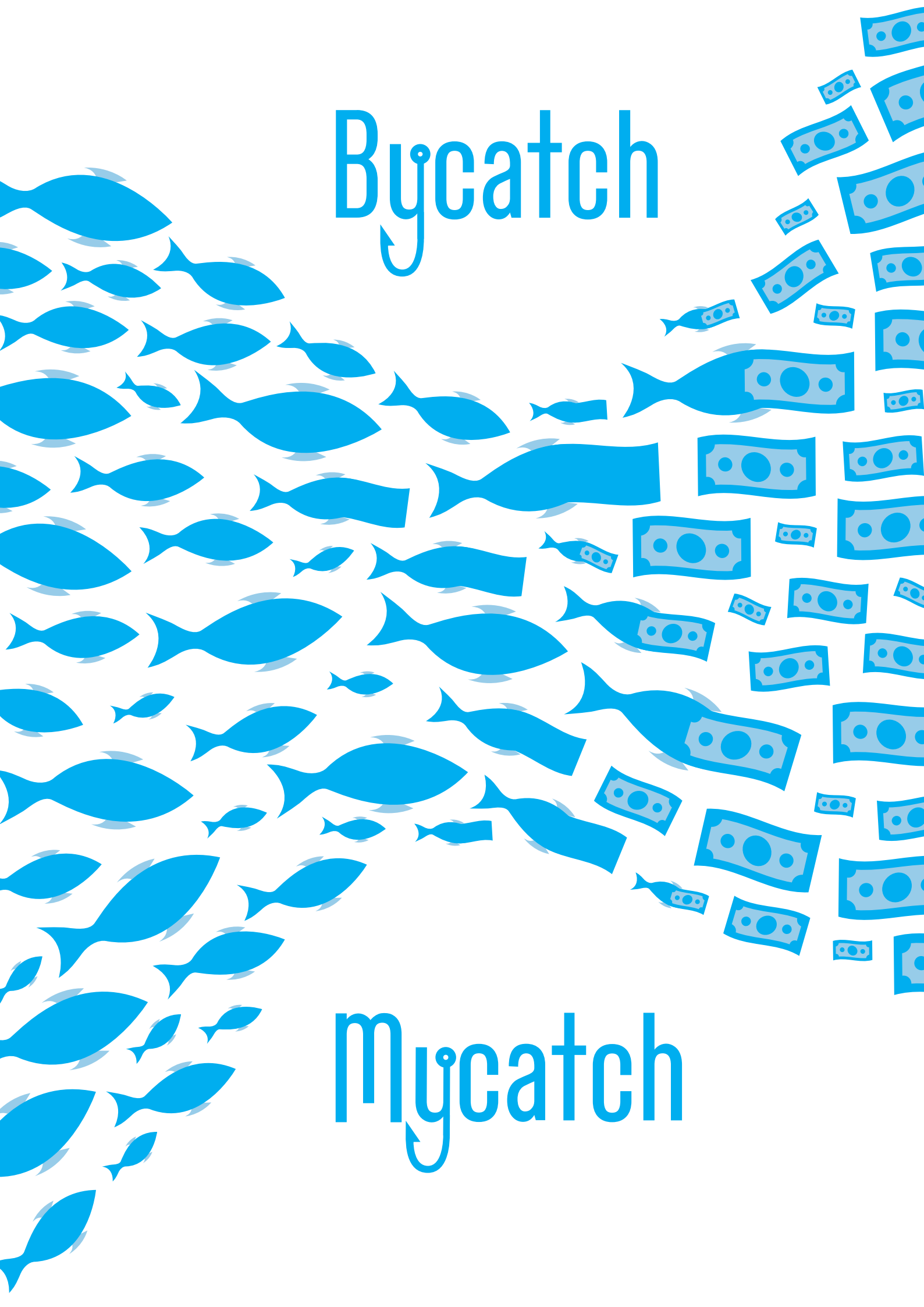
Bycatch



Mycatch

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Integrated Food Studies
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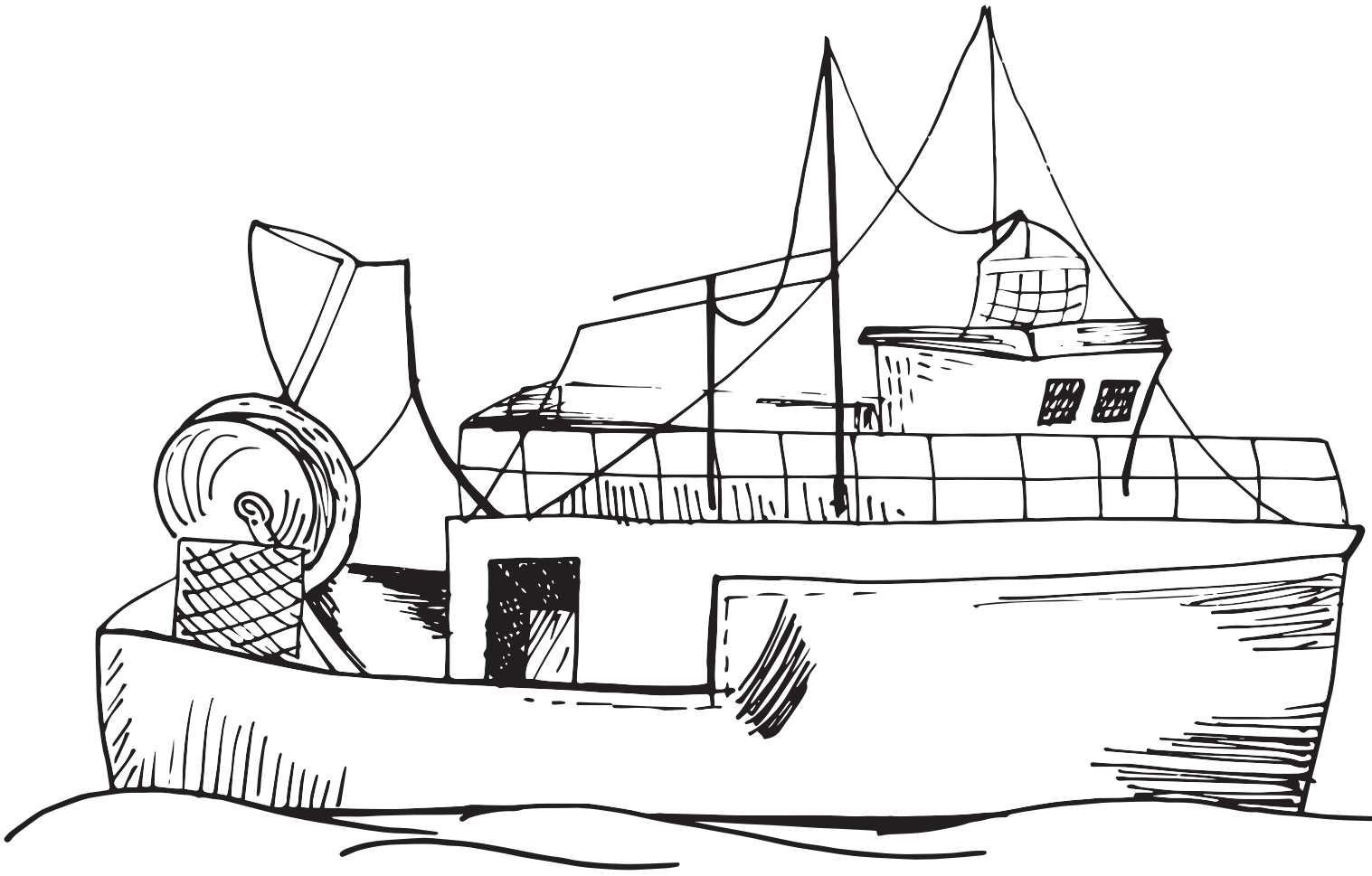
Bycatch my catch

| Exploring the potential value creation of bycatch |

Preface



This study is the result of empirical data collection on the fishing industry and bycatch, with the case of the Port of Hanstholm in Nordjylland, Denmark. In this project, multiple realities of the fishing industry relative to bycatch are unfolded, aiming to reveal a potential for utilizing bycatch to increase its business value. The project applies a *Design Thinking* perspective with *Multiplicity* by Annemarie Mol, as the theoretical framework for integrating Business Model Canvasses to explore *Value Proposition*s. The data collection consists of observations at the Port of Hanstholm (Denmark) and the IJmuiden Harbor (Holland), along with five expert interviews and a focus group discussion.

Due to the implementation of the landing obligation in the fishing industry, fishermen are forced to land all catch, leading to expected increases of landed bycatch. Today, the primary use of bycatch is in production of fish meal, fish oil and biogas, only yielding minor profit. Current studies focus on legislative, managerial and technological improvements to reduce bycatch-rates, however, despite innovations in technologies, bycatch cannot be avoided completely. A gap is revealed in customer-based initiatives compared to other problem-solving approaches related to bycatch in fisheries. This project aims at uncovering the potential use of bycatch by increased business value in a consumer-perspective. By exploring the first three phases of the Strategic Design Practice model, originated from the *Design Thinking* theory, this project should be considered as an important first step in research of identifying potentials for value creation, before proceeding to engage in creating a market for bycatch and addressing future challenges of the landing obligation.

Unfolding the complexity and multiple realities of the fishing industry has led to the conclusion that the fishing industry is multiple, fluid and enacts with many actors, discourses and elements, implying several realities, several ontologies.
Seeking for the potential of bycatch, to increase business value, led to the understanding that public negativity towards the Danish fishing industry, affects behavioral patterns of consumers through distrust. Turning this discourse could partly be done through providing and marketing products of bycatch. Examples of such could be by providing transparency, storytelling, competitive pricing and preparation instructions. Creation of such products are suggested to be retail-driven, focusing on the behavior, needs and desires of the consumer. The value creation of bycatch should not be addressed in the operational fishery, seeing as increased incentives to profiting from bycatch might remove motivations towards selective fishing among fishermen. Value creation of bycatch should be addressed in other parts of the value chain.

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Chapter 1

Introduction

Topic of inquirery

The *landing obligation*, commonly referred to as the *discard ban*, is a new legislation introduced in the European Union (EU). It aims to face challenges in the fishing industry in relation to e.g., unselective fishing practices, stability of fish stocks and ecologic impacts from fisheries (https://www.wur.nl/en/Dossiers/file/Discards-Unwanted-catch.htm, 2017). The incremental implementation of the landing obligation dictates that discarding of both quoted pelagic and demersal fish, will become illegal. Pelagic fish species live neither close to the bottom nor near the shore while demersal fish live on or near to the sea bed. Discarding, the practice of returning fish back to the sea, is generally viewed as a wasteful practice that contributes to the reduction of fish stocks and harmful to ocean environments (Vassilopoulou et al., 2013). However, there is great uncertainty in relation to the quantity of discarded species and bycatch, leaving mostly qualified estimates.

Figure 1 / Discard practices
Returning fish back to the ocean

The landing obligation will be fully implemented in 2019. This legislation has become important in relation to discarding quoted, but undesirable fish of little to no commercial value. The introduction of the landing obligation has raised concerns among workers and experts within the industry (Appendix 2; Appendix 4; Appendix 5). Concerns regarding e.g., survival of small-scale vessels, continuing of discarding as an illegal practice and expected increases of landed bycatch. This project revolves around bycatch in primarily Danish fisheries, and the persistent challenges brought forward with the landing obligation.

Despite fishing selectively or not, catch will consist of more than only full-size targeted commercial species. Catch can include other *(non-)commercial* species, *undersized* fish and *benthos*. These fish are considered as (un)wanted bycatch. Prior to the implementation of the landing obligation, fishermen could return (un)wanted quoted fish back to the sea if it did not live up to the composition of the target catch (https://www.wur.nl/en/Dossiers/file/Discards-Unwanted-catch.htm, 2017).

Discarding is widely considered as waste of resources, that could otherwise be suitable for either direct or indirect human consumption, animal feed, cosmetics or biogas. In *A study of the Options for Utilization of Bycatch and Discards from Marine Capture Fisheries* (1997), attempts and tendencies from all over the world are brought together, in order to research the potential for discards and bycatch in fisheries (Clucas, 1997). One of the earliest documented effort on utilizing bycatch as a valuable resource is from Guyana, dating back to 1970, by aiming to make use of local raw materials in order to reduce the dependency on imports. Several examples have since been initiated to make better use of resources but: *"... each location and each set of circumstances require different solutions"* (Clucas, 1997). The resources and raw material may be the same, but the solution does not apply to all contexts. Successful production and commercialization of a bycatch product is highly dependable on market forces and socio- economic conditions, then on the actual ability to make the product itself (Clucas, 1997).

Discarding causes a problem in terms of mortality among marine life and the total biomass of fish, seeing as the majority of the catch either dies when returned to sea, or shortly thereafter (Clucas, 1997). Naturally this causes a wastage in present and future resources of the fish stocks. A key informant in this project, estimates that there is a survival-rate of 10-70% when discarding, depending on the catch method (Appendix 5).

The expected increase in landed bycatch has raised awareness among industrial-, as well as, governmental actors. In May 2017, the Danish Ministry of Environment and Food, issued a competition on how to make best use of the expected increase in volumes of bycatch. The winner is offered one million Danish crowns on one condition, that the idea is carried out and realized (mfvm.dk, 2017). Industrial actors have begun exploring possible scenarios of product development. Resource efficient procedures, to put waste into use, are currently attempted by Amanda Seafoods, one of the large-scale fish processing companies in Denmark. They are currently experimenting with producing sausages made from bycatch (lbst.dk, 2017). This example however, is targeted towards the Middle-East, where fish consumption is rather the exception, than the rule. Similar projects have not been identified in Denmark during this project.

The main concern regarding the landing obligation is that fishermen will be forced to seize fishing activities and land all catch, including wanted and un-

wanted bycatch. Today, bycatch is often sold to processing plants, such as fishmeal factories where it is turned into animal feed or fish oil, or to energy companies turning waste into biogas. Both options offer very low profits. Despite those utilizations of bycatch, due to operational costs it is commonly destroyed, yielding nothing (Appendix 1; Appendix 2; Appendix 4).

