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Kandidatnr.:	124

Informasjon fra deltaker

Antall ord *:	26988

Egenerklæring *:
Ja

Jeg bekrefter at jeg har registrert oppgavetittelen på norsk og engelsk i StudentWeb og vet at denne vil stå på vitnemålet mitt *:
Ja

Gruppe

Gruppenavn:	(Anonymisert)
Gruppenummer:	13
Andre medlemmer i gruppen:	118

Jeg godkjenner avtalen om publisering av masteroppgaven min *

Ja

Er masteroppgaven skrevet som del av et større forskningsprosjekt ved

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Er masteroppgaven skrevet ved bedrift/virksomhet i næringsliv eller of

Nei

MASTER'S THESIS

The Green Transition: A Qualitative Study of Drivers and Barriers to Green Innovation in Norwegian Food and Beverage Firms

Det Grønne Skiftet: En Kvalitativ Studie av Drivere og Barrierer for Grønn Innovasjon i Norske Mat og Drikkebedrifter

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Preface

This master`s thesis represents the final chapter of our two-year master's program, Master of Science in Business (Marketing and Innovation), at the Western Norway University of Applied Sciences.

Through our master`s program, we became interested in innovation practices and how this varies between firms. In addition, we are also concerned and passionate about our climate and beautiful nature. We have a responsibility as consumers, but businesses also need to make changes to improve their operations and preserve the future. As one of our informants said, "Small steps lead to big results over time," we agree that all people, stakeholders, firms, and the government are responsible for our planet. Therefore, we wanted to combine our interest in innovation and sustainability to study what affects firms to implement green innovations and what drives and hampers them. The choice fell on firms in the food and beverage industry, as there is an increasing focus on the green transition and circular economy and many exciting firms. Some have a long history, others have innovative solutions, but all have tasteful products.

Finally, we thank our supervisor, Gregory Kwiatkowski, for every feedback throughout this project. Every discussion, constructive criticism, and good humor have helped us reach this thesis's result, and we are very thankful for all the time invested in our questions and work. We are highly thankful for your patience and for steering us in the right direction when new ideas arrive. Also, we would like to thank our participants for taking the time for interviews and for their enthusiasm for this topic. Additionally, positive words and support from friends and our loved ones are extremely appreciated!

Abstract

The Norwegian food and beverage industry is transitioning towards more sustainable production and distribution. However, this transition is not a process without challenges. This master's thesis examines the drivers and barriers experienced by Norwegian food and beverage firms. The guiding research question is: *"What green innovations are being integrated within the Norwegian food and beverage industry today, and what are the key drivers and barriers influencing this integration in food and beverage firms?"*. The thesis investigates what the firms experience as drivers and barriers based on the TOE framework, representing technological, organizational, and environmental factors. The study is conducted through qualitative case studies, interviewing 7 firms from the food and beverage sectors using semi-structured interviews.

According to the research findings, Norwegian food and beverage firms have taken steps towards sustainability by implementing a range of innovative, eco-friendly practices. The primary focus has been on reducing energy consumption during production. The master's thesis highlights that the key drivers for these green initiatives are technology compatibility, top-level management, organizational culture, and stakeholder pressure. At the same time, the main obstacles are limited financial resources, government regulations, and research and development. Interestingly, the study also suggests that although consumers express interest in sustainable products, they remain price sensitive, indicating a disconnection between their attitudes and actions.

Keywords: *Green Innovation, Food and Beverages, Drivers and Barriers, Norway*

Sammendrag

Den norske mat- og drikkeindustrien står overfor et skifte til mer grønnere produkt og produksjon. Denne masteroppgaven undersøker hvilke drivere og barrierer norske mat- og drikkebedrifter opplever gjennom å undersøke følgende forskningsspørsmål: *"Hvilke grønne innovasjoner blir har blitt implementert i den norske mat og drikke industrien i dag, og hva er de sentrale driverne og barrierene som påvirker denne integreringen i mat- og drikkebedrifter?"*. Oppgaven undersøker hva bedriftene opplever som drivere og barrierer gjennom TOE- rammeverket, som representerer teknologiske, organisatoriske og miljømessige faktorer. Studien er utført gjennom en kvalitativ casestudie, der 7 bedrifter fra mat- og drikkeindustrien er intervjuet, ved bruk av semistrukturerte intervju.

Funnene i studien indikerer at norske mat- og drikkebedrifter har tatt skritt i en bærekraftig retting ved å implementere en rekke innovative, miljøvennlige praksiser. De fleste med hovedfokus på å redusere energiforbruk i produksjon. Resultatene viser at teknologisk kompatibilitet, støtte fra toppledelsen, organisasjonskultur og press fra interessentene som de mest fremtredende driverne. Forskning og utvikling, finansielle ressurser og reguleringer fra myndighetene ble pekt på som de største barrierene for grønn innovasjon. Funnene våre viser også at forbrukerne er prissensitive, som indikerer at det er et gap mellom holdning og oppførsel mellom hva forbrukere sier eller ønsker seg, med den faktiske atferden.

Nøkkelord: Grønn Innovasjon, Mat og Drikke, Drivere og Barrierer, Norge

Content List

1.0 Introduction

In recent years, the importance of environmental sustainability has gained traction, especially in the food and beverage (F&B) industry where it is a critical factor that influences firms' innovation strategies (Dangelico et al., 2019, p. 1434). With the world's population projected to reach 10 billion by 2050, the demand for increased food production is a significant challenge (Riaz et al., 2023, p. 2989). Currently, food production accounts for about a quarter of greenhouse gas emissions worldwide (Ritchie et al., 2022). By 2050, food consumption is expected to increase by 70%, global energy consumption by 25% by 2040, and the demand for freshwater by 55% (Hamam et al., 2022). Moreover, the food value chain has a significant impact on the environment, from production to consumption, making it one of the largest drivers contributing to global environmental change (Gonera et al., 2021).

The world is facing the need for a green transition to preserve our planet. Innovation that considers environmental impact has become crucial to meet these challenges and achieve the UN Sustainable Development Goals (SDGs). In addition, consumers are becoming more aware of their environmental impact when buying products. The ability to meet consumer demands and adapt to changes is important for firms to survive (Tidd & Bessant, 2021, p. 2). The food sector is considered a traditional sector with cultural heritage and regional traditions (FoodDrinkEurope, 2024a, April 12th; Riaz et al., 2023, p. 2989). However, F&B firms also represent opportunities within innovation and have a role to play in the green transition. In the food sector, environmentally friendly innovations are crucial to reducing the risk of biodiversity loss, water pollution, soil erosion, and climate change (Riaz et al., 2023, p. 2989). Actions to reduce the environmental footprints of F&B firms can already be seen through practices such as more environment-friendly agriculture, shortening food supply chains, and encouraging more plant-based food alternatives (Gonera et al., 2021, p. 1). In addition, firms are looking to develop less harmful production processes, new sustainable products, investments in innovative technologies and certifications (Camilleri et al., 2023)

Several studies have tried to identify factors that drive and hamper green innovation in firms (Takalo et al., 2021). However, within the scope of green innovation in the F&B industry, previous studies have for instance researched the difference between family-owned and independent small firms in the agri-food industry (Dangelico et al., 2019), sustainable business models in the F&B industry (Long et al., 2018) and how sustainability is driving innovation in

the Norwegian food sector have been studied (Nykamp & Gonera, 2020). Previous studies exist on drivers for eco-innovations (Cuerva et al., 2014; Zhang et al., 2020) and frameworks for overcoming barriers to green innovation implementation in small and medium-sized enterprises (Gupta & Barua, 2018; Takalo et al, 2021). However, through a literature search, the authors found little research on this topic in the Norwegian context. Therefore, this master's thesis explores the factors contributing to and hampering the green transition, specifically within Norway's F&B industry. This thesis can enlighten areas of opportunities and improvements by understanding the drivers and barriers that characterize F&B firms' pursuit of environmental sustainability. In addition, research on green innovation is increasingly important to tackle environmental challenges and understand how firms are and can adapt to the green transition (Dangelico et al., 2019; Long et al., 2018; Nykamp & Gonera, 2020).

1.1 Research Question

The success and execution of innovation in an organization are very much based on the availability of different resources, and how well firms implement it depends on technological benefits, organizational capabilities, and external environmental pressure (Zhang et al., 2020, p. 2). Therefore, these factors are considered resources for firms that want to implement green innovation successfully (Zhang et al., 2020, p. 2). Hence, the primary objective of this study is to explore the dynamics of green innovation within the F&B sector in Norway, explicitly focusing on understanding the drivers and barriers that influence firms' adoption of green innovations.

With these considerations, this paper is trying to answer the following research question:

> *RQ: What green innovations are being integrated within Norwegian the food and beverage industry today, and what are the key drivers and barriers influencing this integration in food and beverage firms?*

To answer the research question, the study will be structured to answer three sub-questions:

> *SQ 1: What green innovations are being implemented across Norway's food and beverage sector?*

> *SQ 2: What are the technological, organizational, and environmental drivers and*

barriers that make food and beverage firms innovate and implement green innovation?

SQ 3: How have the firms experienced the customers´ response to implementing green innovations?

This research is driven by questions regarding firms' challenges and opportunities in the green transition. By highlighting drivers and barriers, this thesis can contribute to a better understanding of how Norwegian F&B firms are innovating regarding environmental aspects. This thesis also contributes to understanding what firms see as drivers and barriers to green innovation and how they can overcome these to facilitate innovation and meet today's demands from stakeholders. Understanding these dynamics is crucial for the industry and offers broader implications for global sustainability practices in the F&B sector. Therefore, this research holds value for both academic understanding and practical application for firms and management. Lastly, this thesis also seeks to inspire and encourage positive change in the industry.

1.2 Thesis Structure

This thesis is organized into five main sections. Section 2 provides a review of relevant literature and a theoretical framework. Section 3 follows the methodology in which the choice of firms is also represented. To address the research question, the thesis interviewed 7 firms. Moving on to section 4, results are being examined. The collected qualitative data was very extensive. This required the authors to make some subjective cuts that were necessary to write a structured and cohesive thesis. After presenting the results, the thesis will analyze and discuss the findings in section 5 based on the literature review. Lastly, section 6 provides a conclusion and implications, before giving suggestions for further research.

Figure 1. Outlines of the thesis.
Source: Own illustration.

2.0 Literature Review and Theoretical Framework

In this section, the literature on sustainability, innovation, green innovation, and organizational strategy will be first examined. Furthermore, the challenges and opportunities in the literature on innovations in the F&B sector must be understood by looking at the food system. Finally, drivers and barriers for green innovation identified through literature are reviewed, with the TOE framework and other relevant literature as a foundation for categorizing the factors. The reviewed literature will provide a foundation to form the research question and interview guide. In addition, it provides a deeper understanding of the topic, which is important for interpreting the collected data.

2.1 Sustainability

Sustainability is defined by the Brundtland Commission as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland, 1987, p. 41). In 2015, the United Nations established 17 main goals to secure sustainable development which encompasses the definition of sustainability by Brundtland and are built on the three pillars of social, environmental, and economic relations (Longvanes & Årethun, 2020, p. 14; United Nations, 2024, April 12th). The world is facing challenges such as hunger and food insecurity, and environmental impacts. To reach the United Nations' Sustainable Development Goals (SDGs) of 2030, all countries must play their part. This was also discussed in a National dialogue on sustainability in the Norwegian food system in 2023 held by the Norwegian Ministry of Agriculture and Food (Norwegian Ministry of Agriculture and Food, 2023, p. 12). Specifically, regarding this thesis, SDG 12, "ensuring sustainable consumption and production", and SDG 13, "take urgent action to combat climate change and its impacts" are especially of high relevance and this thesis aims to contribute to the right direction.

Figure 2. United Nations sustainability goals.
Source: United Nations, 2024, April 12th, (https://unric.org/en/united-nations-sustainable-development-goals/).

In addition to the pressure from the SDGs, consumers are becoming more aware of the origin of products, and what they eat and drink (Nykamp & Gonera, 2020). Sustainability is therefore becoming increasingly important to most stakeholders, not only in technological firms but also for firms in the F&B industry (Nykamp & Gonera, 2020). Sustainability regarding firms is about a long-term perspective where the economy, society, and environment are preserved. These three pillars are called the Triple Bottom Line (TBL), which refers to an organization's economic, environmental, and social impacts (Martin & Schouten, 2014, p. 29). A balance between the three pillars is essential for sustainable development and contributes to a win-win situation for the company, society, and the planet (Martin & Schouten, 2014, p. 29).
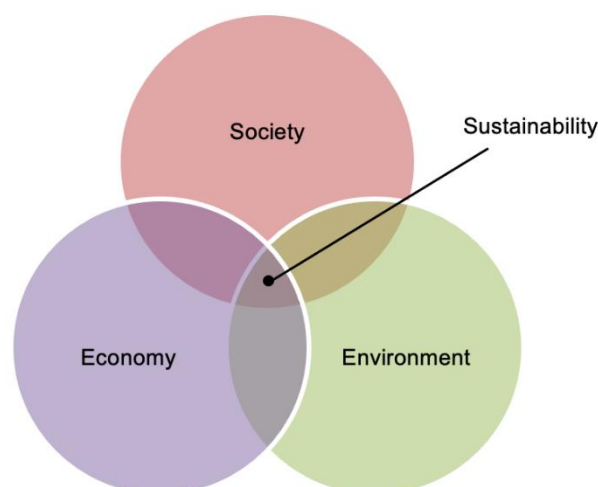
Figure 3. The Triple Bottom Line.
Source: Own illustration based on TBL (Martin & Schouten, 2014, p. 29).

However, in developing a sustainable future, firms are just one actor in this development. Longvanes and Årethun (2020, p. 20) point to three main interacting actors that affect sustainable development: Individuals/consumers, firms, and society/politics. Firms and consumers depend on each other regarding supply and demand. On the other side, the government authorities can regulate consumers and producers more sustainably (Longvanes & Årethun, 2020, p. 19). For firms, the government can regulate through laws, taxes, fines, injunctions, or demands, such as CO_2 taxes or demands for cutting plastic in products such as yogurt spoons. The authorities can also manage consumer patterns in a sustainable direction, e.g. taxes for plastic bags (Longvanes & Årethun, 2020, p. 19).
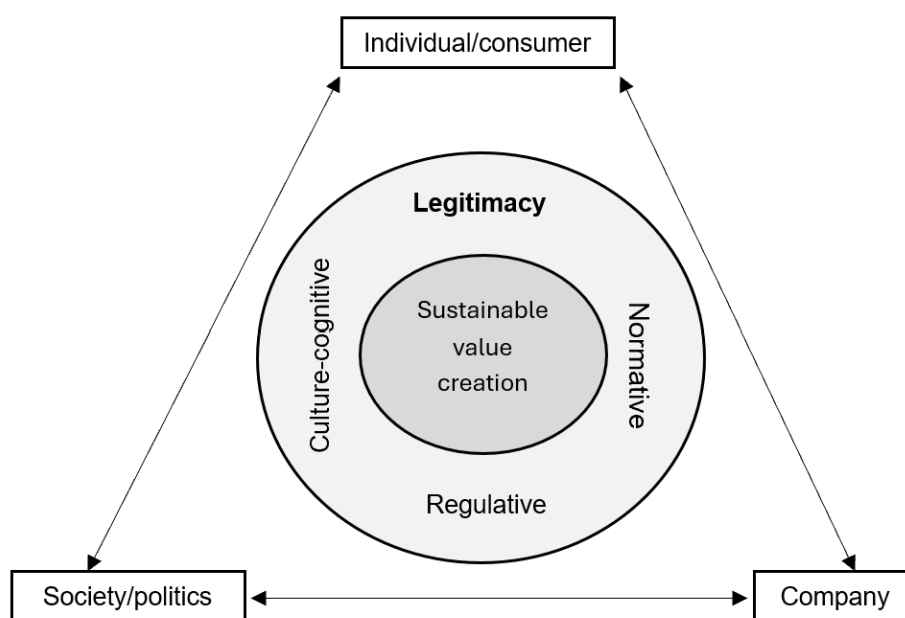
Figure 4. Actors affecting sustainable development.
Source: From *Berekraftig verdiskaping* (p.20), of Longvanes and Årethun, 2020, Fagbokforlaget.

2.2 Innovation and Green Innovation

Innovation is one way firms can adapt to market changes, trends, policies, customer demand, and environmental changes and gain a competitive advantage (O'Sullivan & Dooley, 2008). Today, innovation has become a pervasive term that organizations find elusive (Kahn, 2018). Over time, several definitions of the term have been proposed. Popa et al. (2010, p. 151) present one of the first definitions given by Joseph Schumpeter in 1930: "Introducing a new product or

modifications brought to an existing product." This includes exploring a new market, developing new sources of supply channels with raw materials, and other alternations in the organization.

Another definition presented by O'Sullivan and Dolley (2008, p. 4) states that innovation is "making changes to something established by introducing something new." In recent years, definitions of innovation have become more complex and focused on adding value rather than creating something new. Skillicorn (2016) presented what is referred to as the ultimate definition of innovation: "Executing an idea which addresses a specific challenge and archives value for both the company and the customer." This definition addresses creating something new and adding value to consumers and organizations.

Table 1. Overview of definitions of innovation.

Definition	Keywords	Author
"Introducing a new product or modifications brought to an existing product"	New product, modifications	Schumpeter (1934)
"Making changes to something established by introducing something new"	Changes, established, introducing, new	O'Sullivan & Dolley (2008)
"Executing an idea which addresses a specific challenge and archives value for both the company and the customer"	Idea, execution, value	Skillicorn (2016)

Source: Created by the authors based on existing definitions.

The literature surrounding green innovation has expanded and evolved over the past years (Takalo et al., 2021), making consumers and organizations more cognizant of green products. In the literature regarding green innovation, multiple terms have been used interchangeably in the literature to describe green innovation, such as "ecological innovation," "eco-innovation," "environmental innovation," and "sustainable innovation" (Arfi et al., 2018). However, they all have the same purpose, to define a term of practice that makes firms more sustainable and lower their environmental footprint. Arfi et al. (2018, p. 211) emphasize that green innovation, understood as environmental innovation, aims to improve both environmental and economic performance. Nykamp and Gonera (2020, p. 6) state that "sustainable" is a broader term because it includes a social dimension. This can distinguish sustainable innovation and green innovation, as green innovation focuses on the environmental aspect of the three pillars of sustainability. However, it is essential to acknowledge that balancing all three pillars is important for sustainable development.

Further, Kemp and Pearson (2007, p. 7) define green innovation as:

> The production, assimilation, or exploitation of a product, production process, service or management, or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives.

In addition, based on the work of Castellacci and Lie (2017), Takalo et al. (2021, p. 2) describe green innovation as "a process that contributes to the creation of new production and technologies with the aim of reducing environmental risks, like pollution and negative consequences of resource exploitation, (e.g., Energy)." This type of innovation focuses on creating environmentally friendly, resource-efficient solutions and contributes to the planet's and its inhabitants' sustainable development (Schiederig et al., 2012). This can refer to the natural step framework presented by Karl-Henry Robert, in which guiding principles of sustainability are based on the laws of thermodynamics and natural life cycles (Martin & Schouten, 2021, p. 31).

