BMI and shows that cross-functional collaboration is a central element in innovating BMs to become more sustainable (Bocken & Geradts, 2020; Fallahi, 2018).

The process of SBMI

None of the case companies explained a similar process for innovating their BM to become more sustainable. Several factors might explain this, which are described in the following paragraphs.

First and foremost, all three examined case companies have used different approaches to implement sustainability in the company's BM. For example, MMC First Process has executed a strategic process to solve environmental problems. The management group collaborated with an external consulting firm to identify the areas that require further improvements. Based on the findings from this work, the company identified relevant SDG targets for its business operations. After that, the different departments contributed to developing KPIs relevant to each of the chosen SDG targets. The different departments were involved to ensure that everyone understood the importance of sustainability and felt a strong sense of ownership of the KPIs and the specific knowledge of business operations in the different departments.

In Rostein, the approach to implementing sustainability in its BM has been different. Instead of conducting a strategic process that involves the management group, departments, and external consulting firms, an interviewee with a managerial position has identified and developed the sustainability efforts. In their early work on sustainability, they put efforts into identifying areas of improvement that could represent cost savings. Later, they have systematized their efforts through a strategic process aiming to map previous efforts and identify, quantify, and prioritize new efforts to reduce emissions and footprint.

Finally, Hofseth Aqua has evaluated the firm's business operations in collaboration with an external consulting firm. The firm examined its production and value chain to identify the areas that could be improved by implementing sustainability. Based on this analysis, Hofseth Aqua prioritized its efforts by determining the most pressing sustainability concerns.

In addition, none of the case companies has similar business operations. All the case companies started at various stages of the SBMI process at different times and developed the process in different directions. Moreover, some of the case companies make more sustainable, long-term decisions than others and have different strategic plans for the future. For example, MMC First Process makes plans on an organizational level by having a systematic plan. In contrast, Rostein and Hofseth Aqua aim to find solutions to sustainability issues as they occur.

Additionally, one of the case companies has implemented more measures to increase sustainability than the two others. Some reasons for the contrasting SBMI process are the different sizes of the firms, different managerial teams, and their different time perspectives. However, in all the cases, companies have changed the core of their BM and made several measures more sustainable. Thus, all the case companies have been in the process of SBMI.

Changes in BM

Even though the case companies have had different approaches to the SBMI process, they all started by implementing sustainability in the value creation component. The specification of the value creation component is found in the literature, often leading to the need to adjust the remaining components. Additionally, the literature state that developing SBMs is initially concerned with the value creation or delivery component (Laudien & Daxböck, 2017). This might explain why it was the case for all the firms to initiate the SBMI process by implementing sustainability in the value proposition component of the BM. A change in the value proposition often leads to a change in the value creation of the BM (Laudien & Daxböck, 2017), which is supported by findings from the interviews since all the case companies have also implemented sustainability in their channels. Moreover, this change can lead the companies to implement sustainability in the key partners and key activity components of the value delivering part of their BM.

Tools

It was found that the firms at this stage of the SBMI process have not used the tools and methods described in the literature. Still, the authors used BMC to illustrate the cases' BMs as described in the literature, thereby identifying which components they have initiated implementing sustainability. It was also found that the firms started in the value creation and delivery parts of their BM, including the components value proposition, key activities, key partners, and channels. However, the interviews revealed that the cases had not conducted stakeholder or materiality analysis at this stage. In terms of the case companies, they can articulate who their stakeholders are, their most important stakeholders, and their expectations. Nonetheless, according to the literature, it is essential to conduct the analyses and not just believe that one knows how stakeholders prioritize their issues – especially sustainability issues, which none of the firms has prioritized (Calabrese et al., 2017). Using the CapSEM model from SBMI literature, the authors believe that firms at this stage usually are at or between Levels 2 and 3. Still, the results from the CapSEM model may not be accurate since it decides which level a firm is at based on which tools it has used and methods conducted. But, the case companies have not undertaken any tools or methods suggested in the model.

Drivers

It was found that the case companies had similar internal and external drivers in the SBMI process. Literature on internal and external drivers is discussed in sections 2.2.2 and 2.3.3, and these drivers can explain why the case companies had similar internal and external drivers in the SBMI process. For example, the similar internal driver of contributing to sustainable food production with the lowest possible emissions is consistent with the literature stating that motives are often value-oriented and personal (Rauter et al., 2017). Moreover, the external driver of switching from fuel to electricity because of rising fuel costs is in accordance with the literature that has identified rising costs as an external driver (Bucherer et al., 2012; de Reuver et al., 2009).