This project seeks to explore the market potential of bycatch, by contributing to an increased business value, from a consumer-based perspective. As later argued in *State of the Art*, efforts concerning challenges of the landing obligation and the expected increase of bycatch, have mainly been addressed in a perspective of managerial and/or technological improvements, focused on limiting the amounts of bycatch. However, bycatch-rates cannot be expected to be avoided completely (Appendix 1; Appendix 3; Appendix 4).

The project applies methods and theories, that contrasts but contributes to previous research projects and initiatives. The overall framework is based on *Design Thinking* whilst applying *Multiplicity*, *(situational) mapping*, *personas* and *Business Model Canvasses* (abbreviated as BMC) as main contributions to the *theoretical* and *methodological framework*. The empirical data is gathered through *semi-structured interviews* with experts, *field observations* and a *focus group* discussion. The project is applied to the case of the Port of Hanstholm in Northern Jutland, Denmark. Hanstholm is home to the largest fishing port in Denmark concerning fresh fish and the third largest in Europe. The majority of the empirical data is collected here, along with an interview and observation at the Wageningen Marine Research (WRM) department at IJmuiden Harbor in Holland and two interviews conducted at Aalborg University in Copenhagen.

A *problem satement* and *research question* based on this introduction will be presented in the following chapter.

Chapter 2

Problem statement

Problem statement, research questions and delimitations

The landing obligation and its restrictions on discarding will have an expected effect on fisheries through all member states of the EU. Regardless of the estimates on actual percentage that bycatch will impound, handling bycatch requires e.g., storage space, time, knowledge and economic resources, that would otherwise have been allocated to target catch (Appendix 2; Appendix 4). Due to the fact that bycatch has little to no value, along with a descent in the amounts of storage for commercially viable catch, cause great challenges regarding potential loss of profits and emerging challenges regarding the extra volumes of bycatch. By banning discarding practices, unwanted catches will require additional resources both at sea and on land. Species formerly discarded, due to either high incidences of juvenile (undersized) or low commercial interest will potentially restrict fishing activities directed at other quota species (Catchpole et al., 2017). As stated in the introduction, bycatch is most commonly sold to processing plants or energy companies with little profits, if it is not destroyed. Naturally this presents a degree of wastage, either in terms of loss of profits, or the waste of a resource that could serve as human nutrition. As later argued for in *State of the Art*, the majority of current efforts in addressing these challenges, is mostly related to reducing the amounts of bycatch through discussions on managerial systems and technological improvements. Since bycatch cannot be completely avoided, this project seeks to uncover the potential use of bycatch, by looking at possibly increasing its value.

This is what has led this project to work with the following research question.

2.1. Research question

How can a Design Thinking perspective help unfold multiple realities of the fishing industry and reveal potentials for utilizing bycatch to increase business value?

2.2. The aim of the research

The purpose of this research is to uncover the potential of introducing bycatch to the commercial market through incentives towards increasing its business value in a consumer-based perspective.

The aim of '*unfolding multiple realities of the fishing industry*' is to unveil the complexities and controversies in the fishing industry according to key experts, by gaining knowledge of the current developments in the industry and bycatch's integration in it. The initial research of the industry functions as the fundament to further researching the *problem statement*. The unavoidable amounts of bycatch and/or little attention towards exploring retail and consumer-based methods for utilizing bycatch, is a main motivation to '*revealing the potential for utilizing bycatch to increase business value*'. This can serve as an important initial

step to research in product and concept development for commercial uses of non-commercial species, that are seen as bycatch. The approaches chosen for this project can help uncover complexities in the fishing industry related to bycatch and put them into a context that can be of interest to certain consumers, hence also of interest to the industry.
In order to do this, it is necessary to portrait and understand the landscape in which these challenges of the landing obligation take place. Before applying a consumer-based approach, vast amounts of research into the legislative framework and the many chains and activities of the fishing industry, will be conducted. By adding this knowledge into preparing the empirical data collection, discussions with key informants can be conducted more qualitatively, as opposed to relying on them for general and descriptive explanations.

2.3. Delimitations

Following delimitations define parameters and boundaries that have been set for this study. Delimitations are addressed within three main areas, the aim of the study, the field of investigation and the design process.

This project seeks to uncover the potential of introducing bycatch to increase business value. However, the purpose of increasing business value should not provide an increased profit to those practicing fishing, as it could reduce motivation towards selective fishing, hence the purpose of the landing obligation. This study delimits itself from seeking for a possibility to increase fishermen' earnings by making use of bycatch. In addition, this study does not aim to reveal the potential of utilizing the following types of fish that falls under the heading (un)wanted bycatch: juvenile fish, non-targeted commercial species or choke species.

Delimitations are identified in relation to the field of investigation regarding current legislations and technological innovations. This study delimits itself from researching *how* or *why* legislations and technological innovations can be introduced and implemented to reduce bycatch-rates.
In addition to the field of investigation delimitations, this study does not account for the developments of fisheries in all EU member states. It mainly focuses on the Danish industry, the Port of Hanstholm in particular, with inspiration from empirical data collected in the Netherlands.

Delimitations of the study design regarding the exclusion of specific phases of Strategic Design Practice model, based on the *Design Thinking* theory are addressed. Given the extra efforts put in to understanding and collecting empirical data in the fishing industry prior to further research, it has not been possible within the timeframe of this thesis to reach the *fulfill* and *fabricating* phase i.e., the final two steps of the *Design Thinking* framework.

“How can a Design Thinking perspective help unfold multiple realities of the fishing industry and reveal potentials for utilizing bycatch to increase business value?”

Chapter 3

Thesis outline

Reading guide

The following paragraph provides a reading guide of the report. The topic, context, *problem statement*, research questions and delimitations are introduced above. Further research, research methods and theories, analysis and study results will be presented in the following chapters. Starting with a clarification of the research field in the background chapter. Followed by chapters on *methodological* and *theoretical frameworks*, after which research findings and an analysis on both empirical data and implemented methods are presented. The results of this work will be discussed together with the validity of methods and theories along with future perspectives in the end of the report, leading to the conclusion of this thesis.

Chapter 4

Background

Gaining ground

The following chapter provides the sufficient information to determine an understanding and contextualization of the overall framework that this project is subject to. This section on background information is mainly based on literature research and parts of the *empirical findings*. In order to paint the landscape in which this project is placed and provide the reader with the necessary glossary of key terms, it should aid in untangling certain aspects of the legal framework and management systems within the fishing industry. This field is subject to an overall complexity calling for a need to supply the reader with proper background information and the urgency of clarifying central topics of both the legal framework and management systems.

4.1. Fishery management

In recent years, the fishing industry have undergone major political changes. Developments of management systems have been put in place to 1) maintain stock reproduction for high and long-term yield, 2) lay the foundations for a profitable industry, 3) externally share and distribute fishing opportunities fairly and 4) consume marine resources (European Commission, 2016a).

According to the European Commission (2016b), fisheries management can take form of *input control*, *output control* or a combination of both. Input control includes e.g., the regulations on water access, which means that every vessel is controlled in terms of where to fish; which waters and fishing grounds. Limiting the volume of fishing activities is another aspect of input control and falls under the term *fishing effort control*. The last input control facet is regulating when and where fishermen fish, as part of the technical measures and also entailing regulations on gear usage or gear selectivity (European Commission, 2016b).

Limiting the amounts of allowable catches is part of the output control. To control the allowable catch, catch limits are introduced in the fishing industry for most commercial fish stocks. In the sector, these catch limits are known as *Total Allowable Catches* (TACs). The European Commission states that advisory bodies, such as ICES and STECF provide scientific advice on the stock statuses, this advice servers as the fundament of the TACs. Each year, TACs are re-established by the council of fisheries ministers for almost all stocks (European Commission, 2016c).

In Europe, TACs are divided between EU countries where every country is allocated a fixed percentage, varying from each stock of species. These shared TACs are known as national quotas and each EU country can exchange their quotas between other EU countries (European Commission, 2016). This system is called *relative stability* and has the aim to guarantee that national quota distributions endure constant in relation to each other (Seafish.org, 2018a).

Within a country, quotas are one kind of catch share and are called *Individual Fishing Quota* (IFQ) or *Individual Transferable Quota* (ITQ). Quotas can be bought, sold and transferred (Appendix 2).

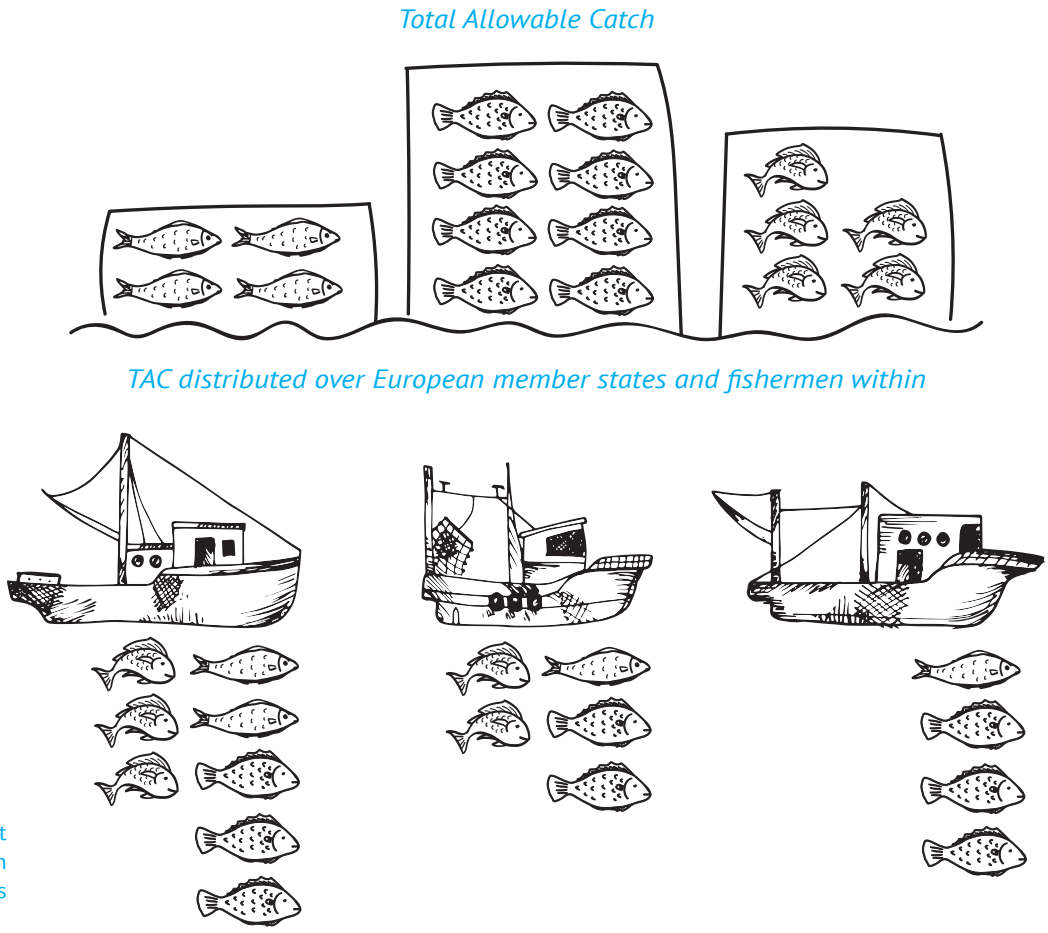


Figure 2 / Catch shares
EU's TAC management and quota distribution over EU member states and fishermen within

In the council regulation (EU) 2018/120, all catch limits for the year 2018 and 2019 are defined. This regulation *"fixes the fishing opportunities available in Union waters and to Union fishing vessels in certain non-Union waters, for certain fish stocks and groups of fish stocks"* - European Commission (2016b).

To give the reader an understanding of current quoted fish, an overview of all quoted fish species for the year 2018 can be found in appendix 7.

4.2. Bycatch and discard

"Operational definitions of what is meant by bycatch are frequently not available in published literature" - Alverson et al., (1994). In our project, research (both desk as field research) is conducted to define the term bycatch. The term bycatch can have many different meanings to e.g., environmental groups, politicians, fishermen and individuals of the masses. This means that the term bycatch is

substitutable with the catch of sea mammals and other high profile marine life, but bycatch is also associated with waste and non-targeted species which also includes juvenile species and specific sexes. *"The use of the term bycatch adds considerable confusion to a topic that is already complex to both scientists and managers",* and *"yesterday's bycatch may be today's target species"* - Alverson et al., (1994).

According to the paper *A study of the Options for Utilization of Bycatch and Discards from Marine Capture Fisheries*, the fishing industry uses the term bycatch in different ways. Clucas (1997), emphasizes three accepted definitions of the term. The first use of the word, defines bycatch as the catch being any non-targeted fish, weather retained, sold or discarded. The second definition refers to bycatch as the wrong species/sizes/sexes of fish, and is therefore discarded by fishermen. And lastly, the third explanation of the term is that bycatch includes all unwanted mollusks, non-commercial shellfish and protected or endangered species such as sea turtles, sea mammals and sharks and their relatives.

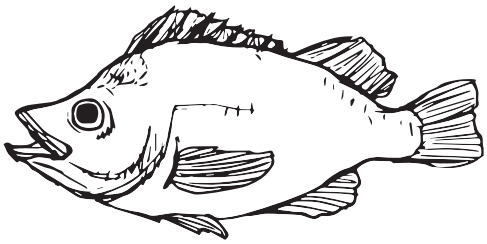
As found in through empirical data, the definition of bycatch distinguishes between *wanted bycatch* and *unwanted bycatch*. Wanted bycatch can be defined as un-targeted commercial species which still have value. Non-commercial species, with less value, belong to the term unwanted bycatch. According to several research participants, juvenile or damaged (commercial) species belong to this definition as well. Juvenile species are undersized fish, which are below the *Minimum Landing Sizes* (MLS). In order to lower waste, it is legal to sell undersized catches for non-direct human consumption. It is a central task, within the industry, to secure proper uses of undersized species, without creating a desirable profitable market for it. EU states are obliged to help fishermen with both storing and finding a use for these species (European Commission, 2016a).