Furthermore, several definitions focus on different forms of innovation. Horbach et al. (2012, p. 119) define eco-innovation as "product, process, marketing, and organizational innovations, leading to a noticeable reduction in environmental burdens". Vasileiou et al. (2022, p. 3) also support this definition by adding organizational change and marketing solutions with environmental benefits to define green innovation.

Table 2 summarizes the definitions reviewed covering the environmental aspects of innovation to understand and define green innovation in this thesis.

Table 2. Overview of definitions of green innovation.

Definition	Key words	Author
"The production, assimilation or exploitation of a product, production process, service or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources use (including energy use) compared to relevant alternatives"	Production, assimilation or exploitation, novel, reduction, relevant alternatives	Kemp and Pearson (2007)
"A process that contributes to the creation of new production and technologies with the aim of reducing environmental risks, like pollution and negative consequences of resource exploitation (e.g., energy)"	Process, new, reducing environmental risks	Castellacci and Lie (2017), Takalo et al. (2021)
"Product, process, marketing, and organizational innovations, leading to a noticeable reduction in environmental burdens"	Product, process, marketing, organizational, reduction	Horbach et al. (2012)
"The introduction of any new or significantly improved product (good or service), process, organizational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life cycle"	New, improved, product, process, organizational, marketing, reduce use of natural resources	Vasileiou et al. (2022)

Source: Created by the authors based on existing definitions.

The thesis identifies similarities between the definitions of green innovations. The definitions primarily focus on process and product innovation. However, organizational and marketing innovations are also mentioned. To get a better overview of the main similarities in the definitions in Table 2, we generated a word cloud, presented in Figure 5 below.

Figure 5. Review of definitions of green innovation.
Source: Created by the authors based on existing definitions.

Based on the definitions reviewed and their comparison, the thesis defines green innovation as "the introduction and exploitation of new or modified products, processes, organizational and marketing innovations that are new or improved to the organization, which aims to reduce environmental impact and ensure financial benefits".

Different industries will benefit from green initiatives as found in research by Leonidou et al. (2013). The authors emphasize that by greening the marketing mix, firms that operate in bad environmental reputation industries (e.g., oil, aviation, and agriculture) will positively affect the product-market performance and return of assets by greening the price dimension of the marketing mix. However, firms that reside in an industry with a good environmental reputation (e.g., renewable energy, electric car manufacturers, and organic farming) will have a positive effect by greening their products.

2.3 Forms of Green Innovation

Guinot et al. (2022, p. 4) state that green innovation can involve all four types of innovation, including product, process, marketing, and organizational innovation, depending on their implementation. Tidd & Bessant (2021, p. 24) define product innovation as changes in the products or services that an organization offers, for instance, its design, package, or ingredients. Furthermore, Dangelico et al. (2019, p. 1436) add this definition by defining green product innovation as having an environmental impact lower than conventional products or reducing the environmental impact of other products. According to Lin et al. (2013, p. 698), green product innovation aims to use nontoxic and biodegradable materials in the production process to reduce environmental impacts. This requires a new look at the product's life cycle (Xie et al., 2019). It can be improvements in the durability of the product and recyclability, the usage of more environmentally healthier raw materials, and the removal of dangerous substances (Xie et al., 2019).

Process innovation is about changes in how products or services are created and delivered, for instance, manufacturing methods and equipment used to produce the product (Tidd & Bessant, 2021, p. 24). Green process innovation involves improvements that reduce environmental impacts through efficient production processes. This includes improved actions such as reduction of energy use in the production process that turns waste into value, reduction air and

water emissions, reduction water usage, improving energy efficiency, minimizing waste, and materials, and using renewable energy sources (Dangelico et al., 2019, p. 1436; Hellstrom, 2007, p. 150; Xie et al., 2019, p. 698). Consequently, green product- and process innovation can contribute to firms achieving competitive advantage, cost, and profit benefits (Albort-Morant et al., 2016; Chan et al., 2016).

Further, organizational innovation involves significant changes and improvements in the organization's structure, e.g. changes in management, practices, and procedures (Guinot et al., 2022, p. 4). Concerning green organizational innovation, Triguero et al. (2013, p. 27) state that these changes in the organization are aimed at reducing environmental impact, but also economic returns (Arfi et al., 2018). According to García-Granero et al. (2018), such changes can involve green human capital with knowledge and skills about environmental processes and technologies and changes in the leadership to facilitate eco-friendly practices.

Marketing innovation is when the organization integrates or uses new marketing methods that have not been used in the organization, e.g. changes in positioning, promotion, design, or packaging, such as disposable, reusable, or returnable packaging (Guinot et al., 2022, p. 4; García-Granero et al., 2018, p. 313). Additionally, packaging attributes can also affect consumers' behavior in reducing food waste and recycling (García-Granero et al., 2018, p. 314). Specifically, package information, certifications, simplification of packaging, and ease of cleaning and recycling are some examples mentioned in the literature (García-Granero et al., 2018, p. 314).

Furthermore, innovation involves varying degrees of change. The degree of novelty in an innovation is usually divided into incremental and radical (Guinot et al., 2022, p. 2). Incremental innovation is gradual and continuous improvements or changes in products, processes, services, or the organization (Tidd & Bessant, 2021, p. 30). Incremental innovation creates value through new improvements (Guinot et al., 2022, p. 2). This is the most common form of innovation in the food industry, through for instance, taste, packaging, and size, which does not require big technological improvements (Capitanio et al., 2010). However, creating new products or services for the market is a radical innovation (Guinot et al., 2022, p. 3). Food made of seaweed or larvae are some examples of such new food products in the market. This requires fundamental rethinking and is often seen through revolutionary technology and new business models, enabling firms to capture new markets and create new standards (Tidd & Bessant, 2021).

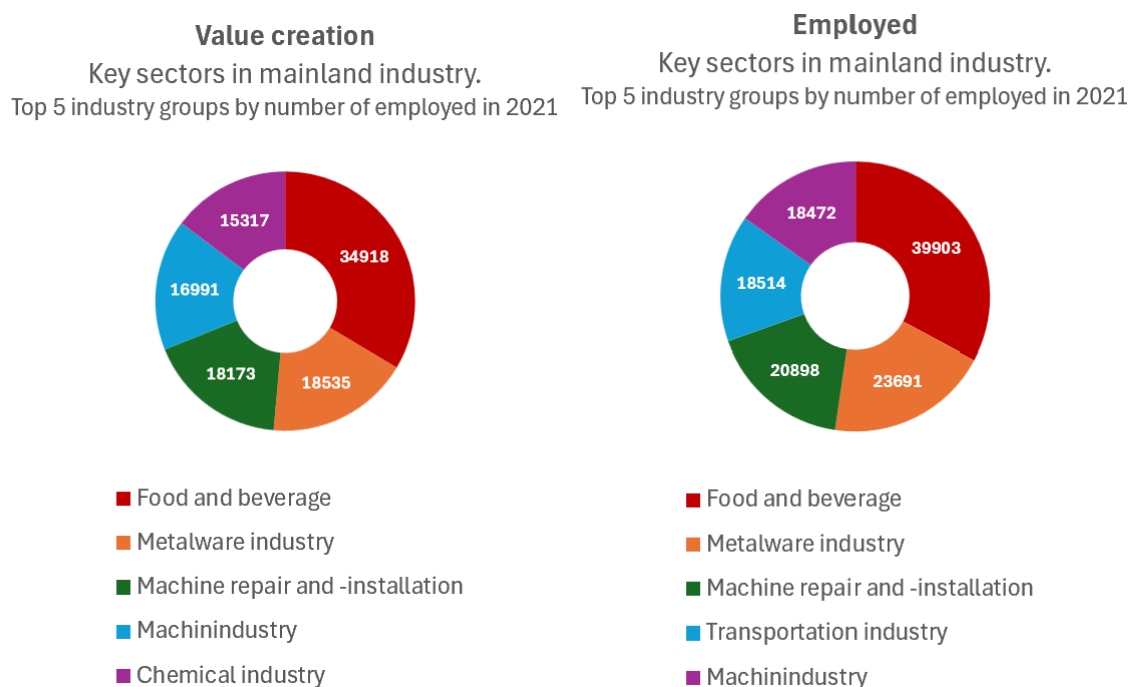## 2.4 Green Innovation in the Food and Beverage Industry

Green innovation is not just about product development and manufacturing processes; considering the entire food system is therefore crucial for achieving environmental sustainability. In general, the food system is the way food is produced and how it affects our health, well-being, and environment (Bizzo et al., 2023, p. 24). More precisely, food systems include all elements such as environment, people, processes, infrastructures, institutions, and activities related to the production, processing, distribution, preparation, and consumption of food and waste management. In addition, it includes all the effects of these activities on the society, economy, and climate (HLPE, 2017, p. 23). Innovation is fundamental in addressing sustainability challenges and constructing a more environmentally friendly food system (Herrero et al., 2020). The complexity of these systems means that changes in one part can have far-reaching implications for other aspects, from farm-level practices affecting biodiversity to consumer choices influencing global supply chains as illustrated below (Herrero et al., 2020).
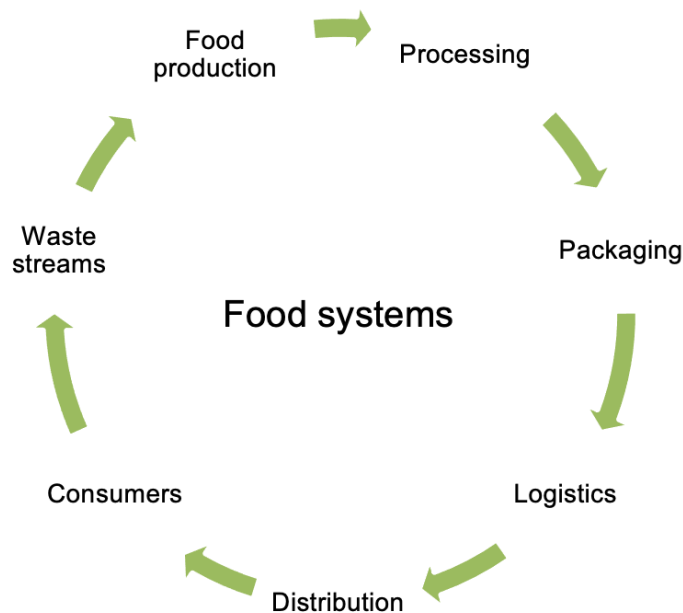
Figure 6. Food systems.
Source: Based on *"Food 2030 – Pathways for action 2.0 – R&I policy as a driver for sustainable, healthy, climate resilient and inclusive food systems"* of Bizzo et al., 2023, Publications Office of the European Union, p. 24.

Furthermore, the Norwegian industry is diverse, with agriculture and aquaculture as important for food production. The F&B industry has developed progressively to become one of the most important sectors in the Norwegian mainland industrial sector, representing a value creation of around 37 billion NOK in 2021 (The Confederation of Norwegian Enterprise, 2023a, April 4th). In addition, the F&B sector is the top industry group in the Norwegian mainland regarding employment and value creation based on number of employed, as illustrated below (The Confederation of Norwegian Enterprise, 2023a, April 4th). This illustrates the scale and importance of Norway's F&B industry.

Value creation
Key sectors in mainland industry.
Top 5 industry groups by number of employed in 2021

Employed
Key sectors in mainland industry.
Top 5 industry groups by number of employed in 2021

15317 | 34918
16991
18173 | 18535

18472 | 39903
18514
20898 | 23691

- ■ Food and beverage
- ■ Metalware industry
- ■ Machine repair and -installation
- ■ Machinindustry
- ■ Chemical industry

- ■ Food and beverage
- ■ Metalware industry
- ■ Machine repair and -installation
- ■ Transportation industry
- ■ Machinindustry

Figure 7 and 8. Key sectors in the mainland industry in 2021.
Source: Data from «NHO Mat og drikke. Tall og Fakta» by The Confederation of Norwegian Enterprise, 2023b, April 4th, (https://www.nhomd.no/politikk/konjunkturundersokelse/tallogfakta/).

In addition, sustainable agriculture practices to preserve the planet and reduce environmental impact are crucial (Prasanna et al., 2024). Agriculture such as cultivating farmland as crops, orchards, vineyards, and raring animals for food, significantly contributes to and is simultaneously affected by climate change (Nykamp & Gonera, 2020). However, different sustainable agricultural practices have emerged, and vertical farming is one innovative way of growing crops (Prasanna et al., 2024). Through this method, the crops are stacked in layers vertically, which saves space, resources and enables all-year-round farming, reduced food miles, and soil erosion (Prasanna et al., 2024). Another example of innovation within food

production in factories can be seen in the Norwegian chocolate and candy producer Nidar. Since 2014 they have reduced their water consumption by 44% by implementing new equipment and new systems to reduce and reuse water on a larger scale than before (Nidar, 2019, March 25th).

Moreover, new process techniques have been developed to use waste from food and enhance its durability. Food processing transforms raw foods and ingredients into new products or ingredients (Nykamp & Gonera, 2020). This can be done through packaging, preservation and different preparation and cooking techniques such as pasteurizing, fermenting, steaming, and drying to name a few examples (Nykamp & Gonera, 2020). Enhanced food processing can be done to improve shelf-life and to provide food products that require fewer resources and have reduced environmental impact, in addition to increasing long-lasting food that can be prevented from going to waste (FoodDrinkEurope, 2024b, April 12th).

Within the era of environmental sustainability, packaging is another important innovation area. Food products have a shorter lifecycle; therefore, disposal and packaging solutions are vital for reducing environmental impact and creating environmentally friendly purchase solutions (Zhang et al., 2022). In addition, consumers are increasingly demanding packaging that does not contribute to pollution and products that are made through sustainable processes (Petkoska et al., 2021). Innovative package solutions can reduce food waste, ensure extended durability, and reduce package waste (Zhang et al., 2022). However, many of the packages are made of plastic. This can be seen as a two-edged sword. On one side, its functionality is good for preserving food for a longer shelf life and ensuring food safety (Nilsen-Nygaard et al., 2021). On the other hand, plastic pollution is a massive problem for the planet. Therefore, sustainable innovations are necessary to reduce reusing or recycling package waste and explore possibilities for using non-thermal disinfection technologies, non-fossil materials, and bio-based or biodegradable materials (Nykamp & Gonera, 2020; Galanakis et al., 2021). For example, the Norwegian chocolate manufacturer Freia is using 80% of renewed plastics in the packaging on "Kvikk Lunsj" chocolate (Freia, 2024, 25th March), illustrated in Figure 9.

Figure 9. Recycle of Kvikk Lunsj packaging.
Source: Freia, 2024, 25th March, (https://www.freia.no/om-freia/baerekraft).

The F&B sector has complicated logistics and supply chain management, as it comprehends crucial aspects of both food and retail logistics (Lagorio & Pinto, 2021). Logistics is described by Paciarotti and Torregiani (2021, p. 429) as the systematic coordination and management of activities aims at ensuring the smooth and optimal transportation, storage, and handling of goods and associated information from their origin to their final destination of consumption to meet consumer requirements. Green logistics is described by Helo and Ala-Harja (2018, p. 465) as a practice and strategy of supply chain management that decreases environmental efforts and energy consumption produced by cargo handling, waste management, packaging, and transportation. E.g. Rema 1000 has invested in trucks that run on biogas fuel, which is in the first test stage. They have also set clear goals for minimizing waste. The firm achieved its goal of over 80% sorting rate for all shop waste (Rema 1000, 2024 1st May).

The food system's distribution aspect involves delivering food products from production to retailers, restaurants, and other sales points (Palazzo & Vollero, 2021). The efficiency of food distribution systems is closely linked to food safety, quality, and quantity. Green food distribution innovations involve reducing the value chain, such as food hubs and value-based supply chains, farmers' markets, cooperative establishments, and home deliveries (Nykamp & Gonera, 2020).

The retail stage of the food system is seen as where consumers purchase products for personal consumption (Lagorio & Pinto, 2021). According to Nykamp and Gonera (2020), retailers have limited incentives to compete on innovation, quality, and sustainability. As a result, farmers face cost pressure, prompting them to intensify production methods, which has environmental consequences.

Food waste is also an issue for improvement. Globally, one-third of the food produced for consumers is lost or wasted (1.3 billion tons) (Garrone et al., 2016). Food waste is what could be consumed, but eventually gets wasted during the distribution or consumption of the food, or due to mismanagement of food throughout the food supply chain (Vilariño et al., 2017; Teigiserova et al., 2020). Waste of food also means waste of water, cropland, and energy used in the production and transportation of food (Garrone et al., 2016). Therefore, firms must contribute to reducing today's food waste. HOFF have for instance evaluated their product portfolio and increased the durability of their fries through storage tests. This resulted in

increasing the shelf life of the product to minimize food waste (Matvett, 2024, 10th April).

Furthermore, the circular economy is closely linked to managing food waste (Ouro-Salim & Guarnieri, 2022, p. 226). To preserve well-being and secure resources for present and future generations, the transition to a circular economy is becoming increasingly important in firms (Longvanes & Årethun, 2020, p. 17). A circular economy aims to replace the conventional "take-make-waste" linear model. Retaining the value, materials, and resources within the production cycle for as long as possible to minimize waste and pollution is important to facilitate sustainable and economic growth (Longvanes & Årethun, 2020, p. 17).

A systematic literature review by Zhang et al. (2022) explores the role of the circular economy in fostering sustainability in the food sector. Their systematic review emphasizes that several challenges to food management have been outlined in the literature, such as a lack of knowledge about using food waste as a resource (Zhang et al., 2022, p. 659). Also, one successful example is the Norwegian company Invertapro, which is working on getting the most out of food waste by producing high-value animal feed and food (Invertapro, 2024, March 5th). They are doing this by using food waste from e.g., local markets and hotels to feed insects, which are later used to create larvae flour, which again is used as animal feed and as a human protein source in bread (Invertapro, 2024, March 5th). In this case, food waste is used as a resource, creating new business opportunities. However, according to Patel et al. (2019) such radical innovations of insect-based food are often neglected by consumers in the Western world.

2.5 Trends Within the Food and Beverage Consumption and Production

Although the production of meat, dairy, and fish products carries significant environmental consequences, global demand for these products is progressively increasing. Projections indicate that the world's demand for animal-derived products will double by 2050 (Pojić et al., 2018). The trend towards adopting a predominantly plant-based diet has become more popular to diminish the environmental impact and endorse animal welfare (Alcorta et al., 2021). Paradoxically, Norway's total amount of land used for organic farming decreased by 16,7 percent from 2012 to 2018. Still, the demand for organic food increased in the same time frame (Kildahl, 2020). On the other hand, with increased wealth, people's diets changed to contain more dairy and animal protein. These contradictions are part of an unsustainable food system

that influences the environment destructively and contributes to climate change (Nykamp & Gonera, 2020).