Furthermore, the revealed challenge of getting all employees and managers involved, engaged, and understanding that sustainability is crucial was in line with literature on cognitive barriers (Chesbrough, 2006). On the other hand, literature on organizational barriers (Chesbrough, 2006) was not in line with the challenges the case companies faced, but one reason might be that all the case companies had someone in the management team to be the initiator and was involved in the SBMI process.

Classification of changes

The three examined case companies are all established firms aiming to move from an existing BM to a more SBM. The cases are in Geissdoerfer et al.'s (2018) sustainable business model transformation process to change their current BM into an SBM. Moreover, Bocken et al. (2014) and Boons & Lüdecke-Freund (2013) argue that BMI is framed in changing and identifying the value proposition for the customer and that this is the key to unlocking the creation of sustainable businesses.

Schaltegger et al. (2012) distinguish between adjustments, adoption, improvement, and redesign in the BMI process. The three case companies' innovations in their BM are classified as an improvement. Business model improvement occurs when substantial parts of the BM elements are changed, including simultaneous changes of a significant number of components, which is the case for the case companies. This is because they have innovated substantial parts of their BM, including their value proposition, key activities, key partners, and channels.

Finally, even though the innovations in the case companies' BMs are substantial, the cases' changes are incremental step by step rather than radical. The innovations are found incremental due to the cases' perceptions and the literature. Moreover, the cases' changes for sustainability in their activities are classified as operational optimization using the study of Adams et al. (2012). Therefore, with the literature and the case companies' opinion in mind, it can be concluded that the firms have incremental, step-by-step innovations to become more sustainable rather than radical at this phase.

6. Conclusion

This section presents the thesis's main findings, including addressing the thesis's overarching research objective and research questions, outlining limitations and avenues for future research, and implications for theory and practice.

6.1 Main findings

The main objective of this thesis was to enhance the understanding of how companies innovate their BM to become more sustainable. To answer the overarching research objective, three research questions were formulated:

1) How do companies implement sustainability in their business model?

2) How have companies used tools in the sustainable business model innovation process?

3) What drivers and challenges do companies face in the sustainable business model innovation process?

The answers are rooted in BMI and SBMI literature and drawn on empirical findings from a real-world, multiple case study of the SBMI process of three firms in the Norwegian aquaculture industry, aiming to address the research gap identified by Geissdoerfer et al. (2018) on the implementation of the BMI process, its tools, and its challenges. The following paragraphs briefly present the main findings, providing answers to the three research questions of the thesis' research objective.

The empirical findings of the thesis indicate that companies implement sustainability in their BM by starting with the BM component value proposition. The implementation of sustainability in the value proposition component results in changes in the value delivery of the firms' BM, which includes their key activities, key partners, and channels.

The companies implement sustainability in their BM by measures to become more sustainable. Sustainability measures mainly emphasize environmental and economic sustainability, not as much social sustainability. The measures were incremental changes rather than radical, disruptive transformations. According to Schaltegger et al.'s (2012) classifications of changes in the BM, the cases' changes were classified as *improvements* since a substantial number of BM components, were reformed, and according to Adams et al.'s (2021) classifications, the cases' changes were operational optimization.

Moreover, findings suggest that firms do not use tools as discussed in the literature. Still, the case companies are conscious of their stakeholders and their expectations for sustainability issues. Additionally, even though none of the firms have used BMC to visualize and communicate its BM, they were able to articulate it and its nine components.

While some of the case companies' drivers and challenges faced during the SBMI process align with the literature, others do not. The internal driver of contributing to offering sustainable food production with the lowest possible emissions is consistent with literature identifying motives as value-oriented and personal. Additionally, the external drivers of stakeholders' expectations and gaining a competitive advantage is consistent with the literature. Other drivers for the SBMI were changes in customer demand, changes in legal regulations, employees' motivation, and increased revenue. The initiator that drives the SBMI process is typically value-oriented, has personal motives, and is usually driven top-down. The challenge of not getting all employees and managers involved, engaged, and understanding the importance and benefits of sustainability is in line with literature on cognitive and organizational barriers. Other challenges include dependence on technological development from suppliers, prioritizing, and limited access to renewable energy.