An exception to the rule are *choke* species. Choke species are mostly commercial species with no quota or a very low quota. SeaFish (2018b), a non-departmental public body, states that choke species are the first species for which quota would run out on a vessel.
Different fish species live in the same habitat, therefore it is rather difficult to catch only the target species. This leads to catching other species too, even the species which have no quota left or are un-quoted (Appendix 2). The landing obligation forces fishermen to land all species, even the species with zero quota or those for which fishermen have reached their quota maximum. Landing zero-quoted species can result in mitigations, or even worse, a forced interruption of fishing activities (Appendix 2). Therefore, choke species are defined as unwanted bycatch as well.

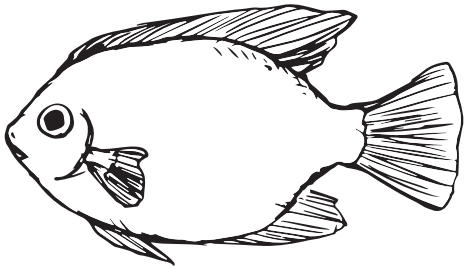
Prior to 2015, returning unwanted bycatch to sea was considered legal. This practice is commonly known as discarding. *"Discarding is the practice of returning unwanted catches to the sea, either dead or alive, because they are undersized, due*

to market demand, the fisherman has no quota or because catch composition rules impose this" - European Commission (2016a).

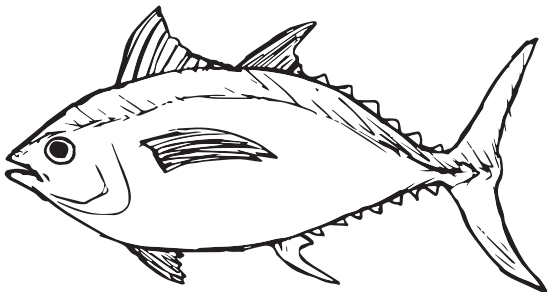
With the landing obligation, fishermen are not allowed to discard quoted fish and therefore has to navigate in two determining factors; regulations and the market (value). As the European Commission highlights in their definition of discarding, there are many reasons to discard fish (European Commission, 2016a).



1. The catch has little or no value



2. The catch has little or no value

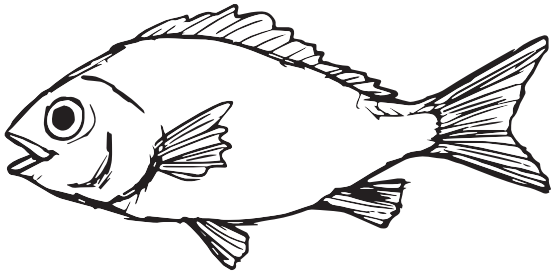


3. The catch may not be landed according to the regulations

a. The fish are undersized;

b. The fisherman has reached his quota;

c. The fish is a protected species.



4. Other fish sizes are more interesting (money and quota wise). However, this practice called 'high grading' is forbidden

Figure 3 / Discards
Main reasons to discard according to the European Commission, 2016

4.3. The landing obligation

The European Commission introduced a proposal for new legislation in the fishing industry in 2011, the landing obligation. According to the European Commission, the landing obligation *"... requires all catches of regulated commercial species on-board to be landed and counted against quota"* - European Commission (2016a). The proposal came through in 2013, when the European Parliament and the European Council voted in favor of the policy.

The landing obligation, also known as the discard ban, was introduced with the aim to reduce the amounts of unwanted catches and wasteful practices, motivate selective fishing practices and ensure reporting and data collection of fish stocks (European Commission, 2016a; Appendix 2; Appendix 4). The expectations of limiting discarding practices on quoted species are through increased investments in innovations ultimately leading to more selective fisheries, with less ecological impact and healthier fish stocks. Selective fishing depends on a number of factors and not only on the benevolence or the behavior of a fisherman. It is dependent on e.g., financial resources, fishery technology- and methods, mesh sizes, target species, season and weather, the fishing area and location. A selective fishery has the aim that translates into a profitable and healthy fishery in the longer term (https://www.wur.nl/en/Dossiers/file/Discards-Unwanted-catch.htm, 2017).

In an easy-to-understand guide to simplify the landing obligation, Seafish (2018c) states that the it is implemented in phases to allow time for fishermen to adapt their fishing practices to this new legislation. In 2015, the implementation of the landing obligation began in the pelagic fisheries. Several species such as mackerel and herring now had to be landed if/when caught. In 2016 the implementation of the landing obligation began in the demersal sector on certain species, such as Haddock, Sole and Plaice. The landing obligation will be fully implemented in 2019, on all commercial (quoted) species (Seafish.org, 2018c).
There are exemptions to the discard ban, as non-quoted- and endangered species are not part of the landing obligation and can therefore still be discarded.

Regional groups of the EU member states of the EU are the authorities on making exemptions and controlling the phasing of implementations. These will also conduct regulations and evaluations upon which the quotas are decided. This includes: *"... the species covered, provisions on catch documentation, minimum conservation reference sizes, and exemptions (for fish that may survive after returning them to the sea, and a specific de minimis discard allowance under certain conditions)"* - European Commission (2016a). These have a maximum span of three years, after which they will be implemented into multi annual plans.

Summing up

Fishery management

Input control - regulations on water access that controls where fishermen fish. Another aspect of input control is limiting the volumes of fishing activities, that is called fishing effort control. *Output control* - includes limiting the amount of allowable catches, which is done by *Total Allowable Catches* (TACs). TACs are based on scientific advice on fish stocks and are divided between EU member states. Within each member state, quotas are called *Individual Fishing Quota* (IFQ) or *Individual Transferable Quota* (ITQ). Quota can be bought, sold and transferred.

Bycatch and discard

The term bycatch can be divided into two, *wanted bycatch* and *unwanted bycatch*. The term wanted bycatch can be defined as un-targeted commercial species which are high in value. Non-commercial species, with less to no value belong to the term unwanted bycatch. *Choke species* are commonly commercial fish species with a high market value, however, these species can pose challenges due to zero quota or very low quota. Unwanted catch can be discarded and thus returned back to the ocean.

Landing obligation

The landing obligation, or *discard ban*, is a new legislation that will be fully implemented in 2019 on both quoted *demersal*- and *pelagic* fish species, aiming for a more selective fishery with a less ecological impact and better fish stocks.

The context description above is based on mostly literature research and partly results from the empirical data. It serves as the overall legal- and managementorial framework where further research is built upon. The literature search is presented in the following chapter.

Chapter 5

State of the Art

Literature search and State of the Art

5.1. Literature search

The first step in the research process is a literature search to open the field and gain a better *understanding* of the fishing industry in general (partly presented in the background chapter). In line with the background chapter, this literature search and *State of the Art* focuses on obtaining knowledge through governmental-, cultural- and economic aspects related to the fishing industry and exploring the research field related to previous and current developments in the fishing industry.

Google Scholar, ProQuest, Ebscohost serve as the main online databases from where the literature search was conducted. Governmental sites and web pages of (educational) institutions aided in selecting data as well. Journals, articles and other documents were selected and used in the report, with English, Danish and Dutch keywords.
Due to the absence of scientific literature on e.g., a general analysis of the (Danish) fishing industry, experiences with the newly introduced landing obligation and the business value of bycatch in Denmark, following keywords were used in the search to lay the foundation for further research and analysis:

Landing obligation, discard, bycatch, innovation, fishery.

This chapter consists of elements that are important to understand the field of research in which this project is centered. The research has been aimed at investigating what is already known on the topics (and topics related to it) and what kind of methods and theories have been applied in other research projects.
This includes references on specific fishery-related subjects, as well as studies that have been of inspiration to the choices of methods and theory for this project. In addition to that, academic research and findings relative to the *problem statement* of this project will be presented.
It is important to note, that no material was found that could serve as an overall description and analysis of the Danish fishing industry. Therefore, it is necessary to gather data, by literature- and empirical research, that can inform *how* different areas and activities of the fishing industry systematically coexists, but as separate pieces of a larger puzzle.
Not only are the findings and results of current available material of importance, but also the theories and methodologies which are applied to it. By looking at *how* previous research and conclusions have been gathered, we are better equipped at understanding and reflecting it in reference to its assessment in this project.

5.2. State of the Art

This field of research is highly influenced by complexity and controversy among its human- and non-human actors, as well as stakeholders of in-direct relations. Naturally, this results in a rather complex set of legislations and management systems. These have been central to include in order to properly understand the historical development, that has shaped the current realities and challenges of the fishing industry in Denmark. Both in general as well as specifically related to bycatch. There are several initiatives which link governmental actors of the industry with initiatives working to develop technology in the industry, in order to comply with changes in the political landscape. This part will be briefly touched upon, as reviewing relevant literature in line with the scope of the project was prioritized higher. Due to the expected challenges that the implementation of the landing obligation will bring to this specific area of the fishing industry, there are currently many projects working to limit the amounts of bycatch.
The timeliness of the subject is visible in North Jutland, where Growth Forum in Region North Jutland, the Danish Ministry of Food and several companies in the industry, in cooperation with Aalborg University, Technological Institute of Denmark, SCP Consult and the North Sea Science Park through a catalogue for the development of the fisheries in Northern Jutland (Eliasen et al., 2015).

Jentoft (2004) argues how the understandings of institutions in fishery management is central in the discourses revolving the industry. He argues that the perception of institutions is a key component in making more effective management systems. By drawing on social sciences, he addresses a need for institutions that are able to encompass a wider spectrum of perspectives, in order to be open to more options for intervention and improvement. A system that can accommodate a broader sense of social and cultural understandings in fisheries management, in order to have a less-restricted view on how to address future challenges (Jentoft, 2004). This is complemented by Johnsen & Eliasen (2011), who, in a study to explore problem-solving in discarding of fish, analyzed institutions and arrangements in Denmark, the Faroe Island, Iceland and Norway. They found that problems such as discarding, are multi-faceted and can not only be solved through technical and regulatory adjustments alone, but by embracing structures that can facilitate more overall cultural changes (Johnsen & Eliasen, 2011).
Another study by Eliasen (Eliasen et al., 2013) explores how discarding practices and behavior among fishermen is influenced by several factors. In a cross-case study in trawl fisheries in Denmark, England and Greece, Eliasen found that fishermen's practices are much related to interactions with; 1) *state* - the legislative and managerial framework of their profession, 2) *community* - the daily practices, discourses and social interactions among fishermen, colleagues and the public, and 3) *market* - the arena and competitive setting in which products and prices are compared to the marketing and sales of fish, in the end determining the profitability of the catch (Eliasen et al., 2013).

Figure 4 / Fishing trawler
Vessel going out to fish

Due to the vast amount of references and the limited scope of this project, we will limit ourselves to acknowledging, that a quick search through the preferred research database, revealed many relevant results as to initiatives on reducing amounts of bycatch in Denmark, through improvements in fishing methods and technology.
The number of available sources has forced the inclusion of references that best portray the link between the complex political landscape with studies revolving around themes and methodologies relevant to our particular project and study design.

5.2.1. Innovation in the fishing industry

The fishing industry consists of many activities and stakeholders across sectors. This means that when researching a field like this, one has to keep a wide perspective as to suggesting implementations or looking for potential improvement and room for innovation.
Christensen et al., (2015) published a study, examining innovation activities in the Danish *Agricultural, Forestry and Fishing* industries (AFF). Twenty percent of Danish exports derives from these industries. Despite of this, studies on innovation in this field have been limited. Findings from studies, referenced throughout the article of Christensen et al., (2015), have shown that collaborations and knowledge sharing between companies are key to innovation and that it differs greatly depending on the size of a company. Even though AFF industries are perceived as rather low-tech, there are lots of innovation processes taking place.
The study explores these patterns and how size, geography and customers influence innovation in the Danish AFF industries. The Danish AFF industry consists of 8,520 companies. 1,283 companies were approached for this study, whe-

reof 372 companies have more than 10 employees. Because this study focused on larger companies, with five or more employees, all 372 companies were contacted, with a response rate of 58 percent.

Due to the fact that the AFF industry consist of various activities and fields of expertise, the study was divided in sub-industries; cultivation, farming, market gardening, service and fishing in order to systematically approach the empirical analysis.

In the literature review they highlight that constant transformation and cross-sector advancement are making innovation a vital part in maintaining industrial relevance (Christensen et al., 2015). Through interaction with other companies, suppliers, customer, universities etc., external knowledge is becoming increasingly important in innovation activities. In systematic approaches innovation can become embedded in the innovation system, both internally and externally of companies. In the AFF industry, innovation is often based on individuals interacting in institutional contexts. It is important to view *who* and *how* they have affected innovation processes and interactions and how this has affected the institutional outcome and vice versa (Christensen et al., 2015).

There is a correlation between geographical proximity and innovation activities. Companies with lots of innovation activities are often located close to bigger cities. It is suggested that demands can be higher near large cities, which can increase the need for innovation. The same goes for the size of companies. Although the size of companies in the AFF industry can be hard to define precisely, the size influences internal knowledge capacity, resulting in less external advice knowledge-sharing. The same goes for resources and activities in marketing and advertisement that are proven to have great effect on companies in the food industry and their ability to innovate successfully (Christensen et al,. 2015).

The distance between producers and their end-consumer is another aspect that could be of relevance. Innovation surveys show that the customers are the primary source of innovation. In the AFF industries, the customer may be in different areas of the value-chain, as either wholesalers, retailers or end-users, but there is evidence that close links to retailers stimulate innovation, because they are better at catching signals from the end-users. This is an interesting point in exploring the potential value creation of bycatch, seeing as the target group in this project is located across the country in Copenhagen.