Furthermore, according to Bossle et al. (2015, p. 9), technology is important to increase sustainable food supply, reduce losses, and improve environmental sustainability. Technology can enable firms to develop ecological packages that appeal to consumers, are practical and preserve the food. Conversely, according to Galanakis et al. (2021), technological innovations within the food industry that consider sustainability are still developing. However, the authors point out that innovations such as lab-grown meat, plant-based meat, biobased packaging, food production automation, and robots will disrupt the food industry in the coming years (Galanakis et al., 2021, p. 197). Technologies such as big data, ICT, blockchain, artificial intelligence (AI), non-thermal technologies, augmented and virtual reality, and 3D food printing will also affect manufacturing processes and contribute to sustainability and new opportunities for traceability in the whole food chain (Galanakis et al., 2021, p. 197).

2.6 Drivers and Barriers to Green Innovation in Food and Beverage Firms

Although several organizations carry out green innovation for sustainable development, not all are successful (Zhang et al., 2020) and implementation – converting ideas into reality, often depends on resources, knowledge, uncertainty, and different factors (Tidd & Bessant, 2021, p. 22). To address the factors that affect firms' implementation of innovations, researchers have developed frameworks to understand better what influences firms to adopt and implement green innovations. One of these frameworks is the technology-organization-environment (TOE) framework developed by Tornatzky and Fleischer (1990). This framework is based on innovation diffusion theory by Rogers (1995) and looks at the factors that determine corporate innovations from technological, organizational, and environmental aspects. Further, Zhang et al. (2020) adopted this framework in their study to examine how prepared enterprises are for green innovation in terms of technology readiness, organization readiness, and environment readiness. Indrawati et al. (2023) also highlight the influence of organizational, environmental, and technological factors on the successful adoption of green innovations through their research.

Several frameworks and theories examine drivers and barriers for green innovation, and from different perspectives. Some studies are looking at determinants from a technology-push perspective such as technological capability, and market-pull perspective such as pressure from various stakeholders, while others at internal factors such as the capabilities within the firm and external factors such as demands, regulations and pressure from competitors (Tariq et al., 2017, p. 13; Cuerva et al., 2014). Due to the vast and known usage of the TOE framework and its adaptability to different cases, this framework has been chosen to systematically categorize the drivers and barriers into technological, organizational, and environmental context. The thesis categorizes the determinants into internal and external factors. Internal factors are internal conditions and features in the firm that make the firm able to engage in the development of environmental innovation (Hojnik & Ruzzies, 2016). External factors are incentives and impact of actors and factors that pressure the company to respond (Hojnik & Ruzzies, 2016). Within these contexts, identified and relevant drivers and barriers from the literature will be discussed. The variables found in the literature for each TOE factor are summarized in tables 3, 4, and 5.

2.6.1 Technological Drivers and Barriers

As seen, technology is an important facilitator for green innovation to ensure the reduction of environmental impacts, efficiency, and product quality (Galanakis et al., 2021). Furthermore, when discussing technological drivers and barriers, several literatures have identified different factors for technology implementation. According to Tornatzky and Fleischer (1990), technological factors are primarily concerned with the attributes of an innovation itself. This includes aspects like an innovation's relative advantage over existing solutions and its compatibility with the firms` current practices. These attributes determine the willingness to integrate new technologies. However, Tariq et al. (2017, p. 14) refer to technological factors as characteristics that enable firms to gain innovative competence and acquire competitive advantages. Technologies can hold a dual role as both a facilitator and a barrier to sustainable practices.

Several factors of an organization will affect their willingness to learn and adapt new innovations. According to Indrawati et al. (2023), the adoption of new technology is determined by several factors. Specifically, the combability of the technology with the company or external business conditions is identified to impact green innovations (Tornatzky & Fleischer, 1990). Firstly, compatibility is the degree to which an innovation is perceived as consistent with the firm's values, experiences, and needs (Indrawati et al., 2023, p. 5). However, this can vary across contexts or industries (Indrawati et al., 2023). Weng and Lin (2011, p. 9156) argue that adopting green innovations is not a single event but can rather be described as a process of knowledge accumulation and integration. Therefore, green innovations that fit the existing knowledge and capabilities within the firm will be more likely to be adopted (Weng and Lin 2011). For instance, this could involve assessing whether sustainable technology can be integrated into their current production processes or if it aligns with the firm's strategic goals (Weng and Lin 2011). Tariq et al. (2017) emphasize the role of technological capabilities within a firm to gain competencies and resources for green process and product innovation. Firms with technological capabilities that can engage in innovation activities will have a competitive advantage. This can be supported by the study of Bossle et al. (2015), who found that the company's unique capability and motivation to differentiate and add value to its products is driving innovation in the F&B sector.

Moreover, relative advantage is the perception that an innovation gives more advantages than the existing technology or the firm already has (Zhang et al., 2020). Firms are more likely to adopt technology that can provide better performance and economic gains than existing ones (Zhang et al., 2020). This could include reductions in energy consumption, waste, and greenhouse gas emissions or improvements in resource efficiency that contribute to environmental sustainability and offer economic benefits such as cost savings. Such benefits that motivate firms to adopt green technology can be reduced energy usage and natural resource consumption, reduced waste and emissions, financial performance, and greater ability to meet stakeholders' expectations (Weng & Lin, 2011).

Furthermore, Research and Development (R&D) investments are connected with the firms' technological capabilities (López Pérez et al., 2024). R&D is seen as a driver for green innovations as investments in R&D will allow firms to develop cleaner technologies and encourage changes in products and production processes (López Pérez et al., 2024). However, according to López Pérez et al. (2024), SMEs often must rely on other stakeholders to do innovations due to a lack of knowledge about the needed technology and the ability to invest in

R&D. Therefore, R&D can be seen as both a driver and a barrier for green innovation, depending on the capabilities of the firm.

Table 3. Summary of technological factors.

Technological factors	Barrier	Driver	Keywords
Compatibility		x	Fit of the technology to the company
Relative advantage		x	Have to ensure advantages, improved performance and economic gains
R&D	x	x	Develop cleaner technologies, encourage changes, large firms

Source: Created by the authors based in the literature.

2.6.2 Organizational Drivers and Barriers

Organizational factors are the organization's internal characteristics relevant for innovation adoption (Tornatzky & Fleischer, 1990). This involves the enterprise's available resources and capabilities, which can either facilitate or hinder the adoption of new technologies. Such factors influence a firm's ability to embrace and integrate sustainable practices and innovations. In the context of the F&B industry, where green innovation is increasingly becoming important, understanding these organizational dynamics is essential. The following part will present organizational factors the literature points to as drivers and barriers for green innovation, with a table summarizing the factors.

Firstly, several managers have realized that green innovation is an important factor in sustainable development and that it benefits the company and can be used to their advantage (Soewarno et al., 2019). Through several research, the support of top management is identified as crucial for adopting green innovations (Ilyas et al., 2020). Managers need to recognize and understand the benefits of green innovation to be a driver for making the green transition. In addition, managers need to consider the constant changes in technologies and trends in the market (Dong et al., 2024). Collaboration and coordination are important functions for adopting green innovations, and getting the resources, building organizational capacity, and offering incentives to facilitate the implementation of green innovation are important (Dangelico et al., 2019). In addition, the literature points to corporate culture as a factor in green innovation. Leadership with a future-oriented culture consisting of learning, experimenting, and risk-taking is seen to drive green innovation (Kiefer et al., 2019). Adams et al. (2023) found top management to be the key internal driver for large F&B firms. However, an obstacle to engaging in green innovation can be managers' myopia regarding opportunities from green

investments, where managers consider green innovation as a cost rather than beneficial for competitive advantage (Dangelico et al., 2019). Therefore, top management can also be a barrier for green innovation initiatives.

Furthermore, for firms to make green innovations, they need to have knowledge and expertise in implementing innovations in their operation (Zhang et al., 2020). Abdullah et al. (2016) point out that if the company does not have the knowledge and expertise on green initiatives and green innovation, it will not proceed with greening their activities. The authors also indicate that if a company does not see any clear benefits from green innovations, they focus on other perspectives. This could be due to a lack of information on green innovation or a case of neglecting environmental concerns. This is supported by a study by Zubeltzu-Jaka et al. (2018) and Zhang et al. (2020), who found that a higher level of environmental concern within the company drives the company to be more innovative regarding employment concerning green initiatives.

Human capital is identified a factor affecting green innovation (Takalo et al., 2021; Kiefer et al., 2019). In this case, it means the employees have expertise, commitment, and experience concerning the protection of the environment (Indrawati et al., 2023). To gain the human capital needed with knowledge and skills on sustainability, firms can take responsibility for recruiting or training their employees. This can improve the capacity to develop green products, ideas, and innovation adoption (Indrawati et al., 2023). If the company has the needed human capital, this can act as a driver for green innovation. However, if the company lack human capital, it can act as a barrier (Indrawati et al., 2023).

Moving on, an organization's culture is also central in the organizations' ability to change and adapt. Firms culture results from their beliefs and collective values (Adams et al., 2023, p.1456). Adams et al. (2023) found, through their qualitative research of large F&B firms, that most respondents identified the organizational culture as a barrier to implementing sustainable practices. Established organizations often have a traditional and established culture where norms and values can hinder change and innovation (Chesbrough, 2010). Jacobsen (2018) is referring to what is called the cultural paradox. An organization's culture could be a key to success, giving competitive advantages if managed correctly. However, if a culture is so strong and uniform, it can hinder innovation and changes to achieve success. Firms that consist of different cultures or do not have a strong culture may be more accessible to accept change.

According to Saunila (2020), innovation capability is discussed as a success factor for firms in the market throughout the literature. The innovative capability is composed and varies from different firms and industries and refers to an organization´s ability to develop or improve new products (Yousaf, 2021). It is seen to be dependent on the ability of the company to transform knowledge and ideas into something new, and the organization's readiness to test and explore new ways of doing things, such as new products, processes and systems (Saunila, 2020). According to (Arranz et al., 2020), previous experiences have an impact on the company´s innovation capability. If the company has positive experiences with developing green innovation, it will have a positive performance on the innovation capability, which will drive the company to further innovative work (Arranz et al., 2020). Conversely, if previous efforts resulted in adverse outcomes, the innovation capability will become a barrier for the company to overcome (Li et al., 2019).

Furthermore, the company's size has been frequently studied as a determinant of innovation over the years and has a significant positive effect on innovation (Becheikh et al., 2006). The literature states that when small firms voluntarily adopt environmental measures, the economic benefit is greater than in large firms. This is due to improved reputation which in terms of greater demand and approval from stakeholders, leads to improved company performance (López Pérez et al., 2024). However, Becheikh et al. (2006) claim that larger firms have greater innovation capability, more resources to innovate and take risks, and do investments concerning R&D and development. Due to more extensive resources, it is claimed that larger firms have better ability to change (Jacobsen, 2018). Conversely, the literature shows that larger firms face more difficulties in change than smaller firms (Jacobsen, 2018, p. 95). Larger firms are often complex with different procedures, routines, unities, and a mindset of "old ways of doing things" (Jacobsen, 2018; Adams et al., 2023). Empirically, the size of the organization is seen to hamper the ability to change, even though they have the resources (Jacobsen, 2018, p. 95). Whereas, in a study by Jakobsen et al. (2020, p. 46) of what firms introducing green innovation, the results showed little difference when it comes to company size regarding introduction of product innovations. However, when it comes to process innovations, large firms are embracing process innovations to a bigger extent than small firms. Jacobsen et al. (2020, p. 46) explain that the environmental challenges and emissions are often more comprehensive than for smaller firms, which can be the cause for these findings.

Financial resources significantly influence the development and implementation of green innovations (Cecere et al., 2020). According to Purwandani and Michaud (2021) financial

issues act as drivers and barriers for green practice. On one hand, economic capital constraints can hinder the adoption and implementation of green innovation, limiting the pace and scale of transition towards more sustainable practice. Implementing green innovations often requires significant investments in various fields within R&D work and infrastructure (Purwandani & Michaud, 2021). Firms may face financial barriers due to high costs associated with transitioning to more sustainable practices and developing environmentally friendly products. The uncertainty on return of investment acts as barrier. Banks and financial institutions tighten the lending standards, negatively influencing the willingness to invest in green innovation (Chen et al., 2023). The return of investment on green innovation is often viewed in a long-term perspective. Firms may hesitate to invest in green innovation due to uncertainty about financial return and profitability. The long-term benefits of green innovation may not always be immediately apparent, leading to concerns about the viability of investments in sustainability (Chen et al., 2023). This reflects the barrier noted that management experience myopia regarding opportunities from green investments (Dangelico et al., 2019).

On the other hand, financing of green innovation is crucial for green growth and environmentally friendly development (Cecere et al., 2020). The risk involved with investing in green innovations are closely linked to the available financial resources. With slack in financial resources, firms can lower the risk of making costly investments. Financial incentives such as reducing costs drive firms to implement green innovation strategies (Purwandani & Michaud, 2021). Large firms tend to have a more stable economy than SMEs, giving them more room to invest in green innovations. For reference, Cecere et al. (2020) state that large firms are more likely to invest in green innovation to contribute to sustainability in general. SMEs have a more difficult time committing their resources to green innovation. However, in a study by Jakobsen et al. (2020, p. 46) of which firms are introducing green innovation, the results showed little difference when it comes to company size regarding introduction of product innovations. However, when it comes to process innovations, large firms are embracing process innovations to a bigger extent than small firms. Jakobsen et al. (2020, p. 46) explain that the environmental challenges and emissions are often more comprehensive than for smaller firms, which can be the cause for these findings.

Table 4. Summary of organizational factors.

Organizational factors	Barrier	Driver	Keywords
Top management support	x	x	Benefits of green innovation, Collaboration, coordination, culture, mangers myopia
Knowledge and expertise within the company	x	x	Knowledge, lack of information
Human capital	x	x	Recruitment, training
Organization culture	x	x	Norms, cultural paradox,
Innovation capability	x	x	Previous experience, ability to develop or improve new products
Size of company	x	x	Reputation, exposure, innovation capability
Financial resources	x	x	Economic capital, up-front costs, profitability,

Source: Created by the authors based on the literature.

2.6.3 Business Environmental Drivers and Barriers

The environmental context includes external factors outside the organization that may affect the implementation of green innovation (Tornatzky & Fleischer, 1990; Zhang et al., 2020, p. 2). These include the consumer market dynamics, regulatory policies, and competitive pressures, among other external conditions. These factors impact the enterprise's decision-making processes regarding innovation adoption. The following section will present and discuss external factors regarding green innovation in F&B firms.

With increasing competitive pressure within the industry, firms must evolve to maintain their edge. As firms strive to differentiate themselves and secure competitive advantage, green innovation can be a central driver. Calafat-Marzal et al. (2023) mention that digital technology implementation is essential for agri-food firms because it not only enhances their reputation in the market but also directly impacts their ability to compete. In an industry were staying ahead is paramount, competitive pressure drives the need to adopt digital technologies and other innovative activities (Calafat-Marzal et al., 2023)

Interestingly, competitive pressure acts as a catalyst for green innovation, as firms vie for supremacy, they recognize that sustainability is a strategic imperative (Huang et al., 2009). Environmental responsibility becomes intertwined with competitiveness and competitors´ actions influence how firms approach their environmental work (Alam & Islam, 2021). To navigate this landscape, firms can look to green innovation leaders within their industry, who set the bar for sustainable practice. (Huang et al., 2009).

Generally speaking, consumers today are conscious of environmental protection (Chien et al., 2022). Previous studies have shown that firms adopting environmental management performance were driven by consumer's environmental concerns (Huang et al., 2009). Consumption patterns are shifting rapidly with rising awareness of what food is safe, healthy, nutritious, and friendly to the environment and animals (Rezai et al., 2012). Thus, the awareness of consumers is driving the F&B industry to make green innovations. Chen (2008) also points out that consumers' environmental consciousness is driving firms to participate in green innovation activities.

On the other hand, the lack of information on the sustainability topic, or consumers neglecting the fact that there is a need for green innovation in the F&B industry, stands as a barrier to making the green transition (Abdullah et al., 2016). If consumers are not educated on environmental concerns, they will not change their demands and can be less adaptive to green innovations from manufacturers (Ma et al., 2032) The lack of awareness or neglecting environmental concerns stands out as a barrier to green innovation because consumers will choose conventional products. With neglecting the environmental crisis, consumers will choose unsustainable products (Buerke et al., 2017). Without knowledge, consumers will stick to their purchasing habits. According to White et al. (2019), one way to overcome this barrier is to shift the habits of the consumers to a more sustainable behavior. The authors present several incentives such as penalties, feedback, gifts, and prompts to change consumer habits.

Green image is identified as an essential driver for green product and process innovation (Tariq et al., 2017). With the rising environmental awareness among consumers (Chien et al., 2022), firms can benefit from embracing green innovation signals and commitment to enhancing the brand reputation (Yao et al., 2021). This is due to benefits such as competitive advantage and the possibility to differentiate from competitors (Tu & Wu, 2021). Specifically, Dangelico et al. (2019, p. 1444) found that family firms are driven by long-term benefits, including a better image. According to Lin et al. (2019), it is understood that large firms have a stronger visibility than SMEs. Large firms face greater pressure from consumers, markets, and competitors to strengthen sustainable practices. Firms can build a good reputation by implementing green innovation. Due to large firms' higher exposure, green innovation is seen as a driver as consumers apply normative pressure on firms (Adams et al., 2023).

With increasing population comes increasing demand which opens opportunities for producers to address the needs and there is an increasing group of stakeholders. Stakeholders have significant authority to influence a company. Research by Sharma and Henriques (2005) established that stakeholder pressure is one environmental factor that drives a company´s innovative behavior. Lin et al. (2014) support this, stating that pressure from several stakeholders determines the company´s decisions on green innovation. Customers are the firm's most vital stakeholders equated to additional stakeholder groups, and can pressure organizations to make changes and influence the company´s environmental behaviors (Lin et al., 2020). Huang et al. (2009) list supplier stakeholders' refusal as a driver for green innovation. If a company has a negative image of being environmentally irresponsible, suppliers can refuse to supply firms, forcing them to implement green innovation. Bossle et al. (2015) also highlights this as a green innovation driver, where Brazil's firms establish food chains that work with the principles of sustainability and innovation.

Environmental sustainability is increasing in the minds of consumers (Chien et al., 2022). However, despite the growing awareness, the willingness to adapt and change habits remains as a crucial factor that can hinder green innovation practices. According to White et al. (2019), some sustainable behavior requires repeated action to create new habits. These habits shape our daily lives, including those related to environmental impact. The authors present the self-concept, which refers to the defensive reaction to their behavior that has negatively impacted the environment. Our ingrained habits can act as a protective shield against change. Food consumption is highly habitual, and our consumption habits have significant sustainability implications (White et al., 2019). Humans are creatures of habit. Resistance to change is a common trait, making it difficult to adapt to new practices. The creation of new habits requires effort and persistence. Gardner and Rebar (2019) emphasize that change does not come easily. Consequently, the willingness to adapt to green innovation acts as a barrier.

Encouragingly, research suggests that consumers are gradually shifting their behavior. A study by D'Amico et al. (2016) show that consumers with environmental consciousness and curiosity are willing to pay a premium for organic wines without added sulfites. While the willingness is promising, it has yet to reach a level that significantly drives green innovation adoption (D'Amico et al., 2016). As consumers continue to evolve, understanding these dynamics becomes essential to encouraging sustainability (White et al., 2019).