6.2 Limitations and implications for future research

The first limitation of this thesis is the use of *retrospection*. In the multiple case study, the cases were examined in retrospect. Retrospective research can be obstructed by difficulties in determining the cause and effect of the reconstructed phenomenon under investigation (Leonard-Barton, 1990). Although studies indicate that participants in different organizational processes do not forget key events as quickly as one might assume, the interview partner in a retrospective study may not have recognized an event as important and therefore does not recall it during the study. As SBMI processes tend to last over time, the interview partners of this thesis could potentially have overlooked or misunderstood critical facts. To minimize the risks associated with the use of retrospection, screening interviews were conducted with interviewees from each of the case companies. The screening interviews aimed to facilitate recollection of the case companies' SBMI process, which was discussed in greater detail in the main study interviews.

Whereas multiple case studies increase the external validity of the research design, a real-time study can improve the internal validity by tracking cause and effect (Leonard-Barton, 1990). The authors believe that examining the cases would benefit from longitudinal studies where the data is collected in real-time over a period or combining multiple retrospective case studies with real-time studies. By combining the different approaches, the synergies could account for the weaknesses of each of the approaches and increase the validity.

The thesis's second limitation is the *selection of interview partners*. The interviewees were employed in the case companies examined and held managerial positions in the firm. As both the literature and the study reveal that cross-functional teams enhance the management and performance of BMI, the research could benefit from conducting interviews with employees in more functional areas such as R&D, IT, sales, or strategy departments. By selecting additional interview partners contributing to the implementation of sustainability in the cases' BM, the research could obtain a more multifaced view of the SBMI process of the case companies.

Furthermore, the third limitation of this thesis relates to the *sample size and selection* of the thesis. An analytical generalization from the similarities identified in the cross-case analysis can be assumed. However, a statistical generalization is not attempted to be achieved by the authors. The case study research method combined with the small sample of three case companies does not make it possible to claim statistical generalization (Yin, 2014). The authors initially considered including more cases in the multiple case study. However, given the time constraints of the thesis, a small sample size was chosen to ensure time and resources to examine the cases thoroughly. The authors recommend larger sample sizes for future research to achieve statistical generalization.

The sample criterion for this thesis was outlined in Section 3.2.2. The first sampling criteria was a clear sustainability orientation of the firm. By applying this criterion in sample selection, the authors may have missed out on other relevant cases where the sustainability orientation was not explicitly evident. Furthermore, by sampling members of GATH as cases and thereby restricting the geographical location of the case companies, the authors excluded other relevant cases. As a result of the sample criterion applied in this thesis, the empirical findings of this thesis are based on a multiple case study of three companies in the aquaculture industry located in Sunnmøre. Further research on the implementation of sustainability in BM for cases in different sizes, industries, and geographical locations is recommended.

6.3 Implications for theory

Scholars have presented several definitions of the terms BM, BMI, SBM, and SBMI. The conceptual literature review addressed the existing definitional ambiguity by providing working definitions for the terms. The attempt to connect existing definitions and conceptualizations can be regarded as a contribution to providing more conceptual clarity in the current literature.

Prior literature has primarily focused on the outcomes of SBMI, and it has therefore been a lack of research on the cases' process of moving to a more sustainable BM and how the BMI process is implemented (Geissdoerfer et al., 2018). By looking at SBMI as a dynamic process, the thesis contributes to shifting the primary focus from static process outcomes to the dynamic BM process. Additionally, the thesis aims to enhance the understanding of how firms in the Norwegian aquaculture industry adopt more sustainable BMs.

The thesis responds to calls from Geissdoerfer et al. (2018) and Evans et al. (2017) that specifically ask for studies on the implementation of the BMI process, the tools used, its challenges, as well as the BMI process' lack of case studies. Therefore, a multiple case study method is used to investigate the underlying process of how the SBMI process develops in practice. Furthermore, there is a lack of literature on the components of SBMI and its link with BM, BMI, and SBM (Shakeel et al., 2020), which the literature review in this thesis aims to uncover. With the current research gaps in mind, the thesis aims to address the theory-practice gap in the SBMI literature. Accordingly, a more coherent understanding of the overall SBMI process and the activities and actors involved have been presented in this thesis.