In summarization, Christensen et al., (2015) suggest four patterns in innovation in the Danish AFF industries:

- Innovations are dependent upon collaboration and are embedded in a broader innovation system;
- Geographical location matters to innovation;
- Size of the firm is positively correlated to innovation;
- Innovation activities may be more or less emphasized depending on the primary consumer.

(Christensen et al., 2015).

Christensen et al., (2015) make use of quantitative and qualitative approaches.

By applying large-scale surveys and qualitative case studies they seek to identify the drivers of innovation in the AFF industry, while also quantifying its innovation activities. The first part seeks to explore more general patterns, where the second part is about exploring specific patterns more qualitatively. The use of a case study can then be used to supplement the interpretation and analysis of empirical data.

This study shows how an overall case study approach can be combined with qualitative methods to explore large-scale patterns. Although being supplier-driven, 46 percent of the respondents claimed to have activities in innovation. By analyzing such patterns, Christensen et al., (2015) found that a company's size, along with its proximity to larger cities, was highly influential to the level of innovation and external collaboration. In the study, they speculate if these findings also make up for an innovation potential in regions farther from major cities in Denmark.
They conclude that product and process innovation in particular, did not match the efforts found in other industries. The same was concluded for external collaboration and external knowledge sources, which was not considered an important part of the current state. By far, most innovation activities were found internally in the companies, rather than through co-operations external communication. Christensen et al., (2015) suggest, in contrast to their findings, that external knowledge sharing in the AFF industries is vital to innovation. It might simply not be considered as so, due to its integration in institutionalized knowledge systems, and therefore negligence of it. Overall, there is found little knowledge on innovation in this sector, so this study represents a first step into the field of research.
This study highlights the benefits of the combinations of methods, that the knowledge had not been obtained by e.g., a quantitative-only approach. Likewise, has the usability of bycatch not received significant amounts of attention from an academic research-perspective.

5.2.2. Mapping

Adele Clarke (2005) argues, that mapping can be applied both qualitatively and quantitatively in many magnitudes.
The following project is an example of how mapping is often used within fishery, as a large scale quantitative tool for analysis.
By Lewison et al., (2009) mapping has been utilized in efforts to highlight areas more prone to bycatch in the Atlantic and Pacific Oceans. Although the main concern is conservation of endangered species of sea turtles, birds and sharks. The study shows a practice where mapping plays a vital role. Similar to this, mapping has been part of the *methodological approach* to identifying mapping local bycatch hotspots by Cambiè et al., (2012).
The oceans and its life within are not constant factors. Spatial locations are important when designing and managing efforts, such as identifying areas for

reducing bycatch levels by e.g., locations of certain mitigation practices, temporary closures or efforts on re-distribution (Lewison et al., 2009). The article suggests mapping over long periods of time as a tool to highlight more patterns, more precisely. The findings of this article are critical in understanding and mapping particular fisheries' effects on bycatch.
The article suggests a future focus on multiple fisheries and species, as opposed to single species and particular fisheries, because it would address the challenges of fishermen more realistically, given the catch composition cannot always be predicted to one species.
Lewison et al., (2009) present a new application of mapping used to study and analyze bycatch, as a tool for management frameworks to promote sustainable fisheries (Lewison et al., 2009).

Overall the article address three main questions:

- Does bycatch randomly occur across fishing locations?
- Are there spatially persistent areas of high bycatch within or among species?
- What is the relationship between bycatch and target catch?

There are multiple purposes of mapping spatial patterns:

- Describing spatial locations of bycatch for species under conservation concern can result in aggregations of other species subject to bycatch;
- Highlighting bycatch *hotspots* where fishing gears are encountering multiple species;
- Identifying hotspots can be important to facilitate efficient conservation planning;
- In a management and economic perspective analyzing bycatch relative to target catch, mitigation strategies can be assessed according to effectiveness and costs.

(Lewison et al., 2009).

The obtained data for this study is collected and mapped out in American Pacific and Atlantic longline fisheries from 1992 to 2005, as shown on the right.

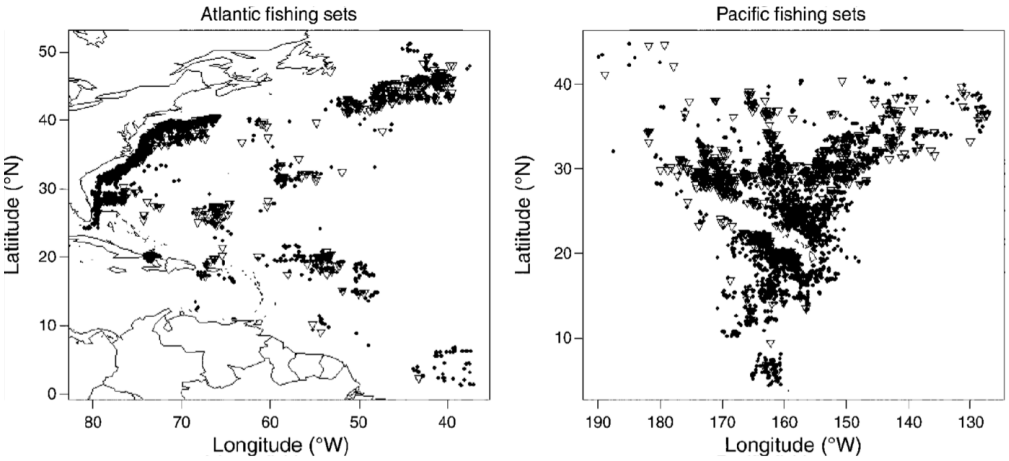


Figure 5 / Maps of American Pacific and Atlantic longline fisheries
Distribution of observed fishing sets with bycatch (open triangles) and without bycatch (solid circles).

These maps show the distribution of fishing sets, those sets that include bycatch are depicted with open triangles and those without bycatch with solid circles. The Atlantic Ocean is on the left map, the Pacific on the right.
Data is collected and grouped over time, with each fishing set being counted as one observation. The specific type of data, that is referred to is point pattern statistics and represents the collected data in similar duration and size of area, with the exact area as a variable. This method is commonly used to describe and statistically analyze spatial patterns (Lewison et al., 2009).
The objective is to illustrate complementary methods, to describe the spatial distribution and patterns of bycatch from fisheries. The use of statistical analysis suggests the probability of these to be representative of the whole population. Through the methodology, four steps are covered using statistical analysis and mapping.

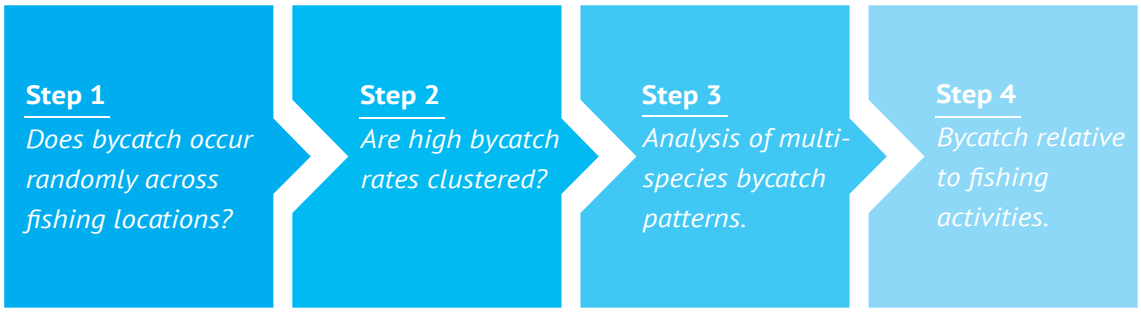


Figure 6 / Methodology steps by Lewison et al., 2009
Four steps using statistical analysis and mapping

The study found that the maps showed a clustered distribution of bycatch, indicating that some areas are subject to more bycatch than others. Likewise, a correlation was found between specific areas and high bycatch rates. Certain areas showed to be prone to high multispecies bycatch depending on the fishing effort and methods. In the Pacific Ocean areas of high bycatch rates also revealed low rates of target catch. This was not the case for the Atlantic Ocean (Lewison et al., 2009).

In reference to this project, the article by Lewison et al., (2009) shows how mapping is a versatile tool for (in this case statistical) analysis, as a stepping stone towards addressing challenges and further implementation in fisheries.
"We believe that the approach described in this study represents a useful starting point for researchers interested in exploring spatial patterns in fisheries bycatch" - Lewison et al., (2009).
The identification and mapping of spatial patterns can highlight areas that could be biologically and economically meaningful to apply focused management efforts. The maps have identified and displayed the patterns and the overlap between bycatch and fisheries. The approach should be viewed as part of a larger framework to analyze bycatch in a long-term perspective.

5.2.3. Mitigation

The landing obligation and its requirement to land all catch raises challenges regarding potential illegal discarding and mitigation processes if the legal boundaries are not being upheld (Appendix 2; Appendix 4; Appendix 5). As the previous study by Lewison et al., (2009) suggests, mapping can identify key areas when addressing managerial decisions and policy making such as mitigations.
Sigurðardóttir et al., (2015) have reviewed twelve proposals on mitigation processes to avoid illegal discarding, by analyzing their strengths, weaknesses, opportunities and threats, also known as a *SWOT analysis*.
In Danish fishery, there is a history of somewhat creative methods to avoid mitigations, as well as a long line of changes in an otherwise complex legal framework (Appendix 5), making mitigation processes an important influence on the daily fishing practices.
The purpose of this study was to serve as a frame of reference for when implementing future policies in fishery across the EU.

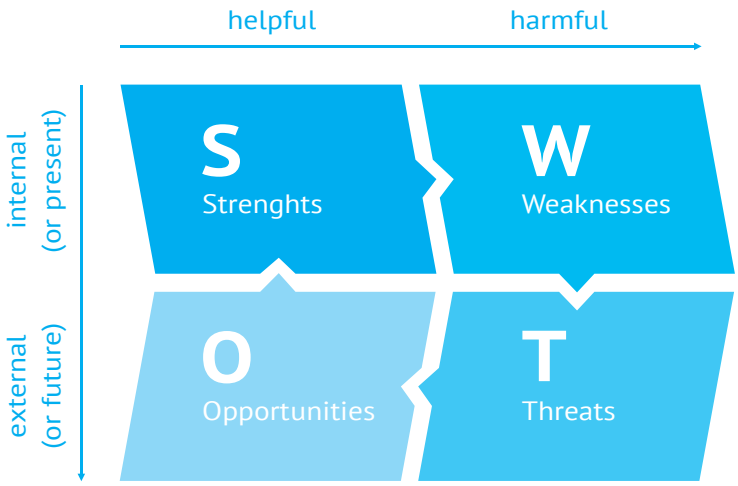


Figure 7 / SWOT model
Framework to analyze strengths, weaknesses, opportunities and threats.

The analysis is based on expert knowledge and experience, supported by literature. The SWOT method gives structure to analyze an organization's competitive

abilities, by focusing on four categories. This can provide an overall view to the organization's current resources and the environment in which it is placed, as well as possible strategic actions.
Sigurðardóttir et al (2015) apply the SWOT to each of the twelve mitigation approaches, to make a comparative analysis of the strengths and weaknesses of each one. The twelve mitigation approaches were identified during a workshop by experts in the field and were divided into five categories;

1. Total allowable catch (TAC) and quotas: controls how much is allowed to be caught (catch quotas) or landed (landings quotas).
2. Fishing effort and capacity: limits the amount of fishing activity, such as the size of the fleet, amount of time spent fishing or amount of gear deployed.
3. Technical: a range of regulations that define how, where and when fishing occurs, as opposed to 1 and 2 which affect the quantities of fish and fishing.
4. Social: methods and initiatives that affect the relationships between and perceptions of stakeholders, in particular fishers.
5. Market: actions and initiatives that modify the way fish are sold along the supply chain, from the vessel to the end user.

(Sigurðardóttir et al., 2015).

The experts performed a SWOT analysis on each of the twelve approaches, with environmental-, socioeconomic and compliance dimensions examined and combined in the results of the analysis.
The SWOT approach was found as a useful tool for reviewing mitigation methods and policy changes in reference to illegal discarding. It was concluded, that inviting more stakeholders to partake might strengthen and deepen the analysis further, as the views of experts proved to vary depending *what* and *who* they represented. This was viewed as a strength in the approach, as it made the project more comprehensive in terms of including more perspectives. However, other approaches should be included, as the SWOT analysis was discussed as too simplistic eventually.
The analysis showed, that based on a lack or misunderstanding of scientific material, introduction of new policies comes with a risk of oversimplifying policy-making. This can lead to quotas being based on skewed data.
Discarding is influenced by several factors, that are important when forming managerial directives (Sigurðardóttir et al., 2015). These factors, along with the overall contexts of management systems need to be in line to create a framework, that is considering all involved actors and the aim of the system. Discarding behavior is highly variable, influenced by several biological, technical and operational as well as socio-economic drivers (Sigurðardóttir et al., 2015).
"The whole management system needs to be thought of coherently to reduce or eliminate these incentives. It is only in this setting that discard mitigation methods are potentially effective" - Sigurðardóttir et al., (2015). Each mitigation method should not be implemented isolated, but instead combined with other approaches, that suit the interests of the stakeholders involved, as it will otherwise raise the potential for failure (Sigurðardóttir et al., 2015).