With the background of the Paris Agreement, all countries' governments were obligated to act to reach climate neutrality (Delbeke et al., 2019, p. 25-28). Together with the UN's sustainable development goals, the governments pressure firms to make green innovative initiatives to reduce their climate footprint. Government initiatives enhance consumer trust and confidence in the food processing organization and its products (Qin et al., 2022). Research by Doran and Ryan (2012) mention that one of the main drivers for green innovation is regulatory pressure, which forces firms to invest in green innovations to avoid negative environmental impacts and reduce pollution. Purwandani and Michaud (2021) mention low-interest loans and environmental tax benefits as incentives the government can implement to drive green innovation.

On the other side, the government strongly regulates the food sector in Norway to secure food safety and ensure ethical and environmental food production (Vittersø & Tangeland, 2015, p. 93). However, while the government is crucial in promoting green innovation, their actions must be carefully deliberate to avoid unintended barriers. Excessive regulations, complex permitting processes, and bureaucratic hurdles can slow down or even stop the adoption of green technologies (Söderholm, 2020). Both firms and the government must be committed to a long-term environmental perspective for green innovations to succeed. Gupta and Barua (2018) point out that firms are often demotivated because of a lack of government support. Complex and rigged rules for green innovation practices alongside poor enforcement of environmental policies are a barrier for the major population and give advantages to the few (Gupta & Barua, 2018; Purwandani & Michaud, 2021).

Table 5. Summary of environmental factor.

| Business environmental factors	Barrier	Driver	Keywords
Competitive pressure		x	Differentiate, pressure, competitive advantage
Consumer awareness/ Information	x	x	Consumer's environmental concerns, consumer neglection, education, less adaptive, purchasing habits,
Image/Reputation		x	Competitive advantage, long-term benefits, high exposure,
Stakeholder pressure		x	Increasing demand, stakeholders,
Consumers' willingness to adopt green alternatives	x		Habits, change-resistant, willingness to pay
Government encouragement/Regulations	x	x	Paris Agreement, climate footprint, pollution, tax benefits, Regulation, long-term perspective, government support, policies

Source: Created by the authors based on the literature.

2.7 Conceptual Framework

Based on the literature review, a conceptual framework is proposed that aims to provide a holistic view of the factors influencing the implementation of green innovation within firms in the F&B sector. Following the reviewed literature, the thesis consider the effects of three key factors that could act as drivers and barriers to green innovation: 1) Technological, 2) Organizational, and 3) Environmental.

The technological dimension focuses on the characteristics of technology and innovation, such as relative advantage, compatibility, and the role of R&D. These factors are pivotal in determining the adoption and success of technological innovations which further can enhance the effectiveness of the processes and products within the firm. Furthermore, organizational factors are crucial for green innovation. The framework highlights top management support, knowledge and expertise, human capital, organizational size and culture, financial resources, and innovation capability. Lastly, the external business environment exerts significant influence on organizational innovation, competitive pressure, consumer awareness, image and reputation, and stakeholder pressure are identified as crucial drivers or barriers to green innovation. These factors underscore the role of external pressure and regulations in shaping firms' responses to follow the green transition..

By analyzing these factors, the framework helps to understand the complex interplay between internal capabilities and external pressures for F&B firms. This understanding can guide strategic decision-making, enabling organizations to leverage their strengths better, address challenges, and take advantage of opportunities for green innovation. In addition, offering valuable insights for both academic research and practical application.
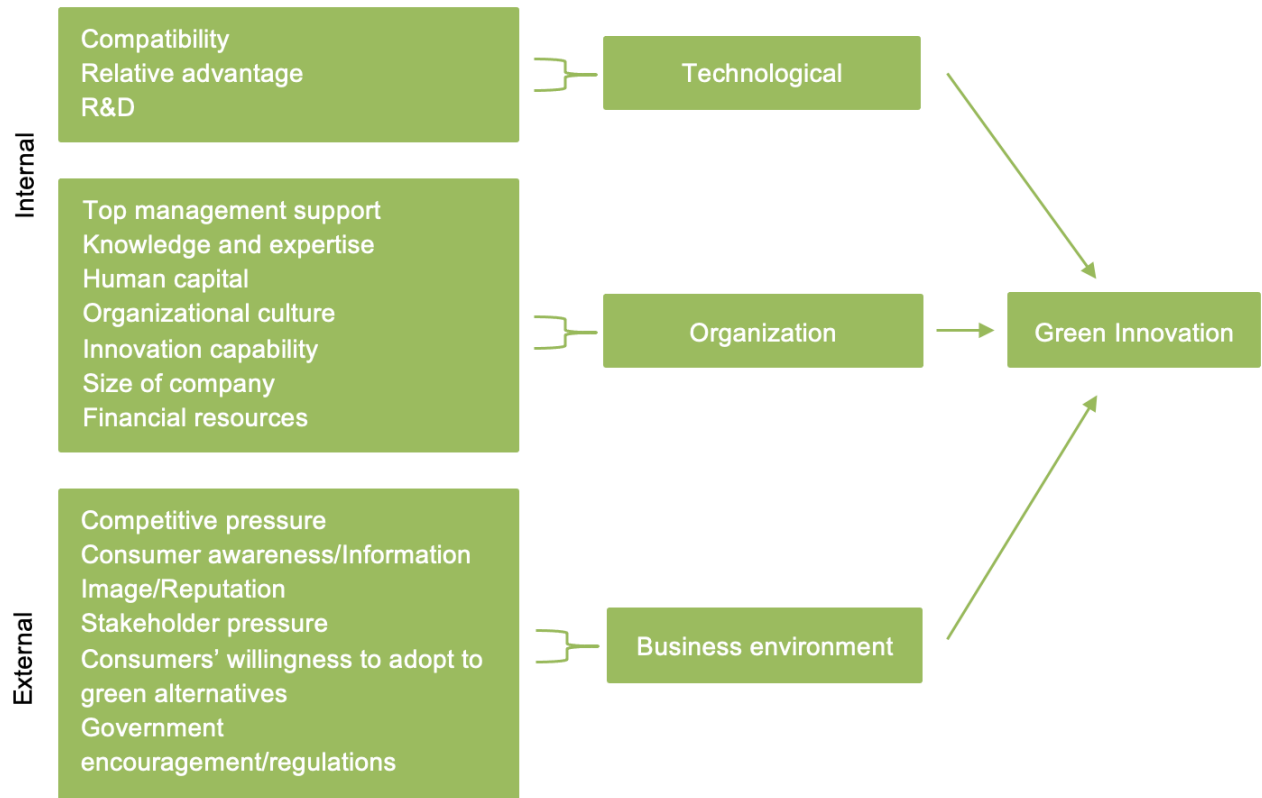
Figure 10. Conceptual framework.
Source: Created by the authors based on the literature review.
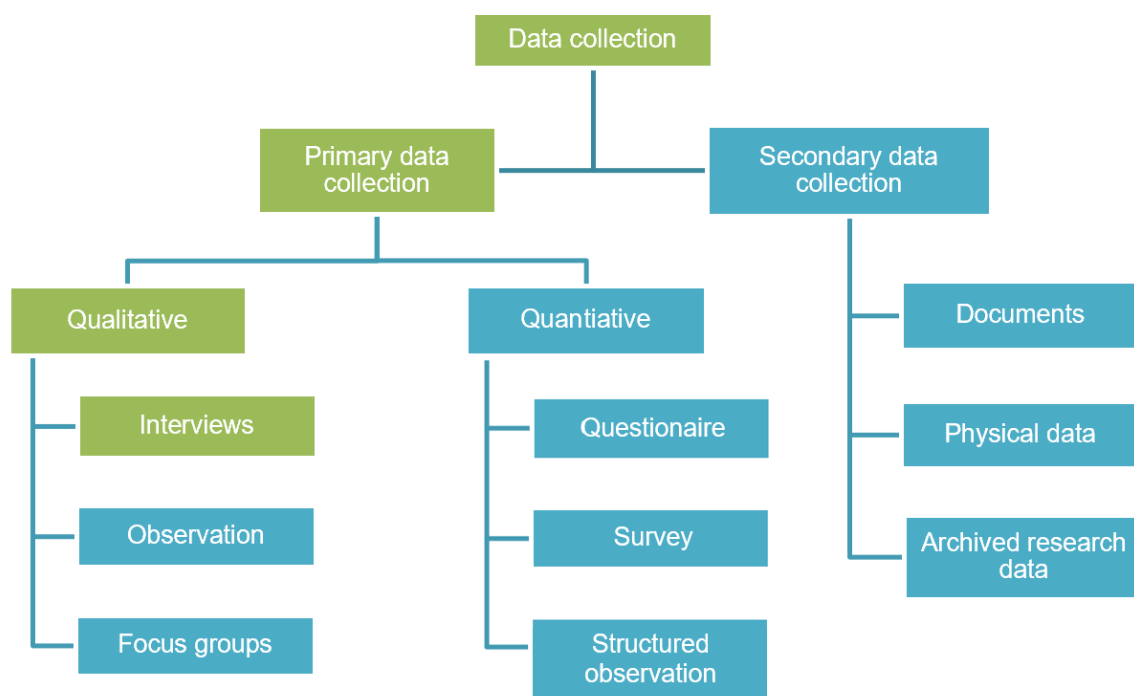
3.0 Research Method

This chapter explains the reasons for the chosen research design and method, discusses the strengths and weaknesses of the data collection method and research methodology, explores the selection of firms and participants to be interviewed, and assesses reliability, validity, and lastly, ethical considerations.

3.1 Research Method and Design

Research data can be collected through primary data and secondary data. Primary data are collected for a specific research problem and add new data and knowledge to the field (Hox & Boeije, 2005, p. 593). Secondary data are data from already existing research that can be reused, often in forms such as official or personal documents, physical data, or archived data (Hox & Boeije, 2005, p. 594). The research started by collecting secondary data through a literature review based on previous research and examining examples of green innovation in the F&B industry. This helped design the research questions and collect the primary data. To collect the primary data, the qualitative method was used. According to Christensen et al. (2015, p. 68), qualitative research is described as an "interpretive research approach relying on multiple types of subjective data and investigation of people in particular situations in their natural environment."

This choice was assessed by comparing the differences between a quantitative and qualitative approach, as the methods differ in several ways. Data collection in quantitative is measured variables (numbers). However, qualitative data consists of nonnumerical information, such as texts, words, and images. This method allows for understanding the data from the participant's subjective perspectives (Christensen et al., 2015, p. 68), instead of objective data which a quantitative method gives. As this thesis seeks to understand what lies behind the factors identified by the participants, the qualitative method is found suitable for the collection of data. Quantitative research aims to find common and complex laws of thought and behavior, seeking to test hypotheses (Christensen et al., 2015, pp. 68, 364). In contrast, qualitative research seeks to explain and comprehend particular groups and individuals in specific contexts and give an understanding and description of situations (Christensen et al., 2015, pp. 68, 364). Qualitative research is therefore used for theory generation (Christensen et al., 2015, p. 68). A quantitative

study gives statistical results, with testing of correlations and differences between variables, through discussion of results. With a narrative and contextual explanation with direct quotes, a qualitative method provides necessary insights into the driving forces behind the factors for green innovation. These arguments substantiate the reasons for choosing a qualitative method for this thesis. With different views of the world and reasons for firms to operate in different ways, the qualitative method gives insight into details of how firms work and find difficulties in the green transition. More specifically, semi-structured interviews are being conducted as a primary data collection method, illustrated in Figure 11.

Figure 11. Data collection method.
Source: Created by the authors based on the literature.

It is worth mentioning that a mixed-method approach uses both the qualitative and quantitative perspectives in a single research study or a set of closely related studies (Christensen et al., 2015, p. 382). This research method would be interesting in this case, with either a follow-up with quantitative data on the determinants of green innovation found through the interview as an exploratory design or doing quantitative data collection before the interviews as an explanatory design (Christensen et al., 2015). Using a mixed method was considered at an early stage, but due to the limited time and scope of the thesis, this method was excluded.

3.1.1 Characteristics of Qualitative Research Method

Specific characteristics describe qualitative research. Christensen et al. (2015, p. 365) present 12 characteristics of qualitative research summarized by Patton (2002). Not all qualitative studies have all 12 characteristics, but the following paragraph will present the characteristics associated with this thesis.

Christensen et al. (2015, p. 365) divide these characteristics into design, data collection, fieldwork, and analysis strategies. From design strategies, this research can be characterized by naturalistic inquiry as the study is of a real-world situation, with a purposeful sampling consisting of a case study, using convenience sampling to obtain informants, which refers to attaining informants who are available and easily selected for the study (Christensen et al., 2015, p. 170).

Concerning data collection and fieldwork strategies, this thesis is characterized by qualitative data, in which the interviews will capture quotations about people's experiences and perspectives. Second, the informants are contacted directly to understand the case, which emphasizes personal experience and engagement. Additionally, the interviews were conducted with an open mind and awareness of participants and the firm. Furthermore, the data collection strategy is characterized by dynamic subsystems, assuming that implementing and devoting to green innovations is an ongoing process (Christensen et al., 2015, p. 365).

From the pool of analysis strategies, the thesis is characterized by inductive analysis and creative synthesis. The details in the data show essential patterns and relationships guided by principles (Christensen et al., 2015, p. 365). Moreover, the research is complex and differs from the firms interviewed the firms. Each company has different variables that influence their work which represents a holistic perspective (Christensen et al., 2015, p. 365). It is only focused on a set number of factors, which is not representative to be put in a larger context.

3.1.2 Strengths and Weaknesses of Qualitative Research Method

In the qualitative research method, the researchers usually meet their informants face-to-face (Larsen, 2007, p. 26). One interview was conducted in person and the others digitally using Teams, due to a long travel distance. One advantage of interviews is that fewer participants

withdraw during the interview than people who choose not to finish a survey (Larsen, 2007, p. 26). It is easier to secure good validity in qualitative research, through the opportunity to ask follow-up questions, to clarify any misunderstandings and confusion to get a deeper understanding of the respondents' thoughts, and the respondents can talk freely and ask for clarification (Christensen et al., 2015, p. 73).

On the other hand, Christensen et al. (2015, p. 70) point out that it is difficult to generalize qualitative research because the data are based on local particularistic data. The thesis contains a small number of informants which is not a representative sample of the whole industry (Christensen et al., 2015, p. 162). The informants express subjective experiences and not on behalf of the entire industry. This case study aims to get an in-depth understanding of the specific context, and not to broadly generalize the outcomes as this is not the aim of qualitative research (Christensen et al., 2015, p. 363). In addition, Christensen et al. (2015, p. 73) list interviews in person and data analysis as time-consuming and costly. Also, informants not answering truthfully face to face is another disadvantage (Larsen, 2007, p. 81). Challenges with qualitative interviews are that the interviewee`s behavior can be affected when being observed which can influence the answer, or the informants may answer what they think is expected, to place themselves in a better light or answer what the general public wants to hear (Christensen et al., 2015, p. 72). In addition there may still be instances where questions are not communicated optimally for the informants to understand, potentially affecting the information provided or interviewer bias.

3.1.3 Choice of Research Design: Case Study

Christensen et al. (2015) present four primary qualitative research methods: phenomenology, ethnography, case study research, and grounded theory. Due to the research question and the desire to want a deeper insight into the drivers and barriers to green innovation in Norwegian F&B firms, a case study is chosen as the research design. A case study is defined by Christensen et al. (2015, p. 377) as "the intensive and detailed description and analysis of one or more cases.". This involves in-depth analysis of an individual unit, for instance, a person, a community, an organization, a process, or an event (Christensen et al., 2015, p. 377). A case study approach explores a phenomenon within a specific context through different data sources (Rashid et al., 2019, p.2), such as questionnaires, documents, tests, archival records, and in our case, in-depth interviews (Christensen et al., 2015, p. 377). As green innovation and the food

industry are complex areas affected by many factors, case study design is seen as the most fitting and meaningful way to answer the research question as it allows for a holistic view by exploration through different lenses to gain knowledge (Rashid et al., 2019, p.2),

The case study of this thesis started with a focus on firms in the F&B sector in Western Norway. After challenges to attain informants and conversations with a professor, it was decided to expand the sample to include firms nationwide. Since the Norwegian F&B industry is homogenous, this is not seen as a disadvantage or impacting the results

3.2 Qualitative Data Collection: Interview

Several methods for data collection exist in qualitative research, such as tests, focus groups, questionnaires, observation, and interviews (Christensen et al., 2015).

Hancock et al. (2001) and Larsen (2017) list interviews as the most common data collection method for qualitative research. It was chosen to use semi-structured interviews for data collection in this thesis. According to Christensen et al. (2015, p. 72), an interview collects data when an interviewer asks the interviewee a series of questions, often prompting additional information. In a qualitative interview, the researcher must gather personal experiences, meanings, and feelings (Larsen, 2017, p. 98). Interviews are often carried out face-to-face, over the telephone, or electronically over the internet (Christensen et al., 2015, p. 73). The interviewer asks the participants questions, and the responses are recorded (Christensen et al., 2015, p. 340).

Interviews can be both structured and without structure, and it is common among researchers to use a semi-structured interview (Larsen, 2017, p, 99). According to Larsen (2017, p. 99-100), a semi-structured interview contains several open-ended questions related to the phenomenon under investigation. The researchers often prepare an interview guide but are flexible regarding the order of the questions and ask follow-up questions if necessary (Larsen, 2017, p. 99). The open-ended nature of both the interviewer and interviewee allows openings to discuss some topics in more detail (Larsen, 2017, p. 99)

3.2.1 The Interview Guide

To conduct the interviews, it was made an interview guide. The first draft had a total of 34 questions. However, it was revised and narrowed down in several steps to fit an interview length of approximately 30 to 40 minutes (this was exceeded in three interviews) and to specifically address the aspects of the study. The final interview guide consisted of 16 questions, divided into 6 parts (introduction, green innovation within the company, technology, organization, environment, and market dynamics). The first 3 questions (not numbered) function as an introduction to getting the position of the informant in the company, to get a feeling of their understanding of the green transition, and their view of the F&B industry as a green industry.

The interview guide was first written in English, before being translated into Norwegian as the interview was conducted with Norwegian respondents. The Norwegian interview guide was then revised by a university professor before it was finished and sent to informants before the interviews. A protocol matrix was made to ensure that the questions align with the research questions, illustrated in Appendix 8.3. Both the Norwegian- and English interview guides can be found in Appendix 8.1 and 8.2.

The questions in the interview guide were open-ended, to allow the informants to tell what they experienced as drivers and barriers, and the context around this without asking leading questions (Christensen et al., 2015. p, 72). Thus, it was possible to ask follow-up questions where it was needed during the interview.

3.3 Selection of Firms

For this thesis, convenience sampling is used as a sampling method. The selected sampling method is done by asking participants who were the most available and easy to get hold of due to the limited timeframe (Christensen et al., 2015, p. 170). It is chosen firms that represent both SMEs and large companies. A criterion for the selection was that the company is established in Norway and produces food or beverage products, mainly for the Norwegian market. The thesis is a case study in the industry's F&B sectors, in which the sample consists of three firms in the food industry, one in the beverage industry, and three that produce both F&B products.