The thesis contributes to SBMI literature that investigates drivers and challenges. The thesis found that gaining competitive advantage, contributing to offering sustainable food to a growing population, rising fuel costs, increased revenue, expectations from stakeholders, changes in legal regulations, and changes in customer demand are drivers of the SBMI process. All internal and external drivers were in line with the literature.

The identified challenges were not entirely in line with existing literature; thus, the thesis provides new challenges firms face when initiating the SBMI process. I.e., the thesis identified difficulty in prioritizing sustainability over initial profit as a challenge in some cases. Moreover, it was found that some of the difficulties identified in the literature were not in line with challenges in the SBMI process in practice, i.e., lack of leadership. When it comes to actors who drive the SBMI process, the thesis contributes to the literature by identifying the process to be initiated top-down. In all cases, the SBMI process was initiated by an employee in a managerial position.

6.4 Practical implications

In addition to the theoretical contributions outlined, this thesis provides practical implications for firms aiming to innovate their BM to become more sustainable.

As indicated by this thesis's findings, none of the case companies used tools or toolboxes for BMI or SBMI, and consequently, there was a weakness in systematizing the sustainability measures. The authors of this thesis encourage the use of tools such as stakeholder mapping, materiality analysis, and BMC. By using different tools, firms can systematize and quantify their sustainability measures and ensure that sustainability is ongoing. Further, the authors emphasize using toolboxes such as the CapSEM model to systematically implement tools to enhance the transition to sustainability.

Organizational barriers to SBMI, such as resilience, can be reduced by establishing an agreement within the organization on core values, beliefs, and ideas. Further, resilience can be reduced by allocating cross-functional teams for innovation of BM with employees possessing relevant knowledge or capabilities.

The empirical findings further reveal that responsibility for SBMI in firms is anchored differently, with employees holding various managerial positions such as CEO, Vice President, and Chief Marketing Officer. The authors recommend establishing a clear organizational set-up for SBMI with the management responsible since they know the operations conducted to ensure that the innovation towards sustainability is ongoing rather than a single occasion and hence capable of securing a sustainable competitive advantage for the firm over time.

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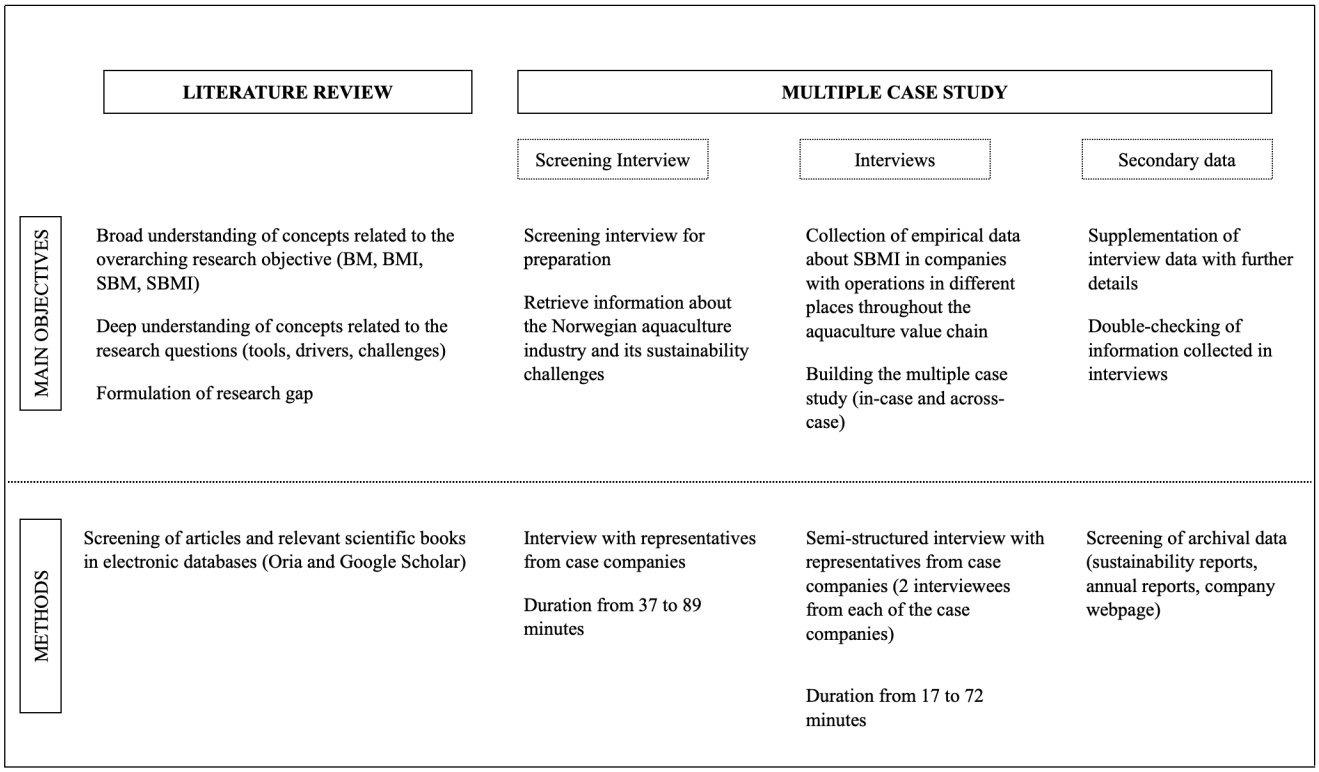
Appendices