Summing up

The *State of the Art* shows that challenges regarding the landing obligation and bycatch are current topics in the Danish (and international) fishing industry on structural-, managerial- and operational levels. This section has explored sources with a connection to the research question in this project, both in terms of specific fields of research and the variety of methodologies applied to it.
Bycatch has proven to be a current topic in Danish fisheries, in large parts due to the implementation of the landing obligation and the expected increase in landed bycatch and challenges related to this.
This *State of the Art* presents an industry which is subject to a wide spectrum of changes and that such changes should be approached, or at least recognized, as multi-facetted.
As a result, this project takes a consumer-based approach, a perspective that has received less attention than e.g., technical innovation or legislative discussions. A proper understanding of institutions within the fishing industry is key in making management systems more effective. Technological improvements and regulatory frameworks alone cannot tackle future problems. There is a need to incorporate structures better equipped at identifying and handling social and cultural differences, in order for them to address and embrace future challenges of fisheries. As a result of this, this project is attempting to unveil the complexities within actors of the fishing industry and its current developments with the use of the theoretical framework *Multiplicity* by Annemarie Mol (2002), before addressing any potentials or possible answers to the *problem statement* and research question.
In the fishing industry innovation activities are dependent on external communication and cross-sectoral knowledge-sharing. There is a correlation between these factors and companies' geographical proximity to larger cities. This is a key argument for why this project has chosen to incorporate a consumer-based perspective in the retail sector. As well also be suggested later in the findings of empirical data, a retail-driven initiative have the advantage of being closer to the needs and desires of the end-user, the consumers. This was found of relevance due to a divide between practitioners of the fishing industry and the consumers, an argument also found in the empirical data (Appendix 5).
This is partly done through alternative approaches to mapping. Mapping have shown to be a viable tool to identify and analyze patterns, that serve as an analytical framework in addressing systematic changes. The SWOT, as described previously, will not be included further in this project. The use of the SWOT proved effective in identifying e.g., strengths and weaknesses of specific mitigation methods, as it found that misunderstandings or lack of scientific material cause oversimplifications of policies, such as quotas based on skewed data. The SWOT itself was reviewed as an oversimplified tool. Along with this, and the fact that this project does not rely on specific solutions to be reviewed, BMCs will be included instead in exploring potential value creation.

(Situational) mapping will mostly serve as an internal tool for opening up discussions and analytical considerations. But, more explicit mapping procedures will be included by the use of BMCs.

To create overview, the most important findings of the literature research have been gathered and categorized in a table, shown on the next page.

Contributor	Key findings	Method	Key words
Lewison, et al., 2009	Bycatch rates are clustered in areas and relative to fishing methods and efforts. Mapping is useful in targeting management efforts.	Mapping and point pattern statistics	Area pattern, Fisheries bycatch, spatial analysis
Christensen, et al., 2015	Innovation depends on collaboration and embedment in broader innovation systems. Closer proximity to larger cities increases innovation activities. Size of the firm is positively correlated to innovation.	Large scale quantitative surveys and qualitative interviews	Innovation, agriculture, knowledge sources
Sigurðardóttir et al., 2015	Discarding behavior is influenced by several biological, technical and operational as well as socio-economic drivers. The management system needs to be thought of coherently.	SWOT- and comparative analysis	Mitigation methods, Fisheries management, SWOT analysis
lbst.dk, 2017.; mfvm.dk, 2017	Bycatch is a current topic and is gaining attention from both industrial and governmental actors		
Eliasen & Johnson, 2011.; Jentoft, 2004.; Eliasen et al., 2015.	Improving discard behavior and minimization of bycatch are multi-facetted in assessment and should be addressed towards broad cultural changes in the whole sector to individual levels.	Cross-case studies	

Figure 8 / Findings
Most important findings from literature search

As touched upon, the findings during this literature research and *State of the Art* are central to the outcome of theories and methods applied to this particular project. Exploring a gap in the current field of research have served as arguments behind *methodological* and *theoretical choices* throughout the process of exploring potential value creation from bycatch in Danish fisheries.
Each choice has been weighed and argued for and against, as will be further explained in the sections on *philosophy of science*, *methodological* and *theoretical framework*.

Chapter 6

Philosophy of science

Researchers' scientific point of departure

The project is based upon a social research which draws upon a development in society – the implementation of the landing obligation in the Danish fishing industry and the challenges it brings regarding bycatch. With an interest in this field and only little amount of background knowledge, as argued in the *State of the Art*, the implementation of the new legislation served as point of departure.
The following section will give an understanding of the researchers' scientific point of departure. Assumptions regarding research, ontology, methodology and numerous approaches are incorporated in this section. The researchers' perspective has an influence on the study and various scientific paradigms guided the research.

This project uncovers questions and exposes information relevant to the social scientific field, integrating sociology, social policy and politics. However, explaining the field is not the purpose of this research; *understanding* it is. This means we approach the research with an *idiographic perspective*. The idiographic perspective focuses on the understanding of a unique and complex problem rather than *explaining* a phenomenon (Ponterotto, 2005). It is a descriptive and detailed understanding, which we will present in the case study to unfold this area of the Danish fishing industry by its complexities, challenges, discrepancies and possibilities.

While seeking the potential for value creation by utilizing bycatch, comprehending the system it is rooted in, is of great importance. Therefore, it is necessary to understand the overall complexity of the Danish fishing industry in general. By exploring the business potential of bycatch, with a consumer-perspective, it is of great importance to understand individual (human or non-human) entities, through in-depth insight of the ontologies of reality (Ponterotto, 2005). Understanding individuals guides and directs research outcomes. The focus of the study is consumer-based, there is a focus on the research participants' perspectives and thus their experiences. Lived experiences are crucial to human science. The aim of human science is *understanding* the meaning of social phenomena by those who live it day to day (Ponterotto, 2005). In relation to individuals' experiences, we emphasize a multiple constructed reality, known as the relativist position. Doing this, one true reality and thus the positivists or post-positivist perception is left in favor of the constructivism paradigm that assumes numerous, apprehend able and equally valid realities are formed in the mind of the individual (Ponterotto, 2005).

Qualitative research is linked to human science. Qualitative research has the aim to understand social phenomena in natural, emphasizing meanings, experiences and the views of the research participants, to capture their realities (Ponterotto, 2005). In qualitative research, data is collected, analyzed and interpreted as opposed to being expressed in facts and figures. The data is related to attitudes and behaviors of the individuals who move in society (Lucassen

and Olde Hartman, 2007). To reveal and unfold the complexities of the research field (consisting of 1) the fishing industry including the experiences of experts within the field, and 2) the retail sector with a customer-based approach, qualitative methods are chosen for this study). The best-known methods of qualitative research are interviews, observations and focus groups (Lucassen and Olde Hartman, 2007). A qualitative research strategy typically stresses words and the meaning/understanding of those words, rather than quantification in data gathering or the examination of it (Bryman, 2012a). According to Bryman (2012), researchers in a qualitative study are frequent users of Grounded Theory. In his book, Bryman cites Strauss in explaining Grounded Theory, *"The grounded theory is derived from data, systematically gathered and analyzed through the research process. In this method, data collection, analysis and eventual theory stand in close relationship to one another"* - Bryman (2012a).

The motivation behind this ontological view of the study design is related to previous mentions of innovation in the fishing industry being mostly dominated by technical and systemic improvements, hence efforts in reducing bycatch, regardless of the fact that bycatch cannot be avoided completely. By addressing the field in a human-centered approach, it can create an insight of how actors within the fishing industry perceive and work in the sector, and/or bring an understanding of potential customers, with the aim of exploring market potential of bycatch through understanding consumer needs. These motivations are supported in *State of the Art*, by the identifications by Jentoft (2004) and Johnsen & Eliasen (2011), who describe how institutions of the fishing industry needs to embrace socio-cultural differences in addressing future challenges and cultural changes, as opposed to relying on technological and regulatory optimizations.

Bryman (2012b) illustrates the main steps of qualitative research, shown in figure 9. A process closely followed in this project.

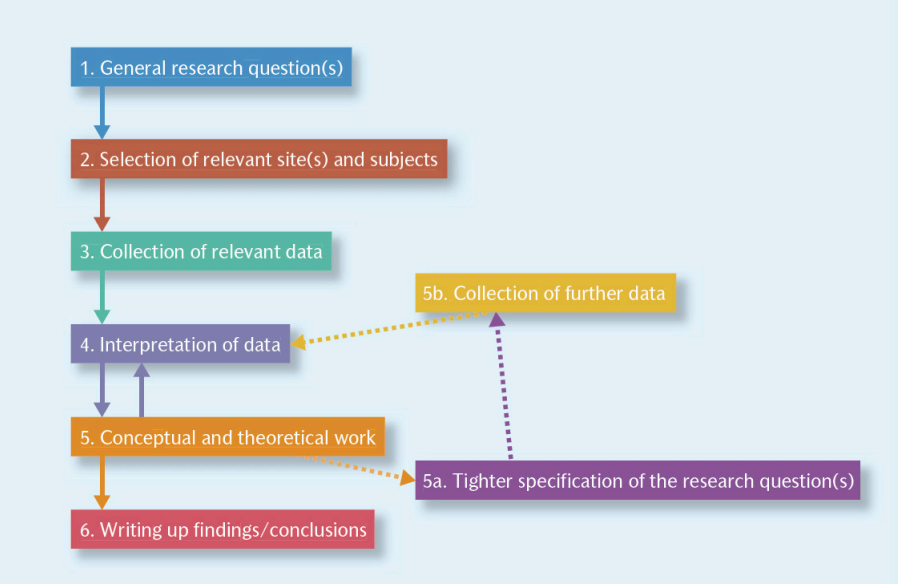


Figure 9 / Qualitative research
An outline of the main steps of qualitative research

Qualitative research is often linked to an inductive research approach or strategy. As previously stated, the aim of qualitative research is to understand a (social) phenomena by capturing different realities, meaning that it is not based on existing knowledge or facts (deductive reasoning), but on qualitative research methods that result in hypothesis and thus inductive reasoning. An inductive approach starts with researchers opening up the research field from completely blank, meaning no thoughts, expectations or hypothesis on the subject are present in the initial stages of the research. Towards the end of the research, the theory is proposed, as the outcome of the empirical data (Bryman, 2012b). Despite fact that qualitative research is commonly related to inductive reasoning, out-ruling the deductive approach is not the aim. According to Bryman (2012v), the inductive strategy contains deductive elements. Deductive elements are introduced when e.g., researchers begin the research with pre-assumptions or when an inductive study reaches its point where the theoretical consideration concerning datasets have taken place (Bryman, 2012b).
Taking in mind that the inductive strategy contains deductive elements, approaching the research field with an inductive strategy creates a rule based on a case and a result. Induction is exemplified below through a hypothetical example.

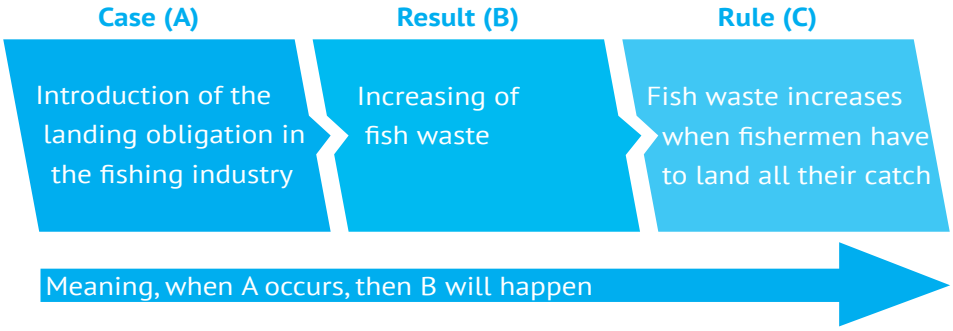


Figure 10 / Inductive approach

The inductive approach does not account for experiences that may prove the conclusion wrong and thus *"an inductive argument is one where the premises do not guarantee the truth of their conclusions"* - Kolko (2010). By incorporating *Design Thinking*, which will be explained in the theoretical framework, we move away from the inductive approach and move over to the abductive sensemaking process. Abduction gives the opportunity to check if the rule is true or false, by looking at the result first and comparing it with the rule and the case itself.

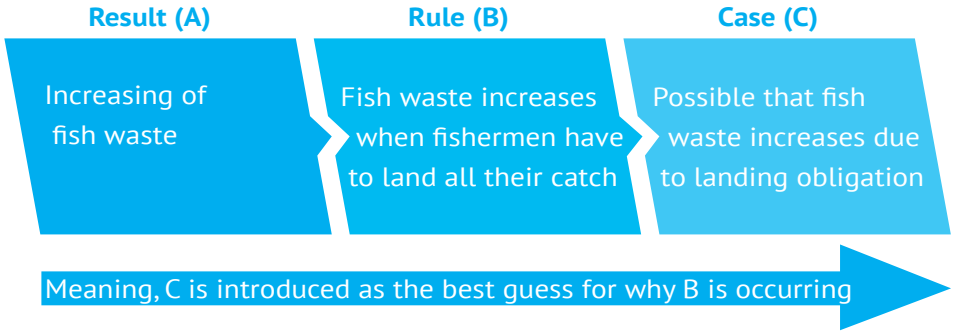


Figure 11 / Abductive approach

By introducing an abductive approach, it allows the researcher to present new knowledge and new insights into the study. Similar to the inductive approach *"the conclusion from an abductive argument might turn out to be false, even if the premises are true"* - Kolko (2010). However, unlike induction, working with abduction is a logic way of considering inference. Abductive reasoning takes in mind that the circumstances might be different when performing, experiencing or seeing something (Kolko, 2010). Abduction gives the opportunity to re-investigate a subject and gives the possibility to bring a new conclusion (the rule) to the table. Implementing an abductive approach to a research does not mean induction and deduction should be ruled out. As visualized in figure 12 below, both inductive- and deductive reasoning is part of the abductive sensemaking process.