The initial thought was focused on firms that are known for engaging in innovation and environmental efforts or firms that seemed to have an innovative image. The firms were also examined before contacted, to understand their thoughts on sustainability. Due to the struggle to acquire informants, the search for informants was extended to include firms that represent several brands in the F&B industry.

A total of 39 firms seen as eligible for the study were contacted. The goal was to interview informants with positions or knowledge regarding sustainability and innovation within the firms. Of those invited to attend the research, 8 responded that they wanted to contribute to the thesis. 1 firm responded too late and had to be excluded. 15 responded that they would not contribute. In addition, 15 firms did not respond at all. All the firms interviewed are Norwegian brands. 4 firms can be categorized as large, and 3 as medium-sized enterprises in terms of the number of employees (European Commission, 2003). The thesis tried to include informants representing a wide range of the Norwegian F&B industry. However, due to the low response rate from firms, it was not possible to include firms from Norwegian aquaculture.

3.4 Analysis and Processing of Data

To analyze the data, a content analysis to analyze the data systematically was conducted (Elo & Kyngäs, 2008). Within content analysis, a deductive approach was carried out, as this thesis used existing theories and literature to shape the qualitative research process and aspects of data analysis (Azungah, 2018). However, as this was limited to the factors identified in the literature review, it is acknowledged that other important factors could be excluded.

The interviews were recorded with a tape recorder and a phone as a backup. Besides, notes were taken during the interviews to highlight important statements. To transcribe the interviews, an automatic speech recognition (ASR) system called Whisper was used (2024, March 24th). This was done to make the process more efficient. As the program was not perfect, the transcription was manually corrected by listening to the recording while correcting mistakes. The collected data were then coded using the digital program NVivo to organize and analyze the data according to the factors in the framework of this thesis, and other relevant information to include in the analysis and discussion part. NVivo was used to highlight text relevant to the codes, which made it easier to analyze and select needed information. The transcribes were coded into a total of 25 codes, divided between 6 topics.

3.5 Quality Assurance

In social science methodology, the quality of the study depends on many factors, and it is important to ensure a high degree of validity and reliability (Larsen, 2007, pp. 80-81). In addition, ethical reflection is included to address the ethical principles in research and evaluate the research method to enlighten areas that can affect the research. Weaknesses of the method are being integrated into the reflections and discussions.

3.5.1 Validity

In the qualitative research method, validity refers to the accuracy of the interpretations being made from the results (Christensen et al., 2015, p. 364). It is often expected to divide validity into internal and external. Internal validity is about how congruent the findings are with reality (Merriam & Grenier, 2019, p. 25). In quality research, this is about the researchers' interpretations of the participants' interpretations of the phenomenon being studied (Merriam & Grenier, 2019, p. 25). As different people from different firms have different perspectives on green innovation, interviewing participants gives us a holistic picture of green innovation within F&B firms.

To secure validity, it must be ensured that the study examines what it is supposed to (Christensen et al., 2015). Christensen et al. (2015) present several strategies to secure high validity. First, descriptive validity is important to describe the phenomenon, situation, or group studied accurately (Christensen et al., 2015, p. 366). Therefore, the results being portrayed must be accurate and factual. To ensure descriptive validity, both researchers in this thesis interpreted the data to avoid only one perspective when analyzing results. However, there can be other sources of error such as poor recording quality and dialect confusion, which can cause incorrect interpretation of information. One interview was interrupted due to a lack of time from the respondent. The interview continued several days later. The context switch could cause the informant to give answers other than originally intended.

Further, interpretive validity means that peoples` subjective thoughts and feelings about phenomena must be accurately portrayed (Christensen et al., 2015, p. 367). This was ensured by "participant feedback", sending all participants the analysis to allow them to agree with or give any feedback on the interpretations of their thoughts. In addition, it is used quotes from the participants to ensure that their points were portrayed in the ways they were originally

stated, contributing to increasing the validity.

Also, the theoretical explanation should accurately fit the data, which is considered theoretical validity (Christensen et al., 2015, p. 367). Multiple data collection methods are also common in qualitative research to secure triangulation (Merriam & Grenier, 2019, p. 25). However, due to the limited timeline, only interviews were chosen. Thus, the thesis includes different theories, perspectives, and multiple sources which enable triangulation and analysis of the collected data against literature. This provided a better understanding of the phenomenon and strengthened the internal validity (Christensen et al., 2015, p. 69; Merriam & Grenier, 2019, p. 26).

Furthermore, external validity is the degree to which the results can be generalized to other contexts (Christensen et al., 2015, p. 369). Qualitative research aims to explore and describe a particular phenomenon in a particular place, and this thesis does not aim to generalize the findings (Christensen et al., 2015, p. 363). The aim is rather to give deeper insights into the green innovation topic in the F&B sector and where it presses the most among the firms regarding this transition. The thesis allows for naturalistic generalization where it is up to the reader to decide whether to generalize the findings to their context based on the given information (Christensen et al., 2015, p. 369).

3.5.2 Reliability

Reliability refers to consistency or stability (Christensen et al., 2015, p. 155), thus whether the research is dependable and accurate (Larsen, 2007, p. 80). In qualitative research, this is about to what extent the results are consistent with the data collected (Merriam & Grenier, 2019, p. 28). Securing a high level of reliability in qualitative research can be challenging (Larsen, 2007, p. 81). According to Larsen (2007, p. 81), interpretations can be done differently among researchers, the interviewee can be affected by the situation which can influence what is being said, and the informant might change their opinion at a later time.

Reliability also refers to the processing of information in a good way. One way to secure high reliability is to keep order in the interviews, for example, to hinder uncertainty of whom have said what (Larsen, 2007, p. 81). To secure reliability, the interviews were conducted the interviews with the same structure and interview guide. However, one interview was conducted face-to-face. There is a chance that the reliability of the study has been affected since one interview was conducted in person and the other was digital. One should keep in mind that the

different situations can have affected the informant's ability to include or exclude information that would have been given in person or digitally, and the researcher's interpretation of the informants` body language or expressions.

3.5.3 Ethical Considerations

Ethical considerations must be made throughout the whole process, from the selection of the research topic to data collection, analysis, and portraying of results (Pietilä et al., 2020). To ensure ethical standards, institutional approval for permission to conduct research and handle personal data was first given by Sikt, the Norwegian Agency for Shared Services in Education and Research. Informed consent, which is one of the vital components of conducting ethical research, was obtained through an information letter which was signed by participants before conducting the interviews (Christensen et al., 2015, p. 136). Here, they were given accurate information about the research. Accurate information about all aspects of the research is important to maintain participants' fundamental rights and dignity (Christensen et al., 2015, p. 125). In addition, all participants in the research had the right to remain autonomous in terms of the choice to withdraw their participation whenever they wanted during the research period. To secure anonymity, the information of the informant's firms had to be limited.

4.0 Results

In this chapter, the findings of the study are presented. Firstly, the thesis will present how sustainability is defined in the firms, the informants' agreement with the green transition, and to what degree the informants believe that the green transition is important. Also, the thesis presents the green innovations that the firms have already implemented. Second, the barriers and drivers identified by the informants are presented. Lastly, the thesis presents the results of the experienced customer response and whether the implementation of green innovation has affected the price.

4.1 Introduction of the Informants

To provide a context for the results and discussion, the role of the informants, type of company, and company size are presented in Table 6. To secure the anonymity of the informants discussed in Chapter 3.0, detailed information about their products and other information about the companies is therefore limited in this thesis.

Table 6. Overview of informants.

Informant	Role	Type of company	Company size	Duration of interview	Interview setting
Informant 1	Executive director	Food and beverage	Medium	52 minutes	Face to face
Informant 2	Director of sustainability, communication and public affairs	Food and beverage	Small	34 minutes	Digital
Informant 3	Project manager of climate	Food	Medium	40 minutes	Digital
Informant 4	Sustainability manager	Food	Large	36 minutes	Digital
Informant 5	Works mainly with product development	Beverage	Medium	41 minutes	Digital
Informant 6	Head of innovation and project leader.	Food and Beverage	Large	52 minutes	Digital
Informant 7	Project coordinator in the department for sustainable innovation	Food	Large	48 minutes	Digital

Source: Created by the authors.

4.2 Sustainability and Green Innovation in the Firms

The informants were asked to describe how they define sustainability in their firms. This thesis concentrates on the environmental aspect of sustainability. However, the authors chose to ask about sustainability as there is often a sustainability strategy or orientation in firms and a more familiar term that covers the three pillars of sustainability: economy, people, and environment which is reflected in the answers given. How the informants' firms define sustainability is presented in Table 7.

Table 7. Defining sustainability in the firms.

Sustainability	
Informant 1	*"Sustainability for us is to take care of nature, nutrition, refinement, people, and the local society"*
Informant 2	*"Sustainability is about more than the environmental and climate aspect, it is about where that factory is located, where that factory is located, social relationships, and economic sustainability"*
Informant 3	*"We do not have our own sustainability strategy, but we do have a sustainable way of working"* *"(…) we are very concerned that we implement sustainability throughout the organization and the way we work"*
Informant 4	*"(…) But those are the areas we identify as having the greatest impact, where we can do the most to limit externalities and create positive ripple effects. And there is food waste, there is packaging, there is nutrition and there is a footprint. Those are the four areas"*
Informant 5	*"We have an extremely practical picture of what we are doing (…) we have a large spreadsheet where we put in all our consumptions of everything, and make measures out of that"* *"(…) we really think so simple as we should reduce consumption of everything"*
Informant 6	*"We have defined sustainability both in terms of climate and environmental consequences, but also in terms of public health, and proper and good nutrition (…) we have chosen to focus on the UN sustainability goal 12,8,17, 2,13,3 (…) good balance between nutrition and food and the consequences of our food production".*
Informant 7	*"For us, sustainability is responsibility. And it is about us taking responsibility for the environment and the climate emissions we have. But we must also take responsibility, e.g., for the farmers who deliver to us. For something to be sustainable, there must also be economics in it"*

Source: Created by the authors.

Importance of the Green Transition

The informants were asked how much they agree that the green transition is important. All the informants have agreed that it is important to some extent, but here are a few differences between them. The informants were also asked if they believe that the F&B industry is green today. Table 8 gives an overview of how the informants look at the green transition and how

they address it.

Table 8. Importance of the green transition and view on the F&B industry today.

	Importance of the green transition	Is the F&B industry green today?
Informant 1	*"I don't believe in a sustainability strategy. I believe that you have to have a sustainable business strategy"* *"We have to think that every day we are going to make the world a better place (…) everyone who works in here (...). And that, I mean that we have, we have cracked a code about how to get it strategically included in the thinking. Sustainability is a very scary word indeed. But we have thought like this: (...) Start with small things, and then it becomes a lot in the end"*	The informant did not give a clear answer, but from the interview, it is interpreted that there are still areas to improve in the F&B industry.
Informant 2	*"It is crucial"*	*"The industry uses little antibiotics and utilizes the grass in a good way, and we have a combi-cow. But after all, there are large emissions from the sector"*
Informant 3	*"It is really about everyone having to take their responsibility to reduce the climate footprint. So, for my part, I think that it will be such a win or lose, thus a hygiene factor that is part of the operation going forward, yes, to a greater and greater extent"*	*"Of course, many are doing a lot of good, but if you look at, for example, the biggest problem, which is really food waste, the challenges we have with food waste; in 2018, they signed this industry agreement to cut food waste by 50% by 2030, and so far the industry has achieved 6%. That's the status of 2024. So, I think we have a long way to go, and the pace is far too slow"*
Informant 4	*"100 percent. Yes, we are completely dependent on it, and we actually see evidence of that on a daily basis, both through the media, but not least concerning what happens in nature and the surroundings"*	*"The industry is genuinely concerned with delivering on sustainability"*
Informant 5	*"For our company it is important, but in a way, it is not more important than it is for the customers"*	*"I believe that the food- and beverage industry is green, at least in Norway we are extremely good compared to what we get credit for"*
Informant 6	*"I think it is very important, especially for us that works with food production"*	*"It depends on how you define it (…) and there are great differences to what product is produced"*
Informant 7	*"I think that it is in a way an expectation from the whole of society, from consumers, from customers, that you have to take part in it, whether you want to or not, almost"*	*"I think it's quite different. (…) So we have kind of geared up for the future. But then, as you say, there are significant investments required, and there are also somewhat different prerequisites there. (...) It's wrong to sort of compare us with other countries necessarily because, I think we do a lot right in Norway, and food production will never be associated with zero in terms of carbon footprint"*

Source: Created by the authors.

Green Innovations in the Firms

In the interview, the respondents were asked if the firms had implemented green innovations in the firms. Table 9 describes green innovations in the firms in the sample. As it appears in the interviews, these are considered innovations by the respondents. Related to the theory, these can be perceived as innovations as are either stated as new to the firms or changes in their products, processes, organization, or marketing practices (Tidd & Bessant, 2021).

Table 9. Description of green innovations in the firms.

	Description of green innovation	Type of green innovation
Informant 1	Saving energy, isolation to preserve heat, solar panels, reuse process heat, changes in bottles to reduce plastic	Product, process
Informant 2	Vegan food, energy reduction, food waste reduction	Product, process
Informant 3	Change in package design, educating consumers, reducing emissions, plastic reduction, efficient transport, reducing waste and emissions, electric boilers, heat pump technology	Product, process, marketing
Informant 4	Recyclable packaging, reducing plastic, reducing food waste, lowering carbon footprint, reducing energy consumption, reusing energy, new job position	Product, process, organizational
Informant 5	Saving energy, solar panels, reusing production heat, reducing waste, packaging	Process, product
Informant 6	Change from oil boiler to electric boiler, packaging	Process, product
Informant 7	Trucks on biogas, filling stations, increasing recycled material in packages, solar cells, seawater for cooling, batteries, storing heat and cold, sharing excess energy	Product, process

Source: Created by the authors.

The different cases have their own approaches to green innovation. Nevertheless, this is an important aspect for all firms. Of the respondents' firms, all seven seem to focus on green product innovation. The focus here is mostly on changes in the packaging, making it either (more) recyclable or containing less plastic. For example, Informant 1 has changed from producing six different bottles to two bottles. These changes result in a saving of 100,000 kilos of plastic a year. However, Informant 6 is bringing out the challenges of packaging.

> *We cannot use 100% recycled plastic because of food safety, but we can use 40%, which is the best we can achieve. (Informant 6)*

Concerning green process innovation, all informants also focus on this area. Five informants explosively mentioned energy reduction or energy saving, four firms mentioned improvements to reduce food waste, and some mentioned specific technologies. However, all of the companies have made improvements to reduce environmental impacts through efficient production processes, for instance, reusing energy for other processes. An example is the firm of Informant 7, which has made improvements using trucks that run on biogas, made from residual raw material or waste, in addition to creating filling stations other firms can use. This was an important improvement as the respondent already here underscored related challenges:

> *Lack of infrastructure is a challenge when it comes to new technologies in transport, both electricity, hydrogen, and biogas. (Informant 7)*

As product and process innovation was the most prominent innovation areas, green marketing innovation, and green organizational innovation seem to be a focus for two of the respondents' firms respectively. Informant 4 mentions organizational changes which include the creation of the informant's position as sustainability manager. Additionally, Informant 3 states that they are working on educating consumers about the expiry date on the products, labeling the products with *"best before, but not bad after"*. This worked as an accelerator as the entire industry followed to reduce food waste. This can be classified as green marketing innovation.

4.3 Drivers and Barriers

This section presents the drivers and barriers experienced by the company and informants. The section is divided into 6 segments to represent the TOE framework. The first two sections present technological drivers and barriers. The third and fourth sections present the organizational drivers and barriers, and the fifth and sixth segments present the environmental drivers and barriers.

4.3.1 Technological Drivers

From the theory chapter, compatibility, relative advantage and R&D, are seen as driving factors for implementing green innovation. The results are presented accordingly.

Compatibility

When it comes to compatibility as a technological driver, none of the informants explicitly mentioned this being a driver. However, according to the theory, the information given by the informants is interpreted to fit this category of the framework of this thesis. Regarding the transportation challenge, Informant 1 states that they have to be ready to use the technology when it is ready, which shows their ability to adapt to changes and implement new technology. The firm of Informant 4 shares these capabilities, emphasizing that the use of digital tools (e.g. AI) is something they are working on to become more efficient and that they must have technology that is right for the organization, but also the ability to exploit it.

> *We are constantly working to work smarter. Use less resources. So, I think that when we talk about digitalization, it's a lot about becoming more efficient. And to be more efficient, we must have the right digitization tools. And we must have increased maturity in the organization to make greater use of the available tools. (…) and we use how we organize ourselves, like organizational structure as a tool to improve ourselves in this area. (Informant 4)*

On the other side, Informant 5 highlights the need to find "kinder eggs" when investing in green technology and states, that technological equipment has a limited lifespan, and it is necessary to find something that is both economical and sustainable.

Relative Advantage

Moving on to the relative advantage of the technology, the statement of four cases referred to this to be a driving factor in terms of the benefits of using green technology. Informant 1 states that they have already used many financial resources on investments, and that is a factor that has contributed to using less energy in production. By using less energy, the company states

that they may be able to lower the price of their products and not just raise it.

Further, Informant 4 clearly sees profit as a primary driver for implementing green technology:

> *I think that it is primarily profitability. If we do not keep up with developments, this will have a strong impact on the company's profitability. And it is about a push from the customer (...) so, it must be profitable to convert to fossil-free to do so. (Informant 4)*

Here, it is notable that the company values a relative advantage in terms of profit to invest in green technology and go through with changes. Similarly, Informant 7 mentions the economic advantages of investing in green technology as a driver for implementation:

> *I think it has a lot to do with the will to do it, but you also do it because you think that there may be economy in it over time, in any case, there are often perhaps more expensive investments here and there. (Informant 7)*

The informant exemplifies the advantages of automation which emphasizes the relative advantage of technology as a driver with that it allows freeing some hands for simple operations that can be used elsewhere. Similar to Informant 4, Informant 5 mentions that they need to keep up with the technological changes in the industry and that it is exciting to be the first one that could bring a market advantage at the other end.

Research & Development

Furthermore, many of the firms seem to invest considerable time and money into R&D. Informant 1 is trying to find out what is best regarding glass or cartons as recycled material, which is something they try to find out themselves. Also, the firm of Informant 2 does the development of cheese themselves. The informant weighs that they try to find the small environments where they can drive the vegan alternative further, but not the big technological innovations. Then they are dependent on others. The informant also highlights that it is easier to do R&D in the convenience market than in the grocery market. Different from the mentioned firms, Informant 3 states that they have a separate department focusing on innovation and product development that makes sure that the ingredients used are the right ones and follows the market changes to evaluate replacements or improvements. . Similarly, Informant 7 has an innovation department that focuses on sustainability, driving green innovation in the firm:

With our department, we have the opportunity to raise our gaze, (...) and focus on innovation and how we can improve. And there is also a bit of that mindset throughout the organization and in the system as well. (...) we aim to be a desired partner in technological development. We intend to be closely connected to R&D environments. And I think that permeates the entire organization. (Informant 7)

4.3.2 Technological Barriers

As the theory shows, R&D is also identified as a barrier to green innovation. Some of the informants say it can be difficult to have the resources and time to develop green innovations. It is mentioned to also about the risk of being the first one and the restraints of what is possible.