Appendix A: Overview of the research design and methods



Appendix B: Interview protocol

Interview guide

Business model canvas

1. Verdiforslag beskriver hva man tilbyr av verdi til kunden gjennom produkter og tjenester. Hva skal dere levere? Hva tilbyr dere?
2. Kunderelasjoner sier noe om hvilken type tilknytning man skal etablere til ulike kunder. Hvordan får dere kunder? Hvordan beholder dere dem? Hvordan kan de vokse?
3. Kundesegment definerer ulike grupper folk eller organisasjoner en bedrift ønsker å nå eller betjene. Hvem skaper bedriften verdi for? Hvem er deres viktigste kunder?
4. Nøkkelpartnere er det totale nettverket av leverandører og partnere som får forretningsmodellen til å fungere. Hvem er samarbeidspartnere? Hvem er leverandører?
5. Kanaler angir hvilke måter man oppnår kundekontakt gjennom. Her beskriver man hvordan bedriften får kontakt med og kommuniserer med sine kunder.
6. Nøkkelaktiviteter er de viktigste aktivitetene en bedrift gjør for å tilby produktet eller tjenesten sin til kundene. Hva er deres nøkkelaktiviteter?
7. Nøkkelressurser er de viktigste ressursene som kreves for å få forretningsmodellen til å fungere. Disse kan være fysiske, finansielle, intellektuelle eller menneskelige, og kan eies eller leies i bedriften eller kjøpes fra nøkkelpartnere. Hva er de viktigste nøkkelressursene i bedriften?
8. Inntektsstrømmer angir hvordan man skal tjene penger. Hvordan skaper dere fortjeneste i bedriften?
9. Kostnadsstruktur beskriver utgiftene til bedriften. Hva er de viktigste kostnadsdriverne for å levere verdi til kunden? Hvilke ressurser og aktiviteter koster oss mest?

RQ1:
How do companies implement sustainability in their business model?
Which internal and external factors contributed to this process?

10. Har bærekraft en plass i bedriftens nåværende forretningsmodell? I hvilke deler av forretningsmodellen har bedriften implementert bærekraft?
11. Hvem er bedriftens viktigste interessenter?
12. Hvilke forventninger har interessentene til bedriften?
13. Hvilke av interessentenes forventninger er mest relevant for bedriften?
14. Hvilke tiltak har dere gjort med bærekraft?
15. Er disse tiltakene inkrementelle eller radikale endringer?
16. Har dere dokumentert disse tiltakene?
17. Har noen interne faktorer påvirket arbeid med bærekraft?
18. Har noen eksterne faktorer påvirket arbeid med bærekraft?
19. Har dere noen fremtidige planer for arbeid med bærekraft?
20. Er arbeidet med bærekraft integrert i bedriftens strategi? På hvilken måte?
21. Har dere gjort spesielle tiltak for å jobbe med bærekraftsmålene?
22. Hvilke av bærekraftsmålene mener du er viktigst for bedriften deres?
23. Har dere planer om å gjøre noen spesielle tiltak for å jobbe mer med bærekraftsmålene?