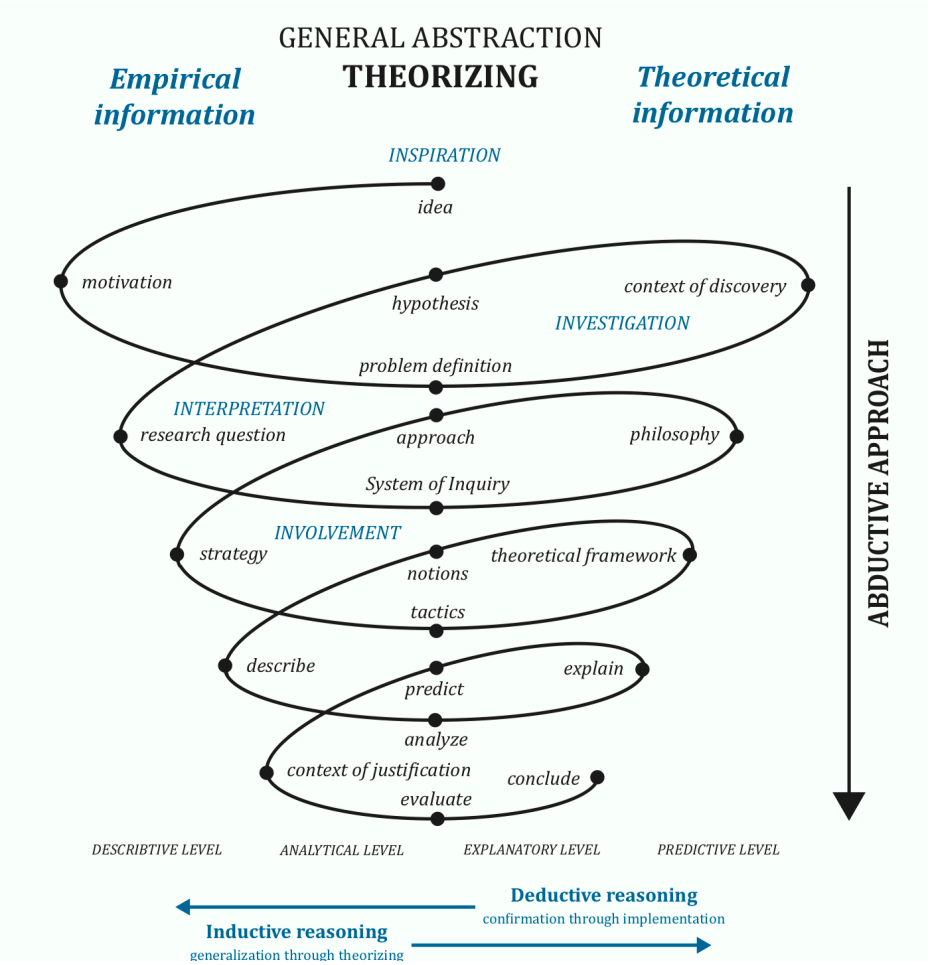


Figure 12 / Abductive approach
General abstraction theorizing abductive appraoch

Summing up

The project is a social research drawn upon a new development in society, the implementation of the landing obligation. An idiographic perspective is the approach of this study, meaning an explanation of the field is not the purpose, understanding it is. With the idiographic perspective of the research, we seek to understand developments of the fishing industry related to bycatch. By introducing human science to seek potential business value creation, the aim is to understand the meaning of a social phenomenon, hence the customers' behavior, needs and desires.
Qualitative research is linked to human science, aiming to understand social phenomena, emphasizing meanings, experiences and views of research participants. Well-known qualitative methods are interviews, observations and focus groups. This qualitative research is approached with an abductive research strategy. Meaning that it allows the researcher(s) to present new knowledge and insights in the study. However, both deductive- and inductive reasoning embedded in the abductive sensemaking process.

This qualitative study began with exploring (understanding) the Danish fishing industry in relation to challenges of the landing obligation and bycatch, followed by investigating perceptions of consumers in relation of the potential value creation of bycatch. The *methodological-* and *theoretical framework,* used within this study, will be presented in the following chapters.

Chapter 7

Methodological framework

Methodological approach

This upcoming section explains the *methodological approach* used for empirical data collection, along with an explanation on *why* and *how* these methods are applied in practice. Observations, interviews and focus group interviews are conducted, as well as desk research are conducted to investigate the topic at hand.

As presented in *philosophy of science*, observations, interviews and a focus group are chosen due to their relevance in qualitatively exploring social phenomena and multiple realities of human actors. These methods can, as opposed to quantitative methods, explore the reasoning and motivation behind e.g., consumer behavior or perception of various actors, and in this sense give a deeper understanding of complex realities (Bryman, 2012b).

When answering the research question *"How can a Design Thinking perspective help to unfold multiple realities of the fishing industry and reveal potentials for utilizing bycatch to increase business value?",* the aim is to understand the perspectives, attitudes and behavior of actors within the industry, this project's key informants, and those indirectly linked to it, the consumers. This knowledge is processed by numerous mapping methods the use of personas and various BMCs.
Mapping, personas and BMC's are chosen as methods to explore patterns in complex contexts (sensemaking), understand the target audience and thus identifying the focus group and to create an overview in the potential value creation utilizing bycatch. The empirical data will then serve as the foundation that maps and BMCs' are built on. This approach allows the researcher to continuously work with the empirical data building up to the main purpose of the BMC, the *Value Proposition*, in this case the business potential of bycatch.

The landing obligation is newly introduced, meaning that it is a fairly new topic and the challenges it brings are unexplored/unidentified yet. As argued in *State of the Art*, there is little qualitative and quantitative information/data on bycatch and discards. The existing research and literature in the field has led us to explore a gap in a rather new issue in the industry.

7. 1. Case study

To get a better understanding of the industry and in order to map out the fishing industry as thoroughly as possible, we chose to work according to a case study design. In qualitative research, a case study is concerned with the complexity of one particular case (Bryman, 2012c), and as argued for in *State of the Art*, the use of a case study design can be used to supplement the interpretation and analysis of empirical data (Christensen et al., 2015). A case contextualizes theoretic or analytical discussions with the location, organization or community in question, in this case the Port of Hanstholm. It allows the researcher to take

point of departure from a real-life scenario. Commencing a case study begins with researchers' interest or knowledge on a subject. The actual first step within a case study design is opening up the field, analyzing, examining and exploring a certain problem and/or existing data (Bryman, 2012c). In this case, the *problem* represents the implementation of the landing obligation and its implications on bycatch in Danish fisheries. Bryman (2012c) indicates that the next step within a case study is highlighting key findings and generating a hypothesis where suitable methods and theories can be introduced. According to Flyvbjerg (2006), it is misleading that a case study is viewed as a pilot method that is used prior to the *real* study. A case study can be seen as self-contained and has value of its own, therefore it is not necessary to link it to a hypothesis. In this study, we apply a self-containing case study that functions as a stepping stone into the research field, as well as, being a tool of inspiration and insights throughout the whole research process. The steps of the case study that is applied to this study are shown below.

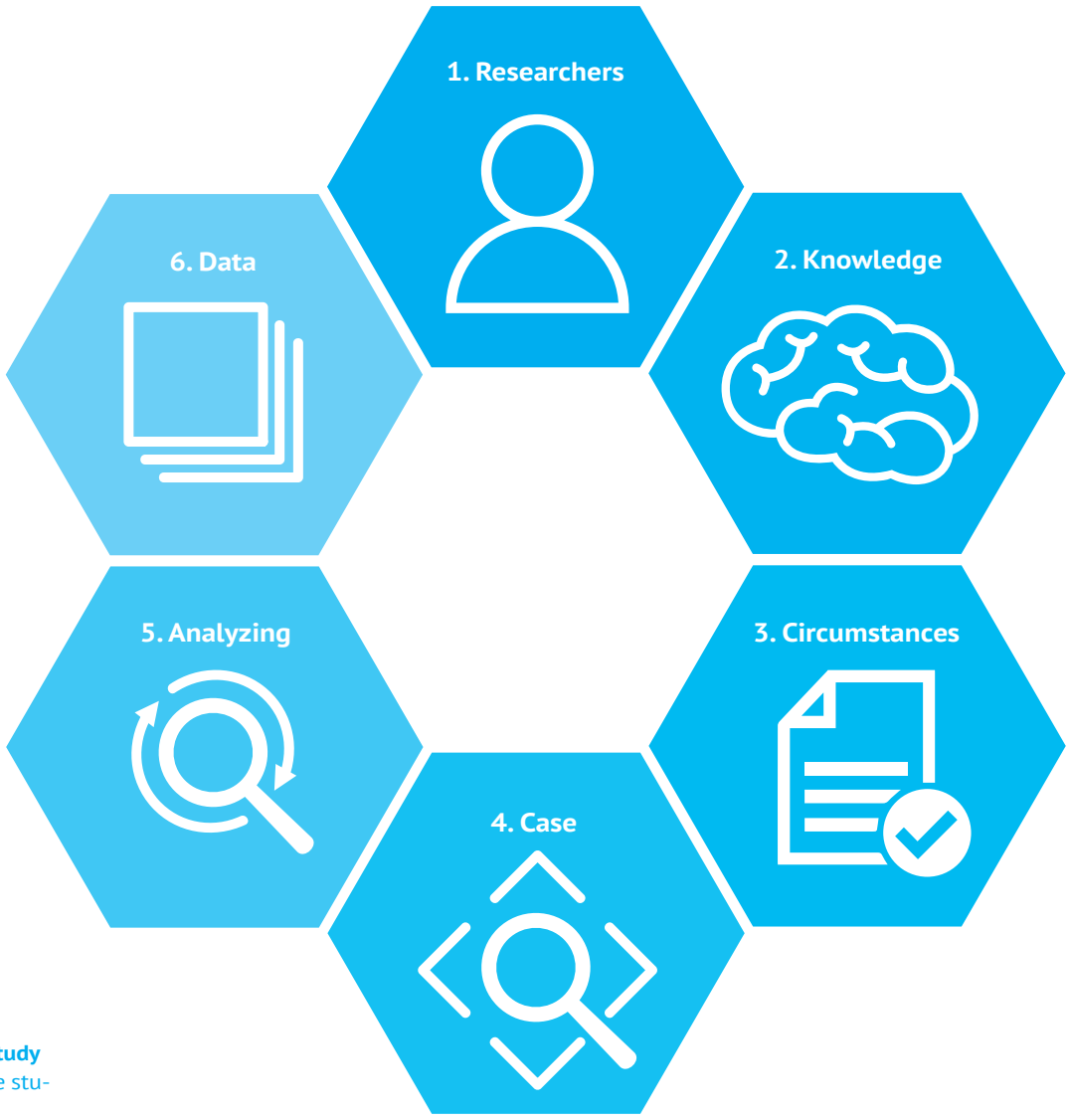


Figure 13 / Case study
Steps within a case study design

In this study the case helps to e.g., contextualize general knowledge gained about the fishing industry, identify key informants and generalize *empirical findings* in a *real-life* setting.
To explore current developments in the fishing industry in the Port of Hanstholm related to bycatch, the case study is based on desk studies and empirical data collection. Field observations and semi-structured interviews with professionals in the field are conducted both in Hanstholm, Copenhagen and IJmuiden in the Netherlands.

7.2. Interview

The empirical data in this qualitative research is primarily based on a series of semi-structured interviews. *Social Research Methods*, by Alan Bryman (2012), serves as the foundation to forming interview guides and conducting interviews in this project. In order to address and ask relevant questions in relation to the respondent's expertise, an interviewee's (background) search is completed prior to the interviews. This guide will exist of explicit topics, specifically concerning the field of work to each expert, with the aim to exploit and make full use of their knowledge. The interview guide serves as an inspirational tool, guideline or checking point throughout the interviews, that allows the interviewer to maintain a dynamic and thus a more natural flow while interviewing (Bryman, 2012d). This means that the interviewer is not forced to stick to pre-formulated questions but is allowed to adjust to the situation and ask spontaneous questions in relation to the replies of the respondent (Bryman, 2012d). Having an interview guide also helps the interviewer focus on the respondent and their answers, rather that the questions and their order.
The use of an interview guide is characteristic to semi-structured interviewing, where interviews are open, allowing the emergence of new questions, while keeping with the scope of the interview guide (Bryman, 2012d). The aim is to have the respondent interact freely, in their own words and to create a situation that allows the interviewer to reflect and react on the answers of the respondent.

To prevent data collections from closing off, open questioning is an important aspect of a qualitative interview. Bryman (2012d) suggests the interviewer allows the respondent to *go off*, in order to encourage input, as it will give the interviewee a change to explain what they view as relevant and important to the topic (Bryman, 2012d). However, allowing too much, can cause the focus of the interview to disappear. The focus is not on the number of interviews that are conducted, or on the achievement of consensus and verification on the investigation, nor the attempt to unveil one single truth. The focus is on uncovering multiple meanings of a phenomenon (Ponterotto, 2005).

Interviews will be conducted with professionals within- and closely linked to

the fishing industry. Each informant is chosen to ensure the validity of the research (Bryman, 2012d), by targeting informants who represent managerial-, operational- and academic stakeholders and interests of the industry, as well as authors of acknowledged literature in line with the scope of the project. The illustration below gives an overview of the stakeholders within this research. It gives an understanding of their field of expertise and knowledge on the identified themes, in relation to the fishing industry.