Research & Development

Informant 1 pinpointed transportation and the technology around as the greatest barrier. The transportation method used today is using diesel. The informant states that they put the highest level of standard on their trucks regarding emissions, but that the infrastructure needs improvements:

But when are we ready to drive electric trucks without having to stop and charge… and is it really the best? (…) the authorities must also gain speed in building the infrastructure because we need to charge these trucks. (…) we do not have that chance to develop this technology on our own. (Informant1)

According to Informant 2, there is a very low level of innovation in the food industry, and that those innovations can be a new taste. The informant also highlights that it is difficult to have time to do research. Informant 6 states:

It is about what production processes we have, and what is possible concerning what exists (...) it is a combination, it cannot be too expensive for the customers and what is technically possible. (Informant 6)

Informant 7 sees a barrier to implementing new technology when it comes to the risk of being a first mover:

> *It could be that it feels like the risk can be a bit high sometimes, at least if it is immature technology, that you are a bit of a first mover. It can feel a bit uncertain, and you don't quite know which horse to bet on or which supplier or which solution.* (Informant 7)

Informant 5 agrees with these barriers mentioned, stating that they are waiting on the technology, or others to try it first and that it does not stop the development but slows it down.

4.3.3 Organizational Drivers

Regarding the organizational factors, top management support, knowledge and expertise, human capital, innovation capability, organizational culture, size of the company, and financial resources are identified as drivers of the implementation of green innovation.

To Management Support

Six companies mentioned top management support as important for driving green innovation in the company, valuing different aspects of what is important from the top management. Informant 1 mentions sustainability as an important part of management and states:

> *It has to be integrated into the business model, and it has to be rooted in the management and the board. (Informant 1)*

Informant 2 cites the demands from management as the most important organizational driver, stating that clear goals that you get measured in, are important and that support from the owners is the greatest driver. The informant enlightens that their strategy is reviewed with the leaders once a month. The firm of Informant 3 underscores that they have a management that is very proactive and concerned that we should be in the driver's seat in the battle against the climate. Further, Informant 4 values the skills of the management to move in the right direction:

I think it is important that management has the right skills to understand what you might be missing out on if you don't work with sustainability systematically. (Informant 4)

Also, Informant 5 agrees with the other informants and states that they have an engaged CEO. Additionally, Informant 6 mentions that the top management is very concerned about sustainability and that there is a balance in this where they are also committed to securing a healthy operation. In addition, the firm has a sustainability manager who works on a higher level and pulls out advantages across the group.

Knowledge and Skills

Knowledge and skills are also identified as important drivers for green innovation. The firm of Informant 1 has set clear goals, for instance, to reduce energy consumption in kWh per produced liter by 2% in 2023. To reach this goal, the informant states that they have involved all employees in making the strategy, emphasizing that all should think about what they can do in the company to take care of the future in a profitable way. Informant 4 supports that knowledge is crucial to overcoming the barriers to implementing green technologies:

The green transition requires a significant competence enhancement and a change in the organization (…) and that's something that is actively addressed and worked on. Increasing employee's competence and having good plans for this is crucial. So, in short, yes. Competence development is particularly important for the green transition. (Informant 4)

Human Capital

Concerning human capital, Informant 1 underscores the importance of all the employees having the knowledge and skills on sustainability. The company needs to move in the same direction, and it is reliable for all the workers to take part:

I cannot do this on my own (…). I am dependent on all the workers here to solve the challenges. (Informant 1)

Informant 2 shares this view in which everyone must work with sustainability and understand that it is a part of the daily work, underscoring it being just as important as selling or developing products, and it has to be done in the right way.

Organizational Culture

Organizational culture is also important for the organization's ability to change, and several of the informants refer to the culture in their firm as a driver for green innovation. Informant 1 pulls forward culture as a driver for sustainability work:

> *I do not believe in having a sustainability manager or a unit for sustainability. (...) it has to be a part of the culture. (Informant 1)*

Informant 2 also supports culture being a driver but underscores the demands from the leadership as most important. Informant 3 states that there is a culture for green innovation and elaborates that a big driver in the organization is finding better ways of doing things. The informant views it as a "win-win" measure as they improve processes such as less waste and better processes, while at the same time thinking about sustainability. Interestingly, Informant 5 states that they have a culture for innovation, at least among the new employees and younger generation driving new ideas. The informant points out differences in their innovation culture between generations:

> *Now we have quite young people in the operation unit, and they are interested in testing things all the time. And we sometimes must tell them to slow down because it is not proven economically sustainable yet. (Informant 5)*

Innovation Capability

Further, innovation capability may be challenging to pinpoint among the firms. However, all informants have mentioned something about their ability to transform knowledge and ideas new products, processes, and systems, or test and explore. Some firms seem to have a proactive orientation regarding green innovation. Informant 1 is pointing out the need to stay head of regulations:

> *We don't have a choice. Instead of waiting for it to be pushed down in us, it is to start. (Informant 1)*

This shows a mentality and ability to embrace the changes and implement green innovations. The informant discusses that they evaluate how close they can get to their suppliers in terms of distance to reduce climate footprint, which shows their ability to change their thinking towards a more sustainable practice. Informant 3 shares this proactive view and sees the long-term perspective as an internal driver for green innovation:

> *We believe that whoever has done the most to reduce the climate footprint will have a competitive advantage. (Informant 3)*

According to the informant, they believe they already must take responsibility and are staying ahead, as they believe that when taxes become stricter in the future, they have created a long-term competitive advantage. Similarly, Informant 7 says that they should be a forward-thinking and leading company in their way to continuously improve their business, as the business has the resources and willingness to invest in sustainability.

According to Informant 4, the business always wants to improve and is looking for new ways to do this, stating that they always want to deliver even better than what they do in terms of sustainability. Informant 2 also mentions that even though they do innovations on a low level, they must constantly hit trends to gain their position, which the informant mentions as an important driving force. Informant 5 mentions that a desire to streamline is the biggest internal driver and if they are to be competitive, they cannot afford any inefficiency.

Company Size

Moreover, the company's size can affect the firm's ability to make changes. Informant 2 illustrates:

> *Since we are a relatively small business, it is easier for us to drive innovation, to answer market expectations. (Informant 2)*

Informant 5 agrees that the size can act as a driver. The informant states that they have few people and therefore short decision parts. It does not take a long time to discuss things. On the other hand, Informant 6 are a big actor which means that they can be a main collaboration partner with smaller producers, which reduces their risk. The informant also mentions that if innovations fit the existing processes and equipment, they can turn quickly and get a large-scale production because they have many units.

Financial Resources

Lastly, financial resources can according to the literature influence the development and implementation of green innovations. Informant 1 highlights that they have spent millions on investments, *"but this is a factor that has contributed to letting us lower energy usage in production."* Informant 3 highlights that their biggest challenge is connected to the dilemma between the expectations of consumers, sustainability, and financial costs:

> *Consumers expect us to do everything we can to reduce our climate footprint. But they are not interested in paying anything more and share the cost. So that means the industry has a challenge and it is facing higher and higher costs to operate and cannot charge the price from consumers. (…) In some strategic areas, we carry out investments, and take the financial costs ourselves, because we think long-term and what is competitiveness. And sometimes the timing is completely wrong.* (Informant 3)

Informant 7 does not explicitly mention financial resources as a driver. However, according to the informants' answers, the company has large resources and great collaborations with both R&D institutions and financial support from their owners, which, according to the informant, is beneficial for green innovation in the company.

4.3.4 Organizational Barriers

Organizational barriers can according to the literature include top management support, knowledge and expertise, human capital, innovation capability, organizational culture, size of the company, and financial resources. However, none of the informants mentioned human capital, knowledge and expertise, top management, or organizational culture as barriers.

Innovation Capability

Some of the informants mention uncertainties concerning the future, as a hindrance for their innovation capability. The firm of Informant 5 is hesitant to be the first one with new innovations. The informant states:

> *We let others be the pioneers, instead of taking the step ourselves. (Informant 5)*

Further, Informant 7 mentions that their innovation department does not always have an overview of the entire organization, which illustrates that the firm do not always have the capability to embrace the opportunities. The informant also mentions that they cannot just accept things as they are and that it is important to be able to see some opportunities or bring it up for discussion.

Company Size

Moving on to firm size, this according to the literature can be a driver or barrier to green innovation. Informant 2 underscores that firm size and financial muscles are composed. The view is shared by Informant 5, emphasizing that they do not have the ability to have several ongoing processes. On the other side, Informant 6 states:

> *We are less willing to change if it requires large changes in our processes because we are so big that we cannot turn overnight. (Informant 6)*

According to the different informants, this shows that larger firms will have a harder time changing processes, but smaller firms have it harder to overcome financial challenges.

Financial Resources

Furthermore, if the firm does not have financial resources available to invest in green innovation, it can hinder the company from becoming greener. All the informants agree that it can be challenging to allocate money to invest in green innovations. Some even mention it as the biggest barrier. Capital is vital for every organization to make investments and Informant 1 highlights that they must make money to invest in the business, which is also reflected by

Informant 6. This view is shared by Informant 2 who points out that there are low margins in the industry:

> *The challenges are that it requires large investments. The greatest barrier is that it is too expensive to make large technological investments. (Informant 2)*

> *You can clearly see that the less funds and capacity you have, the less chance you have of taking the big steps. (Informant 6)*

Informant 5 underlines that they are conservative with money, and there are no chances taken. On the other hand, according to Informant 7, financial resources do not act as a big barrier but highlight that it requires great investments in going green. Informant 1 points to transportation as an area where great investments are missing, and states that they do not believe they have the resources to solve the transportation challenges themselves, but that someone needs to take responsibility for the development.

4.3.5 Environmental Drivers

External factors outside the firms can affect the implementation of green innovation. The literature points to competitive pressure, consumer awareness/information, image/reputation, stakeholder pressure, and government encouragement/regulations as driving factors.

Competitive Pressure

Competitive pressure is mentioned in the literature as a driver for green innovation. Informant 1 raises a thought about comparing themselves to others but acknowledges that is hard. The informant shows interest in other firms to see what their environmental accounting looks like. Also, Informant 7 believes that you can draw synergies by comparing firms and industries. The informant is reflecting that firms sharing what they have achieved and done well may affect others in the industry in a positive way regarding innovation. Informant 2 points out that they do look at what competitors do, and that being better than the competitors is a driver. Also, Informant 3 agrees that competition is healthy by pushing each other to improve.

Consumer Awareness/Information

Regarding consumer awareness/information, Informant 2 states that their customers say they are concerned about sustainability. Additionally, Informant 1 states that consumers are making demands towards the producers and mentions that more and more are feeling the responsibility for sustainability. The informant thinks that:

> *Consumers will, to a greater extent, place even more demands on clean labels in the future. (Informant 1)*

Image

Having a green image is seen as a driver for green product and process innovation according to the literature. When talking about image, Informant 1 states:

> *Our advantage is that we have been able to take our sustainability strategy back to the brand, and it is easier to communicate because it is your brand. (Informant 1)*

The informant supports this by pointing out that if you tie the sustainability strategy to the brand, it is easier to get people on board. Informant 2 mentions that a good reputation is wanted, and therefore they do something, in which the informant highlights that they and a competitor have introduced a more climate-friendly product in their portfolio. The informant states that this can boost reputation, but it is very small, and at the same time, people are very skeptical. However, Informant 2 mentions image as a hygiene factor as being a necessity for the companies to be competitive. Also, Informant 3 sees the image as a driver, as they feel a responsibility regarding doing things and not just talking about it. In this sense, it is important with actions, not just words to show the consumers that they are responsible. On the other hand, Informant 5 has experienced through his career in the F&B industry that it pays off to be bad over several years and then makes big changes regarding sustainability pointing to other firms. The informant sees this as provocative for those who have already made greater changes. This shows that a bad industry image makes it easier to get recognition when implementing green innovation.

Demands from other stakeholders as a driver was mentioned by all the informants. Most of the informants highlight the consumers or customers as the most vital external stakeholder pressure. Informant 1 mentions that

> *We must pull together (...) with employees, the local community, consumers, and government. Because this is how we can take care of what is important around us (Informant 1)*

The informant mentions the reduction of sugar content as important for consumers, stating that customers are on the cut. One of their largest customers decided to reduce the sugar content. The informant followed up by stating that then they had to deliver too. The informant also highlights pressure from the banks as they will set high demands for firms to get loans. This reflects on a force to green the business to get loans to create value. Informant 2 states support this, stating that it is important that the banks set high demands. the informant also mentions that it is important to take the customers into account.

Further, Informant 4 emphasizes the pressure from the customer as a vital driver, and one can often lose a bit of focus because we run a commercial business. To improve, their customers must expect them to improve, which is according to the informant seen as the most important driver. The informant also states:

> *Consumers' willingness to pay is important. I'm a little more unsure because we always put it a little bit forward that a sustainable product is a more expensive product. But I'm a little unsure if that's always the truth. Because a healthier product is also a more sustainable product. So that's exactly what it's all about being able to see the opportunities and find them and use them. (Informant 4)*

Similar to informant 1 and 4, Informant 7 states that expectations to take responsibility is a driver for green innovation. Both from consumers on social media and their wishes to be an attractive collaboration partner regarding projects. Further, Informant 5 mentions previous examples of how stakeholders have influenced their production and states that the reduction of salt content in their products would not have been possible if it wasn't for the chains that forced suppliers and consumers to deliver products with lower salt content. Informant 6 highlights their customers (grocery chains) as the most important external factor. The customers are mentioned as gatekeepers as they decide what products are offered to the consumers. The informant states that for the customers to meet their sustainability goals, it is important that

their products are more sustainable.

Government Encouragement/Regulations

Moving on, as seen in the literature, the government is one of the three actors affecting sustainable development. The government can set regulations and encourage firms and consumers to lower environmental impact. The regulations for the government seem to be a driver for green innovation in several of the respondent firms. Informant 2 clearly states the demand from authorities as a driver to implement green innovations.

> *The very biggest driver is the EU, and clear demands from the EU, because then we don't have a choice (...) I believe that the best thing the Norwegian authorities can do is to set clear demands because then we are forced to run. (Informant 2)*

Further, Informant 3 exemplifies some existing support functions for firms such as Enova and Bionova, that help firms make good investments and that they have used. The informant emphasizes that incentives will be a great driver for green innovation, especially for farmers:

> *There is this thing with the particular focus on farmers. Then there is the matter of the agricultural settlement and what the farmer actually gets in terms of subsidies and support to take climate measures will also help a lot. (Informant 3)*

Informant 4 supports what is being said about authorities as a driver:

> *I think that the authorities are important drivers. This applies both to facilitating competence development and to contributing, what shall I say, money for development. (...) Skattefunn is a good example. It is, after all, a driver for innovation. Sustainable innovation. And the opportunity to focus even more on getting support for it. It is important. (Informant 4)*

The informant also exemplifies that getting support for courses and development to increase the competence in the company will make it much easier for firms to do it. The informant also mentions the facilitation of competence networks is great and should be facilitated to a greater extent.

Informant 6 is welcoming toward regulations. However, the informant mentions that regulations are a good thing, but at the same time, they can bring adjustment costs.

> *When laws and regulations come, things get extra focus and push, which makes it easier to make changes (...) immediately when there are regulations, automatically the value chain has the same focus. (Informant 7)*

Agreeing with this, Informant 7 says it is very difficult with subsidies, but they see that the authorities have a lot of power to decide what the businesses should focus on. A lot is driven by support schemes. When asked about evaluating the incentives from the authorities, the informant also mentions that this lies in the hands of each company and what they manage to create from what already exists.

4.3.6 Environmental Barriers

Consumer awareness/information, consumer willingness to adapt to green alternatives, and government encouragement/regulations were identified as environmental barriers by informants. Even though stakeholder pressure is identified as a driver in the literature, one informant also highlights this factor as a challenge.

Consumer Awareness

It is seen that consumers are becoming more aware of their environmental footprint. However, consumer awareness is interpreted by some of the respondents as a barrier as there are challenges in conveying information to consumers. According to Informant 1, increased consumer awareness is a challenge. The company is relaunching some of its portfolio with a product that is reducing the usage of plastic by 100,000 kilos a year. The informant states,

> *Now, many consumers are calling us out on shrink inflation (...) But the consumer says "is just to make more money" (Informant 1)*

The informant points out that consumers do not look at the totality. Related to these challenges, Informant 5 gives an example of how consumers view plastic versus cardboard in several of their packages, saying that it must look like cardboard before the consumer understands. He

stated they get 11,5 trailers with cardboard but that the consumers do not see this. According to the informant, when the consumers see plastic they think "no", and when they see cardboard they think "yes". The informant also mentions:

> *If we invest in a cleaning facility for water, the consumers will not see it and not understand, but if we put a green lawn and solar panels on the roof, which is a drop in the sea, the consumers will think that it is an environmentally friendly firm. (Informant 5)*

These examples emphasize the difficulties in conveying information on sustainability to consumers. On the same topic, Informant 7 says that they may not be good enough to talk about everything they do, but that this is becoming increasingly important, in addition to proving claims. Also, Informant 2 states, they need to get the product into the stores to get consumers to say they are concerned about sustainability. Given this, it is challenging to raise awareness among consumers.

Consumers' Willingness to Adapt

Moreover, consumers' willingness to adapt to green alternatives is discussed in the literature as a barrier to green innovation. This is argued with consumers being too dependent on habits. This is evident through the comments of Informant 1, who highlights that they made changes in the product design to make it more sustainable, but they met some challenges that underscore the paradox between functionality and sustainability for consumers.

> *The sale dropped 20%, and the consumers hated it (…) we thought we did something fantastic regarding sustainability, and it was much better, but the consumers did not want it (…) so it`s that balance. (Informant 1)*

In addition, there is also the paradox of the attitude-behavior gap which several of the informants are talking about. The informant states regarding consumers' willingness to buy more sustainable products, their actions are different from their words. Like Informant 1, Informant 3 does not experience that the consumers are willing to adapt to green innovations, stating:

> *There is a mismatch between what they say and expect, and what happens in practice. (Informant 3)*

This is also confirmed by their insight analyses. The informant says consumers have expectations about how eco-friendly the product should be to choose it, but that in real life it does not happen. Much of this lies in changing habits according to the informant. Informant 5 also supports this by stating that the average consumers are not very fond of changes.

Moreover, Informant 2 points out that as a brand you have a lot of power, however in the end, it is about what the consumers buy. The informant supplements this by stating if they try to introduce a more environmentally friendly or green product, it does not sell. The informant points out that sales of vegan food are plunging, and consumers do not buy it anymore. According to the informant, this could be due to lower purchasing power. Regarding consumers' willingness to change, consumers need to be willing to make those choices, which the informant points out that they do not perceive currently as green products do not seem to sell.