Appendix C: Interview protocol for screening interviews

Screening interview

Om intervjuobjekt og bedriften

1. Hvor lenge har du jobbet i bedriften og hvilken rolle har du? Har du hatt andre roller i bedriften tidligere? Hvilken utdanning har du?
2. Hvor mange antall ansatte er det i bedriften?
3. Hva er den årlige omsetning til bedriften?
4. Hvilken rolle i bedriften har det overordnede ansvaret for bærekraft?
5. Hvem er bedriftens største konkurrenter?
6. Har bedriften aktiviteter i utlandet eller kun i Norge? Hvis ja, hvilke land har dere aktiviteter i og selger de til?

Bærekraftsrapportering

7. Rapporterer bedriften om bærekraft i årsmeldingen? Hvis ja, på hvilken måte rapporterer bedriften om bærekraft i årsmeldingen?
8. Har bedriften kvantitativ informasjon som rapporteres gjennom ulike indikatorer?
9. Har bedriften planer om å endre på/forbedre dette?
10. Følger bedriften noen retningslinjer for rapportering?

Om næringen

11. Er det noen pågående endringer i bransjen?
    - Vekst
    - Teknologi
    - Etterspørsel
12. Hva er de største utfordringene i næringen?
    - Tilgang på arbeidskraft
    - Marked
    - Økonomiske
    - Kunder
13. Hva er de største bærekraftsutfordringene i næringen?
    - Omdømme i oppdrettsbransjen knyttet til fôr
    - Drift av anlegg
    - Kan materialer i de tekniske anleggene sirkuleres?
    - Trenger bransjen en form for sertifisering?
    - Kommer det ut noe informasjon om karbonavtrykk av produktene
14. Hvem er de største aktørene innenfor deres bransje?
    - Norge
    - Internasjonalt
15. Verdikjeden for akvakultur består av avl, settefisk, matfisk og annen akvakultur, fiskeforedling og leverandører av produkter og tjenester til de ulike delene av verdikjeden. Hvilket forhold har dere til de andre aktørene?

Appendix D: Business Model Canvas for MMC First Process

THE BUSINESS MODEL CANVAS

MMC FIRST PROCESS

Key Partners

- Producers and suppliers of equipment
- Customers

Key Activities

- Producing and designing innovative solutions for customers
- Maintaining and creating customer relationships

Key Resources

- Skilled personnel
- Competence
- Patents
- Capital
- Machinery

Value Propositions

- Supplier of complete and sustainable system solutions for the seafood industry
- Advanced solutions for handling, processing, and cooling of fish

Customer relationships

- Market-driven by focusing on offering system solutions according to customers' needs
- Service and aftermarket department

Channels

- Word of mouth
- Social media
- Digital communication
- Sales and support team
- Existing networks

Customer segments

- Well boat companies
- Land-based farming
- Pelagic fishing boats and handling
- Shipyards

Cost Structure

- Deliveries from suppliers
- Purchase of goods
- Research and development
- Locations

Revenue Streams

- System solutions and competence to customers handling biomass

Appendix E: Business model canvas for Rostein

THE BUSINESS MODEL CANVAS

ROSTEIN

Key Partners

- Larsnes Mek (shipyard)
- Fuel suppliers
- Equipment suppliers
- System and technology suppliers
- Service suppliers
- Designers

Key Activities

- Transportation, processing and sorting of fish
- Innovation

Key Resources

- Skilled personnel
- Well boats
- Equipment
- Partners
- Shipyard

Value Propositions

- Sustainable transport, processing and sorting of fish

Customer relationships

- Attend industry fairs
- Deliver at set price and time
- Find/implement effective processes
- Support customers' growth with capacity

Channels

- Word of mouth
- Digital communication
- Webpage
- Industry fairs

Customer segments

- Time charter
- Framework contracts
- Spot market

Cost Structure

- Well boat personnel
- Operations
- Fuel
- Maintenance

Revenue Streams

- Time charter
- Framework contracts
- Spot market

Appendix F: Business model canvas for Hofseth Aqua

THE BUSINESS MODEL CANVAS

HOFSETH AQUA

Key Partners

- Feed producers
- Well boat companies
- Smolt suppliers
- Service boats
- Contractors
- Equipment and technology suppliers