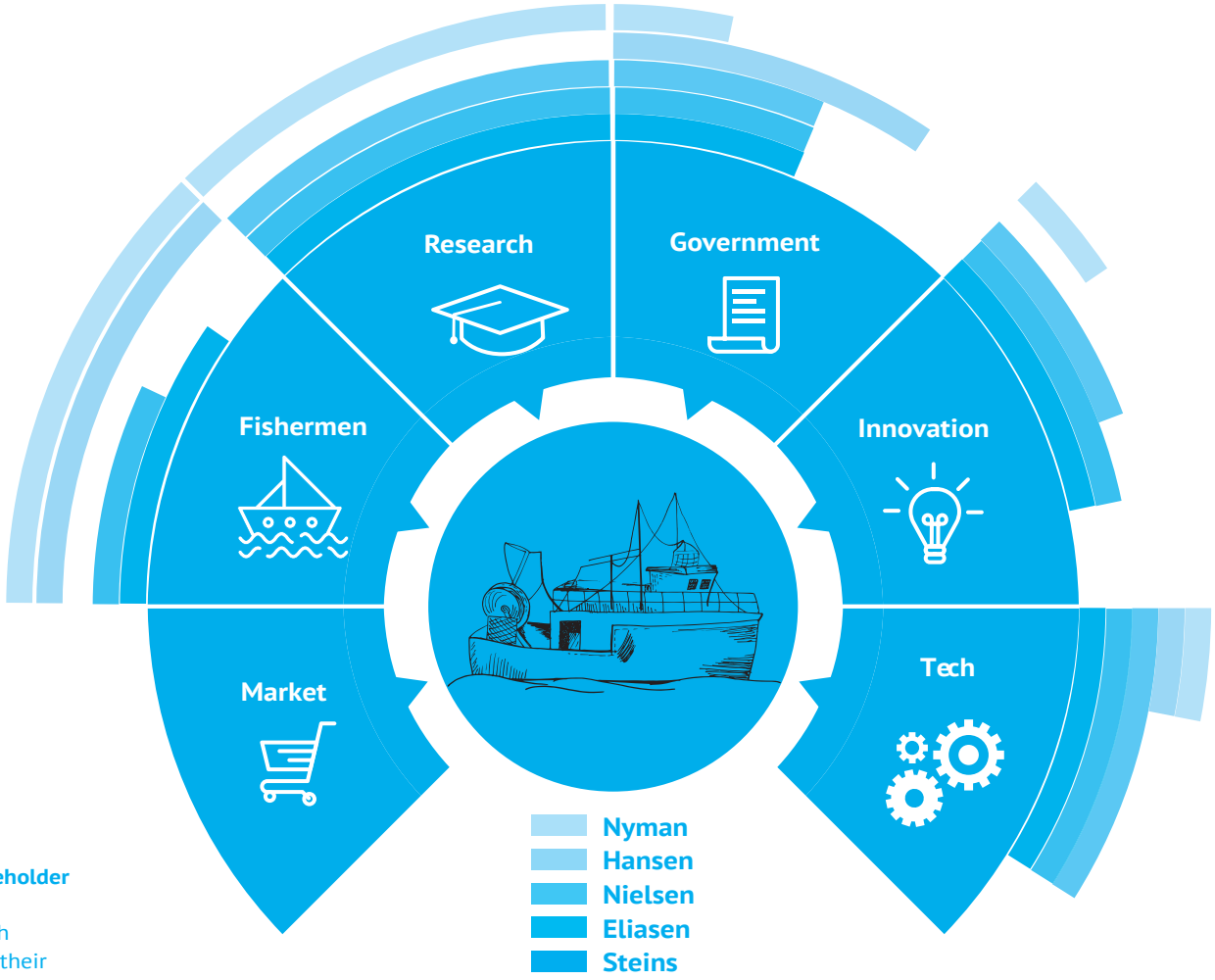


Figure 14 / Stakeholder map
Mapping research participants and their field of expertise

A more detailed explanation and description of the background of the interviewees is presented in the following overviews.

Peter Nyman
Technical Administrator at the Port of Hanstholm
Interviewee 1 - Appendix 1

Peter Nyman is the Technical Administrator at the Port of Hanstholm. The harbor is owned by the municipality of Thisted, meaning its administrative infrastructure consist of a directional board with four different departments. The technical administration deals with on-land logistics of the harbor, such as renting of building, garbage disposal and storage and management of fish boxes.

Based on his vast historical knowledge and engagement in the activities of the port, Nyman was chosen by the administration to partake in the interview.

Søren Eliasen
Associate Professor at the Aalborg University
Interviewee 2 - Appendix 2

Søren Eliasen is a Associate Professor at Innovative Fisheries Management at Aalborg University. The education is undergoing a development into broadening its perspective by focusing on how we use the sea altogether including coastal management and community development. Before this he has worked as a technical analyst at DTU and was later employed in a private research company, focusing on governance management in fisheries.

Nielsen has studied communication and geography at Roskilde University and has written a Ph.d in innovation and knowledge-sharing in fishery dependent communities. Meanwhile he is author (and co-author) to several research projects and initiatives in fisheries management.

Thorkild Nielsen
Teaching Associate Professor at the Aalborg University
Interviewee 3 - Appendix 3

Thorkild Nielsen is a Teaching Associate Professor at the Aalborg University whose work has largely been involved in strategies and policies for sustainable food systems, especially in the areas of Food Policy, Food Ethics, Sustainable Food Production and Technology Assessment.

Figure 15 / Overview interviewees
Who and *why* the key informants are chosen

Nathalie Steins
Program Manager at Wageningen Marine Research institute
Interviewee 4 - Appendix 4

Nathalie Steins is a former student in Development Studies from Wageningen University in Holland and Nature Conservation at the University of Portsmouth in England. She has worked in a fishing cooperative in Ireland. She proceeded to work for ten years at the board of a stakeholder organization in fish production, focusing on fishery policies.

Currently, Steins works as Program Manager at the Wageningen University, at the Wageningen Marine Research department. She works with research collaborations, collecting data on fish stocks and doing projects in connecting the practices of fishermen to the scientific fields of biologists.

Jan Hansen
Chairman at Fishermen's Association in Hanstholm
Interviewee 5 - Appendix 5

Jan Hansen is the chairman of the Danish Fishermen's Association in Hanstholm and the former chairman of the national Danish Fishermen's Association. Along with this he is also owner of two vessels in the Port of Hanstholm. Hansen possess deep knowledge on the history of fishery in Denmark, both historically and contemporarily.

The purpose of the fishing union is to take care of and speak on the behalf of the interests of fishermen in his region. Other than maintaining political interests of fishermen, the association is also runs a business called Pack and Sea, handling logistical operations of fish boxes at the harbor.

The majority of interviews are held in English, which has had both advantages and disadvantages. The main advantage is that both researchers (Danish and Dutch) are able to understand the respondent, hence making it easier to develop a common understanding of the empirical data. However, one respondent specifically asked to be interviewed in his native language, which was accepted as well. Due to the fact that English is not a respondents first language can cause errors in the interview if troubles with expression occurs (Oliver et al., 2005). Therefore, it is possible for all respondents to switch to their native language when they cannot express themselves in English. The language barriers can negatively affect the expression, interpretation and understanding of a topic. It could have consequences on what is truly transcribed; data can present an altered result, ultimately creating room for a bias. Therefore, Danish and Dutch

language skills were required (Oliver et al., 2005).

To prevent the loss or misinterpretation of information, all interviews are recorded. Giving the interviewer the opportunity to fully focus on the interview without having to worry about taking notes (Bryman, 2012d). Respondents' permission is asked in advance. One exemption is the third interview with Associate Teaching Professor at Aalborg University, Thorkild NIelsen, which is documented in note from, as one researcher took the role of interviewer and the other as the observer, taking notes.
The other four interviews are transcripted, as it provides an in-depth insight into the collected data and creates the possibility to analyze and reflect on all discussed topics, by revisiting the empirical data. It is of great importance that an interview is recorded and transcribed since the interviewer is both interested in what the respondent says, and how they say it (Bryman, 2012d). However, not all acknowledging words are taken into account while transcribing. Words such as *yes, uhu, okay, mhm* and other expressions have been removed from the transcription, unless they affected the output.

7.3. Field observations

To accommodate personal schedules, interview respondents chose the location of the interviews themselves. Therefore, different locations are visited, both in Denmark and in the Netherlands. During those visits, impulsive field observations are conducted.
Initially, the purpose of observations was overlooked. By going through field notes and pictures, it became clear that the observations contributed to a better understanding of the fishing industry. The decision was made to include them as field observations, part of the empirical data.
An observation guide was therefore not made prior to the visits. However, the internal scope of the visits was thoroughly discussed, and through this the research/observation had a mutual focus. The observations are non-participant observations, as the researcher was inactive, without directly influencing the situation (Bryman, 2012e). According to Bryman (2012e), doing observations can complement data collection by identifying and unfolding elements of the fishing industry with the aim of understanding of the complexity of the field.

The first interview and thus visited location, is in Northern Jutland, in Denmark, at the Port of Hanstholm. The location of this interview gave the opportunity to get an insight of the operational harbor practices and activities. Since part of the research focus is to get insight in the practices of the fishing industry and what involved actors, activities in aquaculture, generating energy, transport and other services that the harbor provides were omitted, as they might disturb the scope of the project.
The fourth interview, is at the IJmuiden Harbor in the Netherlands. Similar to

the first interview, this location gave the opportunity to get an insight in the harbor practices of the Dutch fishing industry.
A final observation was also conducted at the Port of Hanstholm, during the fifth interview. Multiple observations at the same location can give a more realistic insight in the situation as it allows the observer to take a step further into the situation, and make use of previous experiences (Bryman, 2012e). The second and third interview were located at the Aalborg University in Copenhagen, meaning that no observations were conducted.

7.4. Focus group

A focus group discussion was introduced in order to collect data to answer the second part of the research question to reveal potentials for utilizing bycatch to increase business value, in relation to a consumer-based perspective. The focus group was conducted as opposed to an interview with a retailer, due to consumers' needs being the interests from a retail perspective as well. However, an interview with a respondent from a retail perspective could be considered valuable in a future perspective of this project. Focus groups offer the opportunity to gain insight into the functioning of certain groups in society and/or to understand behavioral patterns of the group and its members (Lucassen and Olde Hartman, 2007).
According to Lucassen and Olde Hartman (2007), a focus group should consist of a target audience group willing to share their personal experiences on specific topics during an interactive discussion. In this research, the focus group participants are chosen on the basis of personas created to identify a target group and included five participants. By linking persona characteristics with the focus group participants, the outcome is likely to be more valid and closer to reality (Grudin and Pruitt, 2002). A pre-existing group consist of a group of research participants that already know each other. Using pre-existing groups ensures a more natural behavior and discussion. It can help to create a safe environment and it is more likely that the discussion represents the focus group participants more closely and groups they regularly engage in (Bryman, 2012f). Since the personas, made for this project, resemble a natural group in our social circle, the decision was made to conduct a focus group using these as a *pre-existing group*.

An insight on the focus group participants is presented in the following overview.

Name	Anna	Frederikke	Andreas	Nicoline	Martin
Gender	Female	Female	Male	Female	Male
Age	32 years	28 years	31 years	24 years	29 years
Nationality	Danish	Danish	Danish	Danish	Danish
City	Copenhagen	Copenhagen	Copenhagen	Copenhagen	Copenhagen
Job sector	Publishing	Communicatio	Communicatio	Student	Consultancy

Figure 16 / Overview focus group participants
Background information on focus group participants

The important advantage of focus group research lies in the fact that, compared to other methods such as e.g., in-depth interviews, it is often a simple and quick method to collect specific qualitative data from several respondents at once (Lucassen and Ode Hartman, 2007). Guided and interactional discussions can generate rich details of complex experiences and reasoning behind e.g., actions, assumptions, values, emotions, perceptions and behaviors of individuals (Britten, 1995).

A guide is created prior to the focus group discussion, with the aim to remain focus. The guide included elements concerning customer behavior, needs and desires, in relation to fish consumption and the interviewees' view on bycatch.

By conducting a focus group, it allows for explicit use of interaction in the group to collect data and insights that are less accessible without that interaction, such as motivations behind consumption of fish (Lucassen and Ode Hartman, 2007). Participants are encouraged to share their experiences and ideas. Moreover, participants also try to understand each other's experiences and will respond to them. It is a process of *sharing and comparing* among the participants, leading to a broad exploration of the topic. A focus group does not have the goal to reach a consensus (Krueger and Casey, 2015), but rather explore and discuss a topic together.

The moderator begins the focus group with introducing the theme, the house rules and should stress that there is no right or wrong answers. After an introduction of the researchers and the participants, the moderator launches an icebreaker, i.e., a non-threatening opening question (Lucassen and Olde Hartman, 2007) or activity/task. At the beginning of the focus group, the moderator asks the attendees to write down their thought on the current Danish fishing industry, along with their perception on bycatch. They are also asked to make a

selection from 50 printed pictures, that represents the Danish fishing industry and bycatch to them (see Appendix 8). Simply put, this activity has the purpose to kick off the participants' involvement in the subject.
While conducting the focus group, the moderator should encourage participants without being threatening or over-involved. In this project, focus group participants should feel at ease and comfortable to answer freely (Lucassen and Olde Hartman, 2007).
Besides the moderator, an observer is present as well. The observer collects information about non-verbal communication and interaction between participants (Britten, 1995). This is done by the use of observation notes. The personal data of the participants, the arrangement of the room, the atmosphere, information on the group process, degree of concentration and participation of all participants are noted here. To the researcher(s) the role of the observer might be valuable later on, as this can help later on in the analysis, by describing events that are not recorded or transcribed.

Like the interviews, the focus group is also recorded and transcribed afterwards. While analyzing, it is important to stress that one should not strive to quantify or generalize too much, by being aware that the outcome is representative of the particular group and should therefore not generalized as applying to all potential consumers (Lucassen and Olde Hartman, 2007).

In comparison with an individual interview, the researcher has less control over the situation and participation level of participants is not equally distributed. Discussing sensitive topics such as health, ethicality, sexual preferences might become superficial, seeing as people are often inclined to avoid these topics and might give politically correct answers when in a group.

The aim of the focus group and the overall topic in the focus group guide, is to unfold participants' perception of the fishing industry, patterns of consumption, motivations behind consuming fish and attitudes toward bycatch in a consumption perspective.

7.5. Mapping

According to Cosgrove (1999), mapping can be done through visualization, conceptualization, representation or creation of spaces explicitly and/or graphically. In relation to this project, mapping is a useful tool when examining the fishing industry, the role of bycatch within the sector and the perception of the audience group in this context. Creating maps function as a way of organizing complexity or *finding clarity in chaos*. This *sensemaking process* is called *synthesis* and aims to find connections or themes in the existing data to unveil any underlying meanings of the subject.
As described by Kolko (2010), fieldwork, theory and evaluation data can be seen

as the systematic input to the research, however it does not provide the necessary *whole* by itself (Kolko, 2010). By introducing synthesis in this project, we aim *"to organize, manipulate, prune, and filter gathered data into a cohesive structure for information and knowledge building."* - Kolko (2010).