Informant 4 mentioned consumer expectations as a barrier concerning the prices of green products. They see that sustainable products are often priced more expensive. Yet, it is not necessarily more expensive to take out fat from a product. Further, the informant states that consumers' willingness to pay is important. However, the informant highlights:

> *There is still a long way to go before there is a large willingness to pay for sustainable products. So as a business, you must deliver at both competitive prices and more sustainable products. (Informant 4)*

Supporting these challenges, Informant 6 states that consumers are price-sensitive and that few consumers are willing to pay a premium price for more sustainable products. The products have to meet the demand and price, otherwise there is no change.

Informant 7 reflects the same thoughts as the other informants giving examples of the alternatives to green innovation, showing that a lot of power lies within the consumers, and habits and changing a common barrier for the firms:

Perhaps a more environmentally friendly plastic could be used which would have been more unclear. But will consumers accept it? (...) because if we do that and consumers don't buy it, then we're back to square one. (Informant 7)

Government Encouragement/Regulation

Almost all the informants mentioned government encouragement/ regulation as a great barrier to green innovation. Several pointed to upcoming directives from the EU as a challenge that will hinder their development. Informants 1 and 5 view these directives as not suitable for the Norwegian system. Informant 4 also expresses that the directives from the EU are not enough to gain momentum and that it is still the case that it does not always pay off to choose sustainability.

We can risk that EU is forcing directives on the Nordic countries (...) and is that sustainable for a country like Norway?". (...) I feel like there is being a distance, almost like the government is the enemy... they have to help the firms". (Informant 1)

However, there is a common understanding from the informants that they miss direct and specific incentives. Informant 5 states that the incentives from the government are "okay" regarding energy, but in other aspects it is bad. Further, Informant 3 states, there is a lack of incentives, especially concerning agriculture. Agreeing with this, Informant 1 mentions that the authorities do not give much support. Informant 2 supports informants 1 and 3 by mentioning that incentives from the authorities are not available for them. Additionally, Informant 4 mentions that they see a lack of support from the government and think that the government has yet to start using certain tools and there is too little initiative to influence the firms to make the right choices. Especially, transportation is mentioned by Informant 1 as an area where the informant is not satisfied with the authorities, stating that "*the government must speed up the building of infrastructure*", referring to the usage of electric vehicles. Also, Informant 6 mentions quota regulations on seafood, so at one point, they need to buy materials from further away, which increases the environmental footprint.

Stakeholder Pressure

Lastly, almost none of the informants perceived stakeholder pressure as a barrier, However, Informant 6 mentions their customers (grocery chains) as the biggest driver and barrier. The informant highlights the importance of understanding their goals and what they are concerned with, as the customers decide what they can put in the stores. The suppliers are also brought up by the informant as a stakeholder barrier, mentioning that it is not guaranteed that their suppliers will implement requirements made by the firm.

4.4 Market Dynamics

Finally, the informants were questioned about the customer response to the changes the firms have made regarding green innovation. Packaging is mentioned by several informants as an area where they have received feedback. Informant 2 and Informant 3 mention positive feedback from changes in packaging. Also, Informant 4 and Informant 6 have experienced positive responses. Informant 3 and Informant 7 mention changes that are hard for the consumers to notice as an area where they have experienced challenges as Informant 7 mentions is due to the short time to convey the message. Informant 2 also highlights that the focus has been changed from what it previously was, regarding sustainability from the manufacturing side, and that this is a good thing.

Further, Informant 4 has not experienced any changes in sales, concerning how they work with green innovation. However, the informant thinks that it is important to work on green innovations. On the other side, Informant 6 mentions that the sales increased to a certain point where consumers were not willing to buy sustainable products because of shrinking budgets. Despite these changes in consumer patterns, the informant confirmed that they would have lost income if they had not changed to a more sustainable practice. Informants 3 and 5 have also experienced positive sales numbers after turning to a more sustainable practice. Informant 5 states that positive sales numbers are not seen overnight, but in a long-term perspective, but Informant 3 states that they had an increase in sales, especially in the last six months. Additionally, Informant 7 mentions that they see changes in customers like restaurants and hotels, stating, that there has been a slight shift from just focusing on price to one having to think more responsibly.

It was also mentioned by Informant 3, that there is a difference between the Norwegian market and the Danish and Swedish markets, stating:

> *There is a big difference in awareness. The Swedish consumer is more aware (...) the Danish consumer is more concerned with ecological products. (Informant 3)*

Further, the informants were asked if the green innovations have affected the price of their products in any way. Informant 1 mentions that:

> *We do what we can to make it better for the whole value chain (...) we do what we can to have a more efficient production here, which benefits us, and maybe we can also lower the price. (Informant 1)*

This reflects that the informant wants to improve the price for the firm itself and its customers. Interestingly, the informant states that one bottle with recycled plastics is more expensive than a bottle with only new plastic in production. On the other side, Informant 2 shares another opinion and states that they will never lower the price. Also, the informant states,

> *If you do green changes, you have the opportunity to raise the price a little (...) we cannot raise the prices to a level where the consumers don't buy our products (...) we are willing to use more money on expensive packaging if it is better to recycle (...) sometimes we take the cost if we cannot push it over on the consumers if the products do not sell. (Informant 2)*

Informant 5 highlights that it is hard to take higher prices in the industry, but regarding the product that has been managed, it states that they can take a price premium because it is cardboard instead of plastic. On the other hand, according to Informant 7 shares a different view on price changes as a result of green innovation:

> *It is not the customer who has to pay the price to get a product that is produced responsibly. (Informant 7)*

Informant 3 emphasizes the attitude-behavior gap among consumers and states that they find it difficult to take a higher price for green products. To exemplify, the informant uses an example of an environmentally friendly product that required a little higher cost to produce than their conventional product in the beginning:

I think it was 1,5 NOK more for that product than regular. The consumer would not pay that. We have reduced the price to the same as the normal product. It was positive, then the turnover increased and we sold more. So, we see that consumers expect us to take climate measures, but they are not interested in paying if the costs are higher. (Informant 3)

Lastly, Informant 6 says that it is hard to answer whether the price change is due to green innovation or a consequence of fluctuating access to raw materials.

5.0 Discussion

Through the analysis of case studies, it became clear that firms are encountering similar challenges and implementing similar innovations. However, there are also notable differences between them. This chapter will examine the collected data, discussing it up against existing literature. This chapter starts by discussing how these firms define sustainability, their perspectives on the green transition, and the green innovations they have implemented. Next, the chapter will explore the technological drivers and barriers identified in the literature, comparing them to the determinants uncovered by the informants. The chapter will then move on to the organizational and environmental factors discussed by the interviewees, drawing on relevant literature to further illuminate these findings. Finally, the effects of green innovations on market dynamics will be examined.

To address the main research question of this thesis, the discussion will first address the following sub-questions:

1. What green innovations are being implemented across Norway's food and beverage sector?
2. What are the technological, organizational, and environmental drivers and barriers that make food and beverage firms innovate and implement green innovation?
3. How have the firms experienced the consumers´ response to implementing green innovations?

5.1 Green Innovation in the Firms

All the informants expressed concern about the green transition as important, and they all had their own way of defining sustainability internally. From the definitions the informants presented, sustainability is an important aspect the firms are trying to improve. The definitions given by the informants (table 7) differ little from the definition given by Brundtland (1987). They focus mainly on the first two pillars of the Triple Bottom Line (Martin & Schouten, 2014, p. 29), but informants 2 and 6 have considered all the pillars in their definitions. The focus is to reduce the usage of energy, and raw materials and have a healthy economy to be able to sustain the business.

In addition, the SDGs have impacted the strategy of Informant 6, where their definition has been based on six SDGs. Martin and Schouten (2014) mentioned a balance between the pillars contributes to a win-win situation for the company, society, and the planet. All the informants agree on this, and several states the balance between economic and environmental sustainability. As indicated by Dangelico et al. (2019, p. 1434) and Nykamp and Gonera (2020), the literature points to the importance of the green transition and the customers' awareness of the topic, reflected in all the informants' answers. The F&B sector stands for a quarter of greenhouse gas emissions worldwide (Ritchie et al., 2022), so there is no surprise that this is a focus area for firms and their customers.

The provided examples of green innovation, indicate that the firms have had this on the agenda for over time. All the firms have implemented process innovations, mostly to reduce energy usage. Several informants mention examples such as reusing production heat, installation of solar panels, and investments in more energy-efficient equipment. In addition, there is a clear mark that packaging is a common area that the firms are focused on, by using more recycled materials and renewable packaging. Nilsen-Nygaard et al. (2021) emphasize the opportunities to reduce waste in packaging. However, in the F&B sector, there are concerns regarding food safety. Informant 6 mentions that the packaging needs to be safe, limiting the usage of recycled material. Petkoska et al. (2021) display packaging where consumers have clear demands, and the informants confirm this. The informant shows that product innovation is a continuous focus area for the firms, in terms of packaging, and other product innovations.

5.2 Drivers and Barriers

In this section, the thesis will discuss the drivers and barriers to implementing green innovation, seeking to understand what firms in the F&B sector are experiencing today. The drivers and barriers will be discussed according to technological, organizational, and environmental factors to answer the research question.

5.2.1 Technological Factors

In this thesis, it has been revealed that technology can be both a driver and a barrier for firms in the F&B sector. The compatibility factor is seen by some of the informants to be a key to implementing green innovations. As seen in the literature, Tariq et al. (2017) enlighten the ability to be ready when the technology is, will give a competitive advantage. This reflects the view of Informant 1, who has the same view regarding transportation challenges. Besides, Informant 5 mentions finding that "kinder egg" when investing in new technologies, to be able to cover more than one aspect in one go, which aligns with the literature mentioned by Indrawati et al. (2023) and Weng and Lin (2011). Also, Informant 4 mentions AI as a tool with many possibilities they can use to become more efficient, and that they are constantly working to use fewer resources. Galanakis et al. (2021, p. 197) point to AI usage as contributing to sustainability and new opportunities. This shows that technology is important to improve environmental sustainability, as Bossle et al. (2023) mentioned. Surprisingly, only three informants stated compatibility as a driver. This paints a view that the other firms do not look to find the technology that best fits the company and may be looking in the wrong direction.

All the informants gave examples of implementation of green innovation where reduction of energy usage was central. Both Zhang et al. (2020) and Weng and Lin (2011) highlight energy saving, reduction of natural resources, and reduction of greenhouse gasses as a relative advantage. This is confirmed by the informants. Informant 4 points out that it could influence the company's profitability if they do not keep up the development. In addition, Informant 5 points out that being a pioneer could result in market advantages. Along with Informant 7, they agree that implementing green technologies may become profitable. All the informants have a long-time perspective, which gives the impression that the firms are taking their time to find the right fit.

Further, two informants mention uncertainties by being the first mover in technologies. Most informants believe that R&D is not something they should do on their own but in collaboration. As mentioned by López Pérez et al. (2024), some informants agree that other stakeholders should be a part of R&D. Informant 1 points out that they cannot do R&D on their own, asking for contributions from the authorities. In addition, Informant 2 points to R&D as difficult to designate time to, and there is a low level of innovation in the industry. This was unexpected as all the informants, including Informant 2, could give clear answers to implemented green

innovations, and the majority pointed out areas where there is great innovation potential. Informant 1 mentions transportation as one area reflected in Informant 5 answers.

On the other hand, R&D also acts as a driver. A majority of the informants stated that R&D is a field they are exploring themselves. Informant 7 mentions that they do have an R&D department with a focus on sustainability. This shows a willingness to investigate opportunities within the company and develop technologies. The informants highlight that they are exploring small changes throughout the organization. Interestingly, Informant 2 mentioned that it is easier to do R&D in the convenience market than in the grocery market.

5.2.2 Organizational Factors

Six of the informants mentioned that top management is an important internal driver for green innovation in the firms, which aligns with the findings of the study of Adams et al. (2023) and Ilyas et al. (2020). In particular, Informant 3 mentioned that they have proactive management concerned about the organization being in the driver's seat regarding sustainability, supporting the importance of the management following the constant changes in technologies and trends in the market (Dong et al., 2024). Informant 4 further underlined the significance of having management with the right skills to prevent what Dangelico et al. (2019) consider managers` myopia. To no surprise, none of the informants mentioned this as a barrier for the organization regarding green innovation, which shows great support from the top management in the sustainability work of F&B firms.

However, it was surprising that only three informants pointed out the importance of knowledge, expertise, and human capital as internal drivers for green innovation in their firms. According to Zhang et al. (2020), knowledge and expertise in implementing innovations in their operation are essential. Informant 2 underscored the importance of ensuring that everyone in the company recognizes sustainability as an integral aspect of daily operations and that it has to be done correctly. For instance, Zhang et al. (2022, p. 659) found that a lack of knowledge about using food waste as a resource is a challenge in food management, which shows the importance of knowing sustainable practices within the company. Informant 4 emphasizes the importance of enhancing the competence of the employees and having good plans, which are something they work on and should be worked on even more in the organization. Informant 1 also emphasizes the important role of everyone in the business to solve challenges regarding green innovation

as a team. All the firms have a certain degree of environmental concern within the company. However, firms 1, 2, and 4 show a high level of environmental concern within the company, which according to Zubeltzu-Jaka et al. (2018) and Zhang et al. (2020) drives the company to be more innovative regarding employment concerning green initiatives. Further, none of the informants mention anything about recruitment or training of employees as a driver for green innovation. However, Informant 4 was recently employed in a new position as a sustainability manager. This shows the willingness of the company to attain human capital with knowledge and skills in sustainability, which, according to Indrawati et al. (2023), can help green innovation implementation and development.

Regarding organizational culture, almost all the informants mentioned that the organizational culture is a driver for green innovation. These findings are interesting as they contradict the findings of Adams et al. (2023), who found that organizational culture is a barrier among large F&B firms. All the firms interviewed are established, with five of the firms being established over or almost 100 years ago. Chesbourgh (2010) points to the challenges in established firms such as traditional culture, norms, and values that may hinder innovation. However, none of the informants point to these challenges. The company of Informant 1 underscores the value of working as a team is important to create changes and have a collective value of sustainability anchored in the culture, which Informant 3 also agrees on by integrating sustainability in all the processes they do. Informant 5 also points out that the younger generation in the firm has a distinctive organizational culture for green innovation and wants to test new things. As Jacobsen (2018) states, the organization's culture may be managed correctly, giving the firms an advantage in their work with green innovation.

The results show that all the firms have innovation capabilities as they have implemented green innovations in their firms. However, some firms are more proactive than others and have greater abilities to transform knowledge and ideas into new products, processes, or systems that aim to benefit the environment (Saunila, 2020). This can be seen especially through the proactive attitude of Informant 1, concerning their approach to changes, as they take the initiative to make changes before, they need to. Informant 3 supports this with their long-term perspective on staying ahead of regulations and believes that the firms that are doing the most are the ones that gain the most benefits. Informant 5 also wants to improve and deliver better in terms of sustainability. Informant 2 emphasizes that their innovations are on a low level, rather incremental such as changes in the food like taste. However, they emphasize that they are following trends, such as vegan products, and are a challenger driving innovation. Informants

6 and 7 view themselves as leading firms in green innovation. It was found that most of the firms have innovation capabilities, however, Informant 1 and 7 shows a proactive strategy. On the other side, Informant 5 expresses a different approach as they would like others to be pioneers before they adapt themselves when talking about the economic perspective regarding green innovation. However, it is not easy to assess firms' innovation capability as this consists of both tangible and intangible assets. Therefore, the thesis might not have the whole picture to evaluate this.

Informant 3 pointed out that they have changed from oil oil-burning kettle to an electric kettle in their production. In an environmental context, this was a good change, but the informant mentions high operating costs due to high electricity prices, which in an economically sustainable matter, was worse than oil. Balancing the TBL and keeping economic sustainability is essential to be able to make environmentally sustainable choices.

The findings show some differences regarding how the company size can drive or hinder green innovation. Informants 2 and 5, categorized as small and medium-sized firms, emphasize that their size benefits green innovation in terms of internal adaptability and shorter decision paths. On the other hand, informants 2 and 5 display the challenges of being a smaller company and taking larger steps in innovation regarding finances and investments. This relates to the literature of Jacobsen (2018) and Becheikh et al. (2006), who state that larger firms have greater innovation capability and larger resources and, therefore, can take more risks. This is also evident in this thesis, as we see that the large company of Informant 7 has come further than the mentioned informants regarding innovations and investments in R&D.

On the other hand, Informant 6 underscores that their large size can act as a barrier when big changes are required because it makes it harder to adjust quickly. Comparing the findings from these informants aligns with Jacobsen's (2018, p. 95) theory, which shows that larger firms encounter more difficulties in change than smaller firms. This can be due to the complexity of the organization with different procedures, routines, unities, and a mindset of old ways of doing things, according to Jacobsen (2018) and Adams et al. (2023). However, Informant 6 states that as large firms, they can adapt quickly and get large-scale production because they have many units, which contradicts the research of Jacobsen (2018) and Adams et al. (2023) but aligns with Jakobsen et al. (2020) who mentions, large firms are embracing process innovations to a bigger extent than small firms.

Financial resources are identified as a barrier to green innovation by most of the informants. Most firms emphasize that making large investments requires large financial capital. Informant 2 underscores that investments are the factor slowing down the green transition in the F&B industry. This is reflected in the answer of Informant 1, regarding missing financial resources in solving the transportation challenge. These challenges relate to the research of Purwandani and Michaud (2021), which showed that economic capital constraints can hinder the adoption and implementation of green innovation and limit the pace and scale of the transition towards more sustainable practice.

Also, Informant 3 underscores the dilemma between making investments. In some cases, they are thinking of the long-term benefits, and in other areas, they evaluate that, in some cases, the cost is too high in terms of economic profit. This relates to the challenges Chen et al. (2023) describe concerning the uncertainty of financial return and profitability of green innovation investments and what Dangelico et al. (2019) describe as managers` myopia of seeing green innovation as a competitive advantage rather than a cost.

We see some differences between the firms in terms of financial resources. The company of Informant 7 is the only company that mentions that they extensively collaborate actively with R&D institutions and receive large financial support from their owner firms. According to Purwandani and Michaud (2021), implementing green innovations often requires investments in R&D work, and we see through the results of this thesis that the business of Informant 7 has maximized new opportunities from these collaborations as they have facilitated trucks and filling stations on biogas of residuals of their food waste which also other firms can use. Thus, Cecere et al. (2020) state that large firms are more likely to invest in green innovation to contribute to sustainability in general. Through three results we can see that Informant 7, classified as a large company, is the company with the most radical innovations when comparing all firms. However, all firms are implementing green innovations, although to different degrees.

5.2.3 Environmental Factors

Informant 3 thinks that competition is healthy and pushes the industry to improve, as reflected by Calafat-Marzal et al. (2023), who mention that implementing digital technology directly impacts their ability to compete. If the firms want to be on edge in the market, green innovation

is one path, as Informant 2 highlights and states that they want to be better than the competitors. Also, informants 1 and 7 believe that comparing firms would be beneficial for reducing environmental footprint, which reflects Alam and Islam (2021) who mention that environmental responsibility has become intertwined with competitiveness. By comparing firms, it is possible to draw synergies, as mentioned by Informant 7, that firms sharing what they have achieved and done well may positively affect others in the industry.