Key Activities

- Farming of fish
- Follow-up on certifications

Key Resources

- Capital
- Skilled personnel
- Competent work force

Value Propositions

- Fully integrated seafood company
- Farming Norwegian salmon, fjord trout, and Atlantic cod with low environmental impact

Customer relationships

- Long term focus on customer relationships
- Being a reliable supplier

Channels

- Word of mouth
- Digital communication
- Web page
- Industry fairs
- Existing networks

Customer segments

- Large food chains all over the world
- Customers in USA and Japan

Cost Structure

- Fish feed
- Handling and de-licing of fish
- Trained personnel

Revenue Streams

- Farmed fish

Appendix G: Assessment from Norsk Senter for Forskningsdata

NSD NORSK SENTER FOR FORSKNINGSDATA

Vurdering

Referansenummer

837413

Prosjekttittel

Transition to sustainability in the Norwegian aquaculture industry – a study of the role of changes of the business model

Behandlingsansvarlig institusjon

Norges teknisk-naturvitenskapelige universitet / Fakultet for økonomi (ØK) / Institutt for internasjonal forretningsdrift

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)

Annik Magerholm Fet, annik.fet@ntnu.no, tlf: 92296890

Type prosjekt

Studentprosjekt, masterstudium

Kontaktinformasjon, student

Lena Førde, lenaford@stud.ntnu.no, tlf: 95066041

Prosjektperiode

01.01.2022 - 30.06.2022

Vurdering (1)

10.02.2022 - Vurdert

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg, og eventuelt i meldingsdialogen mellom innmelder og Personverntjenester. Behandlingen kan starte.

TYPE OPPLYSNINGER OG VARIGHET
Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til den datoen som er oppgitt i meldeskjemaet.

LOVLIG GRUNNLAG
Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake.

Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER
Personverntjenester vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om:

· lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen
· formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke behandles til nye, uforenlige formål
· dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet
· lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lengre enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER
Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18), og dataportabilitet (art. 20).

Personverntjenester vurderer at informasjonen om behandlingen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.
Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER
Personverntjenester legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1. f) og sikkerhet (art. 32).
Ved bruk av databehandler (spørreskjemaleverandør, skylagring eller videosamtale) må behandlingen oppfylle kravene til bruk av databehandler, jf. art 28 og 29. Bruk leverandører som din institusjon har avtale med.
For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og/eller rådføre dere med behandlingsansvarlig institusjon.

MELD VESENTLIGE ENDRINGER
Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til oss ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde: https://www.nsd.no/personverntjenester/fylle-ut-meldeskjema-for-personopplysninger/melde-endringer-i-meldeskjema
Du må vente på svar fra oss før endringen gjennomføres.

OPPFØLGING AV PROSJEKTET
Personverntjenester vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.
Lykke til med prosjektet!

Appendix H: Statement of consent

Vil du delta i forskningsprosjektet

"Sustainable business model innovation: a multiple case study of the Norwegian aquaculture industry"?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å innhente informasjon om hvordan din bedrift jobber med bærekraft. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
Formålet med masteroppgaven er å utforske følgende problemstilling: "How do companies innovate their business model to be more sustainable in practice?". Ved å utforske problemstillingen ønsker vi å se på hvordan overgang til bærekraft ved endring i forretningsmodellen kan bidra til et grønt skifte, i tillegg til hvordan endringer i forretningsmodeller kan bidra til overgang til bærekraftige forretningsmodeller.

Hvem er ansvarlig for forskningsprosjektet?
Norges Teknisk-Vitenskapelige Universitet ved Institutt for Forretningsdrift er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Intervjuobjekt er utvalgt basert på ansatte i medlemsbedrifter i Global Aquaculture Tech Hub. Ansatte i bedriften får denne henvendelsen.

Hva innebærer det for deg å delta?
Hvis du velger å delta i prosjektet innebærer det å delta i et eller to individuelle dybdeintervju. Opplysningene registreres ved bruk av lyd-/ videoopptak, elektronisk og med notater.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Studentene og veiledere vil ha tilgang til opplysningene som blir registrert. Navnet og kontaktopplysningene dine til lagres adskilt fra øvrige data.

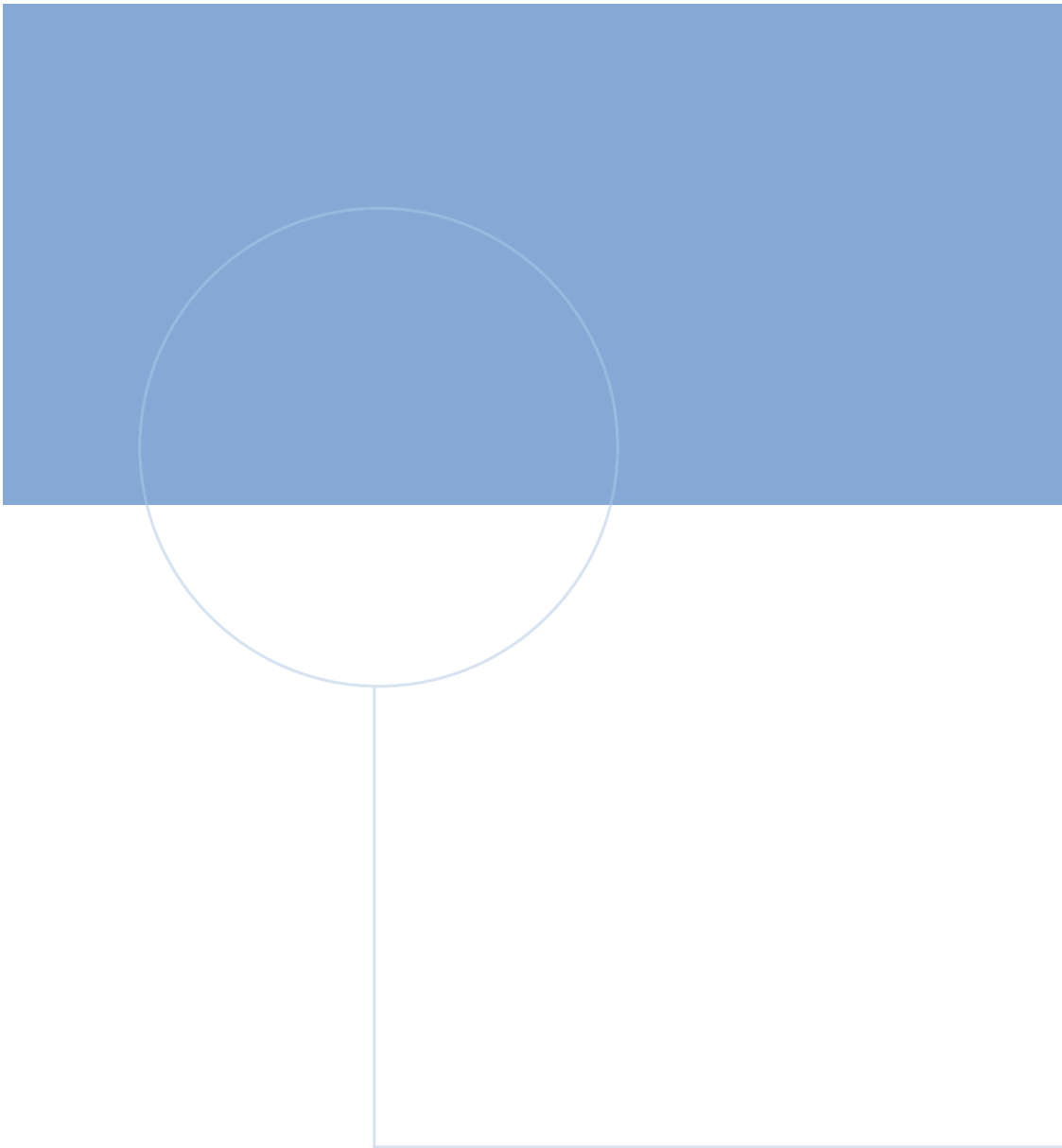
Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Opplysningene anonymiseres når prosjektet avsluttes/oppgaven er godkjent, noe som etter planen er slutten av september 2022. Ved prosjektslutt vil opplysninger lagres anonymisert for etterprøvbarhet der kun studentene har tilgang til datamaterialet

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU har NSD vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene



NTNU

Norwegian University of
Science and Technology