Despite studies by Rezai et al. (2012) and Huang et al. (2009) highlighting consumers' environmental consciousness driving firms to participate in green innovation activities, only two informants mention this as a driver. The informants enlighten that the consumers say they are environment conscious, and they believe that more and more are feeling this responsibility. Although the literature indicates that consumers are a central driver for green innovation, the informants show a different side.

On the other hand, most of the informants list consumer awareness as a barrier. Ma et al. (2023) pointed out that non-aware consumers will not change their demands and are less adaptive to green innovations. This is confirmed by the informants. Informant 1 mentions that consumers do not look at the totality, which is stated and exemplified by Informant 5. In addition, Informant 7, reflects the need for information, and critical states that they need to become better at conveying their practices. This is also mentioned by Informant 2 who states it is hard to get awareness from consumers without having the product on sale in stores, which again reflects the study of Ma et al. (2023) and Buerke et al. (2017) who emphasizes that without knowledge, consumers will stick to their purchasing habits. Informant 1 also mentions that the consumers decide what they want to buy themselves. Research by Buerke et al. (2017) provides the supporting theory that consumers neglect the environmental impact and choose unsustainable products. As revealed by Invertapro (2024, 5th March) larvae could be used as a substitute for flour, which Patel et al. (2019) mentioned is neglected by Western consumers. Consumer awareness is listed in the literature and by the informants as both a driver and a barrier. This reflects a divided opinion among scholars and the industry as to whether consumer awareness drives or obstructs green innovation.

Four informants mention image as a driver for green innovations, which is also noted by Tariq et al. (2017) and Yao et al. (2021) in the literature, indicating firms can benefit from signaling green innovation and commitment to enhancing the brand reputation sustainably. Green innovation is mentioned by Informant 2 as something that can give a reputation boost, but it is

pointed out as a hygiene factor and something that needs to be in place to be competitive; otherwise, you do not compete at all.

Informant 5 highlights that it can be beneficial to have been bad over several years and then make big changes, which aligns with research by Leonidou et al. (2013) that firms in bad reputation industries can benefit more from greening their business than firms with good reputations. Three firms in this study are categorized as large. As Lin et al. (2019) and Adams et al. (2023) point out, large firms have high exposure visibility, therefore image is a driver for green innovation. Interestingly, none of the firms categorized as large, mentioned images as drivers.

As research by Sharma and Henriques (2005) and Lin et al. (2014) highlights, pressure from stakeholders strongly influences firms' decisions on green innovation. All the informants, except Informant 3, agree that stakeholders are a driver for green innovation. Informant 7 mentions that there are expectations for them to take responsibility for green innovations. Informant 1 shed light on the same, stating that they need to pull together with employees, the local community, consumers, and the government. Also, the food chains are repeatedly mentioned as important. Informants 1 and 5 credit the food chain for forcing producers and suppliers to reduce salt content in products.

This can be compared to Bossle et al. (2015), who mention Brazil's food chains that work with sustainability and innovation principles. The customers and food chains are stated to be the most vital diver. Informant 4 mentions expectations from customers as the most important driver. Informant 6 presents the food chains as gatekeepers and the most important external drivers as they decide whether their products are presented to the customers. However, the informant also mentions suppliers as a barrier, by stating that it is not guaranteed that the suppliers will implement requirements from the company. In addition, informants 1 and 2 draw the banks as central, stating that demands from the banks will pressure firms to initiate green innovations.

With the research of White et al. (2019) and Gardner and Rebar (2019) in mind, the literature presents consumers' willingness to adapt to green innovation as a barrier. The literature suggests that humans are creatures of habit. Resistance to change is a common trait, making it difficult to adapt to new practices. This aligns with all the informant statements of how they

experience the consumer response to green innovation. For instance, although Alcorta et al., (2021) mention that vegetarian diets have become more popular, it is not the case found in this study. Informant 2 points out that they have launched several vegetarian and vegan products that the consumers do not buy, and the cause is the products fall out of the shelves.

Moreover, a study by D'Amico et al. (2016) suggest that consumers are gradually becoming more environmentally conscious and that curiosity consumers are willing to pay a premium for organic wines. Thus, this study shows results that there is a mismatch between what consumers say and their actual behavior. Informants 1 and 3 pinpoint this and state that consumers say one thing but act differently in the moment of purchase. Also, Informant 4 mentions that their consumers are price sensitive, and not willing to pay a premium for a sustainable product.

All the informants had strong opinions as to whether the government acts as a driver or a barrier. The literature indicates that the government is pressurizing firms to make green initiatives and reduce their environmental footprint, as mentioned by Delbeke et al. (2019, pp. 25-28). Doran and Ryan (2012) highlight the government as the main driver for green innovation. This is reflected in the answers of several informants. Informant 2 firmly states that the very biggest driver is the EU because they put strong demands on the firms. This view is shared by informants 4 and 6, highlighting that it gives extra focus and push to green initiatives. Also, Informant 7 mentions a lot is driven by those support schemes from the government.

Söderholm (2020) mentions the government as a hindrance to green innovations which is reflected in several informants. Informant 5 mentions that at this point, the government is the worst barrier. As Vittersø and Tangeland (2015, p. 93) present, the Norwegian food sector is highly regulated. Some of the informants express their dissatisfaction with the regulative coming from the EU. The upcoming directives are also mentioned as a barrier. Informant 1 states that the directives might not be suited to the Nordic countries. Which is reflected by Gupta and Barua (2018) who emphasizes that firms are often demotivated because of a lack of government support. Furthermore, it is mentioned that the government is introducing laws and directives but refuses to support the firms to implement them. Thus, poor enforcement of environmental policies is a barrier to green innovation.

The informants were also asked about the incentives from the government. Purwandani and Michaud (2021) mention incentives the government can implement to drive green innovation. The overall impression from the informants was that they see room for improvement in the

incentives. The informants mention that the economic incentive from the government is not good enough. Informant 1 states that the government does not give much support. Informant 5 agrees, expressing it is bad for certain things. In addition, Informant 2 mentions that the incentives are not available for them (Gupta & Barua, 2018; Purwandani & Michaud, 2021). On the other hand, informants 3 and 4 are satisfied with the incentives, which show a divided view of the incentives from the government.

5.3 Market Dynamics

Firms have encountered a range of reactions from their customers in response to their environmentally friendly innovations and modifications to their products or operations. As per the informants, most of the feedback has been positive, but there has also been some reluctance to embrace change, including objections to using wooden spoons in yogurt. The packaging of products is an area that elicits the most feedback from consumers. It is understandable, given that it is the aspect of the product that is most visible to the customer. Informant 4 says that although they do not see any changes regarding sales, it is crucial to work with green innovation for the reputation, as sustainability is a hygiene factor. The informant also points out that consumers are not concerned yet with labels, and Informant 5 is skeptical about how much consumers consider what they buy.

Both informants 3 and 4 emphasize the challenge of communicating green innovations that are not visible to the consumer. It is seen as hard for the consumers to understand, and lack of communication means they may not react to the changes positively. However, this shows the need for better communication from F&B firms on their initiatives so consumers have enough information to make sustainable choices and can accept product changes. In particular, Informant 2 mentions that Swedish and Danish consumers are more aware of and concerned with ecological products, emphasizing the need to shift consumer behavior to more sustainable. Firms have a role to play in this part, using marketing strategies that can limit the attitude-behavior gap among consumers (White et al., 2019). According to White et al. (2019), various means connected to social influence, habit formation, individual self, feelings and cognition, and tangibility can be harnessed to encourage more sustainable consumer behavior.

Informant 4 does not see any changes regarding sales. However, Informant 6 experienced better sales, as people nowadays are more price sensitive. The informant states they would have lost

income if they had not changed to a more sustainable practice.

As for the effects of price change, green innovations can be something that firms can use to adjust their prices. It allows for a premium price level on products due to higher production costs but can also reduce prices by lowering production costs. Informant 2 highlights that it is possible to raise the prices when making green changes but shows an understanding that it must be at a level where consumers are willing to pay. The price-conscious consumers are confirmed by Informant 3, who exemplifies that a more sustainable was priced at 1,5 NOK more than the conventional product. Still, they had to reduce the price to the same level as the conventional product for a positive turnover. The consumers were unwilling to pay the premium even if the products were more sustainable.

The informants commonly understand that the consumers are price sensitive, and few are willing to pay a premium for a more sustainable product. Although D'Amico et al. (2016) show results in consumers being more positive about paying a premium for green alternatives, it was not the case in this study. Arguably, Thøgersen and Zhou (2012) revealed that the most important reasons for not buying organic food are high prices and limited availability. This reflects Informant 6, who emphasizes that consumers are unwilling to accept infinite prices. Also, Informant 2, mentions that the reason for low sales of vegan products is consumers with lower purchasing power.

It is difficult to measure what factors affect a price change. Informant 6 mentions that whether the price change is due to green innovation or not is difficult to measure. Informant 2 mentions that there is a will from the company to take the extra cost, stating that they do take the cost if they cannot push it onto the consumers.

6.0 Conclusion

This master's thesis has dived into the factors that drive or hinder the adoption of green innovation practices in Norwegian food and beverage firms. Through conducting case studies involving seven key individuals responsible for sustainability, product development, or innovation and analyzing the data against existing literature, the study findings showed that all the firms examined actively engage in green innovation and emphasize sustainability as a critical area of focus. Nonetheless, there are variations in how sustainability is integrated into each firm's organizational structure and culture.

Firstly, this thesis provides insights of what green innovations are being implemented across Norway's food and beverage sector. Among the firms, mostly product and process innovation are being implemented. The common innovations mentioned include energy reduction, reuse of energy, reduction of food waste, reduction of plastic, and reduction in transport and packaging. Innovation areas such as transportation and packaging were mentioned as challenging areas. Transportation is due to infrastructure and challenges with technology, and packaging is due to food safety. However, the informants mentioned energy saving or reduction, food waste reduction, and packaging as the most dominant innovation areas.

Secondly, this thesis identifies what technological, organizational, and environmental drivers and barriers make food and beverage firms innovate and implement green innovation. The findings revealed that technology compatibility, top management support, organizational culture, and stakeholder pressure are the most prominent factors driving firms in the food and beverage sector to implement green innovation. Only the SMEs mentioned image. These findings show the importance of having internal structures in place and the effects of external pressure pushing everyone in the right direction.

On the other hand, R&D, financial resources, consumers' willingness to adapt to green alternatives, and government regulations were revealed as the most significant barriers to overcome. This reveals a gap between company stakeholders, where the firms experience little support from the government and wish for a more collective approach to R&D to allocate resources towards green innovations. The thesis can also conclude that the willingness to adapt to green alternatives is not present in the study, showing an obstacle the industry stands above.

Lastly, the firms experience the customer response to implementing green innovations as mostly positive to green innovation. However, there is a challenge in communicating green innovations to consumers, and the firms see the attitude-behavior gap as a challenge. Firms do not feel that consumers care enough about labels or purchases. Today, firms do not experience any impact of green innovation on sales numbers. The informants experience that today's consumers are price-conscious and unwilling to pay the premium even if the products are more sustainable.

This thesis provides valuable insight for firms in the food and beverage sectors, underscoring the importance of understanding the technological, organizational, and environmental factors in implementing green innovation. This is to improve operations and products for a greener future. Also, the thesis provides evidence that most firms are not satisfied with the current incentives from the authorities. However, green innovation is a complex yet emerging area with many factors affecting its success. Further research should, therefore, be done to understand the challenges food and beverage firms face in the green transition and what can be done to drive them in the right direction.

6.1 Theoretical Implications

This thesis serves some theoretical implications by using a holistic approach to understand the drivers and barriers to green innovation in Norwegian F&B firms. By highlighting the significance of technological, organizational, and environmental factors affecting green innovation, the findings add to the emerging literature on green innovation. Also, the TOE framework by Tornatzky and Fleischer (1990) has served well as a theoretical framework for researching drivers and barriers to implementing green innovation. This approach can be used in future research. In addition, we covered two aspects of sustainability due to the limitations of time and the thesis frame. Another study could focus more on the third aspect of sustainability: social sustainability. The framework used could also be simplified, containing fewer factors to get more in-depth on specific ones.

6.2 Practical Implications

In addition to its theoretical contributions, the thesis endeavors to make practical contributions toward identifying areas for improvement within the food and beverage industry. By shedding new light on approaches to green innovation, this thesis has the potential to benefit the industry greatly. Specifically, the research has identified several areas where firms can focus on overcoming barriers to green innovation. Additionally, it has pinpointed areas where firms can utilize the findings to become more aware of the factors that drive green innovation within the food and beverage sector.

6.3 Further Research

This thesis opens for further research. Building on insights from this qualitative study, a quantitative study could be done on the identified factors. Although there have been studies on green innovation across industries, there's a need for more research, particularly in the food industry. Additionally, a study can be conducted to measure the effects of green innovation in firms, including factors such as efficiency, cost saving, and consumer perception. In addition, one point mentioned in the interviews was collaboration—both the importance of it and as an area of improvement. Facilitation of greater competence networks was mentioned to benefit the firms in driving green innovation. However, one company had a negative experience with this. Therefore, facilitating collaboration and competence networks for F&B firms could be an exciting area for future research.

According to Longvanes and Årethun (2020), consumers are one of three players affecting sustainable development. Several informants mentioned consumers' attitudes versus willingness to pay as a challenge or risk. Therefore, a quantitative survey could be conducted to find out whether consumers prioritize sustainability in their purchasing decisions when buying food and beverage products. Investigating if and how firms' environmentally friendly practices and innovations influence consumers' product or purchase choices would be interesting. However, the attitude-behavior gap would have to be considered. Another angle could be determining what factors influence food–purchase decisions, as this could give essential indications to the firms. Factors such as price, vegan, renewable energy, sustainably produced, recyclable packaging, locally grown, certified organic, nutrient, labels, and other factors in the literature would be interesting to investigate.

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8.0 Appendixes

8.1 Interview Guide English

Brief introduction
- What is your role within the company?
- To what extent do you agree that the green shift is important?
- To what extent do you think that the food and beverage industry is green today?

Green innovation in the firms
1. How do you define sustainability within your company?
2. Can you give examples of green innovation that has already been implemented in your company?

Technological factors: drivers and barriers
3. Can you give examples of green technologies implemented to make your company "greener"?
4. What do you consider to be the drivers for implementing green technologies within your company?
5. What do you consider to be barriers to implementing green technology within your company?

Organizational factors: drivers and barriers
6. Which internal organizational factors drive your business to implement green innovation?
7. Based on your experience, what are the barriers your company faces in this endeavour?

External business factors: drivers and barriers
8. Which external factors outside the company do you see as drivers for implementing green innovation?
9. Which external factors do you see as barriers to implementing green innovation in the company?
10. How would you assess the current financial incentives for green innovation from the authorities/government?

Market influence and market dynamics
11. How has the customer response been to the changes the company has made in terms of green innovation?
12. In what way has this affected the price?
13. Has the company established itself in new markets? (If so, is there a different focus here on sustainability than in the other markets?)

Final thoughts?

8.2 Interview Guide Norwegian

Kort introduksjon
- Hva er din rolle innenfor bedriften
- I hvilken grad er du enig i at det grønne skiftet er viktig?
- I hvilken grad mener du at mat- og drikkevareindustrien er grønn i dag?

Grønne innovasjon i bedriftene
1. Hvordan definerer dere bærekraft innenfor din bedrift?
2. Kan du gi eksempler på grønn innovasjon som allerede er implementert i din bedrift?

Teknologiske faktorer: drivere og barrierer
3. Kan du gi eksempler på grønne teknologier implementert for å gjøre din bedrift «grønnere»?
4. Hva anser du som drivere for å ta i bruk grønne teknologier innen din bedrift?
5. Hva anser du som barrierer for å implementere grønn teknologi innen din bedrift?

Organisatoriske faktorer: drivere og barrierer
6. Hvilke interne organisatoriske faktorer driver din virksomhet til å implementere grønn innovasjon?
7. Basert på din erfaring, hva er barrierene din bedrift står overfor i dette arbeidet?

Eksterne bedriftsfaktorer: drivere og barrierer
8. Hvilke eksterne faktorer utenfor bedriften ser du på som drivere for å implementere grønn innovasjon?
9. Hvilke eksterne faktorer ser du som barrierer for å implementere grønn innovasjon i bedriften?
10. Hvordan vil du vurdere de nåværende økonomiske insentivene for grønn innovasjon fra styresmaktenes sin side?

Markedspåvirkning og markedsdynamikk
11. Hvordan har kunderesponsen vært på endringene bedriften har gjort når det gjelder grønn innovasjon?
12. På hvilken måte har dette påvirket prisen?
13. Har bedriften etablert seg på nye markeder? (I så fall, er det forskjellig fokus her på bærekraft enn i de andre markedene?)

Noe annet du vil legge til?

8.3 Protocol Matrix

Table 10. Protocol matrix of interview questions and sub-questions.

	Sub question 1	*Sub question 2*	*Sub question 3*
Interview Q1	X		
Interview Q2	X		
Interview Q3		X	
Interview Q4		X	
Interview Q5		X	
Interview Q6		X	
Interview Q7		X	
Interview Q8		X	
Interview Q9		X	
Interview Q10		X	
Interview Q11			X
Interview Q12			X
Interview Q13			X

Source: Own creation.

8.4 Assessment of Processing of Personal Data

◆◆ Sikt

Assessment of processing of personal data

Reference number	Assessment type	Date
359257	Standard	11.03.2024

Title
Grønn innovasjon i mat- og drikkeindustrien

Institution responsible for the project
Høgskulen på Vestlandet / Fakultet for økonomi og samfunnsvitskap / Institutt for økonomi og administrasjon

Project leader
Gregory Kwiatkowski

Student
Frida Pedersen Bekkestad

Project period
01.01.2024 - 15.05.2024

Categories of personal data
General

Legal basis
Consent (General Data Protection Regulation art. 6 nr. 1 a)

The processing of personal data is lawful, so long as it is carried out as stated in the notification form. The legal basis is valid until 15.05.2024.

Notification Form ↗

Comment
OM VURDERINGEN
Sikt har en avtale med institusjonen du forsker eller studerer ved. Denne avtalen innebærer at vi skal gi deg råd slik at behandlingen av personopplysninger i prosjektet ditt er lovlig etter personvernregelverket. Vi har nå vurdert at du har lovlig grunnlag til å behandle personopplysningene.

LOVLIG GRUNNLAG
Lovlig grunnlag for behandlingen av personopplysninger vil være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 a).

FØLG DIN INSTITUSJONS RETNINGSLINJER
Det er institusjonen du er ansatt/student ved som avgjør hvordan du må lagre og sikre data i ditt prosjekt og hvilke databehandlere du kan bruke. Husk å bruke leverandører som din institusjon har avtale med (f.eks. ved skylagring, nettspørreskjema, videosamtale el.).

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).

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. Se våre nettsider om hvilke endringer du må melde: https://sikt.no/melde-endringar-i-meldeskjema

OPPFØLGING AV PROSJEKTET
Vi vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.

Lykke til med prosjektet!