Synthesis is frequently performed behind the scene and hidden from view, where the designer/researcher begins identifying the relations between actors, moves around content and have the opportunity to draw, sketch or note down findings (Kolko, 2010). Mapping in this project are both used for internal and external communication and analysis. By putting all findings, data and information on paper, making it tangible, content can be freely moved and gives the possibility to see an entire set of data at once (Kolko, 2010). However, as the research/design process might be obvious for the designer, it can be unapparent for someone who is not involved in that process. In this research, the aim is to include the reader in the process of synthesis. Hence, a variety of maps, sketches and/or findings are presented throughout the report, to step away from merely showing the point of departure and end result, but to create an understanding of the research/design process as a whole.
Taken this in mind, not all maps are presented throughout this paper, as some maps are not of great relevance to the reader, hence it does not contribute to the understanding of the research/design process. Initial maps, overviews and/or sketches in early stage research are not show in the report, however, they can be found in appendix 9. The illustration below gives an understanding of what kind of maps synthesis methods are used throughout the thesis project, when they are created and where they are shown.

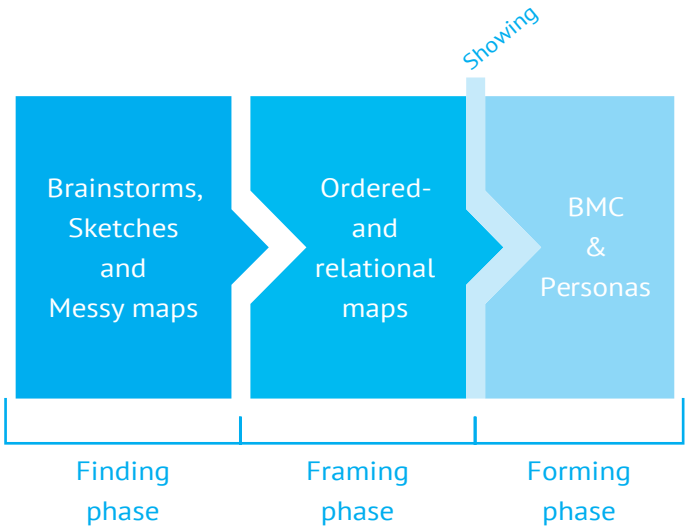


Figure 17 / Steps of mapping
Different types of mapping, the process of it and where it can be found

Data used in mapping processes are gained from experiences and memories as well as empirical data from observations, interviews and/or focus groups. However, all data is processed by the mapmaker, the researcher, keeping in mind that researcher maps are affected, consciously or unconsciously, by individual interpretation (Cosgrove, 1999).

Situational mapping

Elements from *situational analysis* by Adele Clarke (2009), are applied in the research process as a mean to open analysis of literature and empirical data. In the following paragraph this mapping process will be explained and discussed.

In the situational mapping process, both messy maps, ordered- and relational maps were made. By creating these different maps, the research field began to unfold along with the findings from the empirical data that serves as the backbone of the study.
The maps unfold different discourses, giving insight into the various fields of practices and highlighted political, cultural and economic elements of the topic and their interrelations. The situational mapping provokes the researcher(s) to see things afresh and gives the opportunity to make a situation visual and switch between maps (Clarke, 2009).

As Clarke (2009) explains, it is important as a researcher to acknowledge that situational maps will not cover absolutely everything in a situation. The aim of the mapping process is not to fill in the blanks, but to thoroughly investigate the situation of inquiry (Clarke, 2009). After the initial research phase, messy maps were made to capture the findings of the data and the complexities that unfolded throughout, by combining research with empirical data on e.g., bycatch, legislations and economic and cultural aspects within the fishing industry.

To get a more organized and structural overview, ordered maps were created after the messy maps. The complexity of the research, which may seem overwhelming, made creating ordered maps a time-consuming task.

Situational mapping seeks to identify and analyze relations between various elements of the situation at hand. According to Clarke (2009), this step is called relational mapping and according to Kolko (2010) it can be defined as concept mapping. Doing a quick and dirty relational analysis, based on the previous maps, can serve as an eye-opener and can expose unveiled relations (Clarke, 2009). Sometimes, relational maps were directly created while making the ordered maps. In order to create a clear overview, and thus an overview of the field, it was necessary to include and reveal the mutual relations. By having overviews of the field, different themes can surface and the process of analyzing has practically begun.

7.6. Business Model Canvas

For this project we have decided on the BMC as the outline/framework of analysis. The BMC is a method that, similar to situational mapping, can provide an overview for a larger scale of complexities in organizations. By identifying and highlighting specific areas, it can be subject for deeper analysis with the aim to

explore possible value creation. Both ways will be represented in this project. A BMC goes through nine steps that allows the user to *"... describe the rationale of how an organization creates, delivers, and captures value"* - Osterwalder and Pigneur (2010).

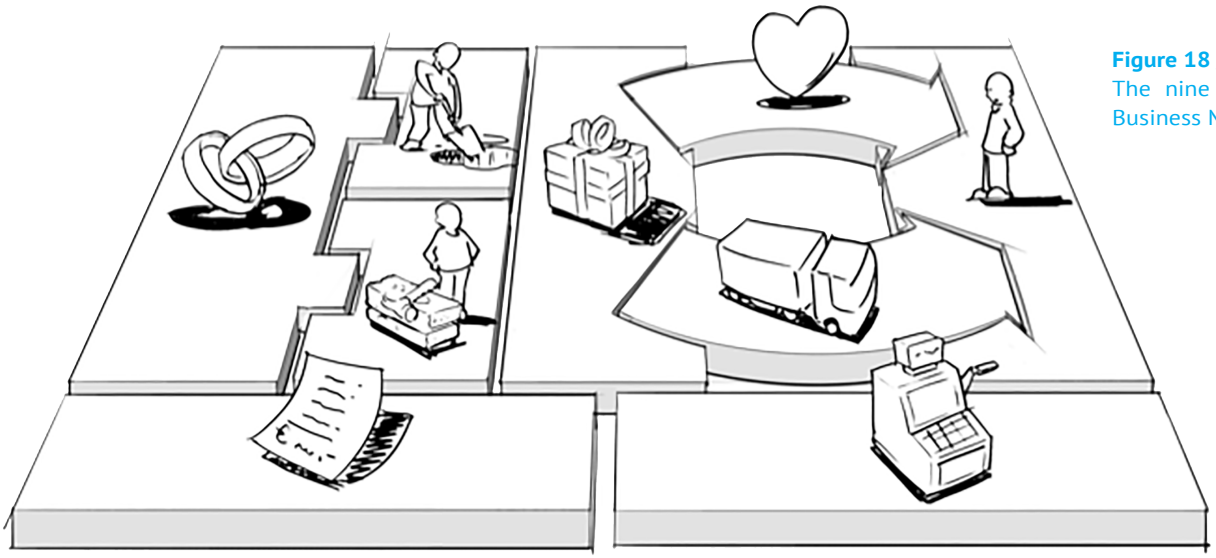


Figure 18 / Business Model Canvas
The nine building blocks of the Business Model Canvas

A BMC include nine steps of analysis, explained in the following section.

1. Customer Segments

This section is about defining the different groups of people or organizations an enterprise aims to reach and serve. Understanding the target audience, which an organization serves, is key in order to target the right segment (or segments) of users and satisfy them as best as possible. An organization should be conscious of who to target and who to ignore, as a key part of structuring their business model.

2. Value Propositions

In order to satisfy the customer segment(s) you need to provide them with a service or product. The *Value Proposition* describes what need this service or product is fulfilling and what kind of value it brings the customer.

3. Channels

So, how are the customers being reached? Through its *Channels*; distribution, communication and sales a company is able to interact and deliver the *Value Proposition* to its customers. This part of a business model is particularly important to customers' experience, as it is through these *Channels* the customer meet the company and its services.

4. Customer Relationships

There are many ways to maintain relations to the customer, from personal

hands on interaction to fully automated procedures. This is important to consider when reflecting on what type of relationship a company wants to establish to its customers and what the aim of this relationship is e.g., customer acquisition, customer retention or boosting of sales.

5. Revenue Streams

A *Revenue Stream* is required to make money, but there is more to it than that. A revenue can be secured through multiple one-time transactions or an ongoing flow, such as subscriptions, memberships or customer support. The *Revenue Stream* also needs to be a balance of what the costs a company have versus how much customers are willing to pay. The pricing of services can vary from fixed list prices, bargaining, auctioning, market dependent, volume dependent, or yield management.

6. Key Resources

By looking at the *Key Resources*, a company can describe what its essential assets are in running a successful organization. This is what makes them able to deliver its services to the market. *"Key Resources can be physical, financial, intellectual, or human. Key Resources can be owned or leased by the company or acquired from key partners"* - Osterwalder and Pigneur (2010).

7. Key Activities

So, what is needed to be done to make the business work and put the Key Resources into providing the Value Proposition to the customers? (Osterwalder & Pigneur, 2010) categorize *Key Activities* as either production and manufacturing of goods, problem solving such as consultancy or management and finally by designing platforms and networks for the convenience of others.

8. Key Partnerships

Through partnerships, companies can create alliances to optimize their business models, reduce risk or acquire resources. Strategic alliances can be formed by non-competitors to aid one another. The same goes for coopetition, only this is an alliance between competitors. In joint ventures, companies can cooperate to create new businesses. The most commonly known partnerships might be buyer-supplier relationships, where companies buy supplies from other companies to ensure its own production.

9. Cost Structure

This step is about examining the costs of maintaining the business and the expenses of the above-mentioned steps. By doing a BMC, it allows you to look at optimizing each step, in terms of financial resources (Osterwalder and Pigneur, 2010).

These previously mentioned nine steps will be applied and used as a frame for analysis, an approach we have found to be complementary when combined with

the approaches of situational mapping. Firstly, we will go through the broader case of the Port of Hanstholm using BMC. This approach allows us to further focus two additional BMC's specifically revolved around bycatch, and the potential of value creation, in a retail perspective, and finally the *Value Proposition* from a consumer perspective.

7.7. Personas

Creating commercial products, meaning to serve thousands maybe even millions of people, can be a difficult task (Grudin and Pruitt, 2002). Therefore, several user-centered approaches are introduced in the practice of its development.

New product and concepts may seem useful to a new user group, but if the target users are wrongly represented, these become useless. Therefore, participatory methods are introduced with the aim to raise the level of user participation (Grudin and Pruitt, 2002) and go beyond information gained in traditional desk research.

In this project, the technique of personas is used to seek for the target audience in unfolding the business potential for bycatch in the Danish fishing industry. By using personas, we step away from *merely* creating realistic scenarios to reflect on a specific situation. Designers/researchers who work with personas are provoked to take social and political aspects in mind, often neglected in product development processes. Designers become more engaged and thus personas can be used as a powerful tool to open important dimensions of a representative participant (Grudin and Pruitt, 2002).

"Personas are fictional people. They have names, likenesses, clothes, occupations, families, friends, pets, possessions and so forth" - Grudin and Pruitt (2002). Grudin and Pruitt (2002) also state that personas have demographic specifications, life stories, life purposes and much more data that scenarios can be built on (Grudin and Pruitt, 2002). Being politically correct is not the aim of using personas according to Cooper (cited in Grudin and Pruitt, 2002), the aim is being realistic and therefore stereotypes and prejudice can in some cases create a more generalizable outcome.

Today, personas are a common used tool and are seen everywhere and used broadly in a development process (Grudin and Pruitt, 2002), creating a strong focus on the targeted user. The personas in this research are based on demographic statistics, empirical data and elements from *Design Thinking*. Observations, interviews, literature research, mapping processes and so on contribute to build a realistic and detailed persona.

Personas highlight a specific target audience but finding the right persona or

group of personas can be challenging (Grudin and Pruitt, 2002). While creating personas, every choice can influence the outcome of the persona, this outcome will affect the composition of the target group, in this case the focus group participants, which should be taken into account throughout the development process and thus end result.

Another risk to the use of personas is potential overuse in the developing process. This may lead to the replacement of other user centered methods and reflections of the empirical data. The overuse of personas can result in over-extending. Over-extending means that personas are being stretched to other contexts than its original intend, such as other organizations or concepts.

In this project, multiple personas are based on empirical- and literature research, including statistics on fish intake in Denmark and serve as the foundation to selecting the focus group participants

Summing up

A *case study design* is applied to serve as contextualizing the research and data collection within the fishing industry. It serves as a stepping stone for further research and inspiration towards shaping the methodology of this project. The case study was based on both *literature- and empirical data* and provides insights, inspiration and understandings to the complexities of the fishing industry and its current developments. Field observations, interviews and a focus group discussion has also part of the empirical research and data collection. *Field observations* were conducted in both Denmark (Port of Hanstholm) and The Netherlands (IJmuiden Harbor). *Semi-structured interviews* were conducted with five professionals within separate fields of the Dutch and Danish fishing industries. *Personas* are created to reveal and get insight in which fish- and potential bycatch consumers to target for the focus group.
The *focus group discussion* has collected data on the target audience and their behavioral patterns, their needs and desires in relation to the fishing industry, their consumption of fish and a market potential of bycatch. Obtaining data from both literature- and empirical research can become complex and confusing. Therefore, mapping processes are used to *synthesize* and *find clarity*.
To create transparency in the research/design process, maps, sketches and/or findings are presented throughout the report, given their relevance to the reader. Knowledge from empirical data serve as foundation to *BMCs*, presenting the complexities of the fishing industry as an organization, as well as, showing the desired organizational approach when delivering, creating and maintaining value in both retail- and consumer related perspectives.

This section has focused on methods and their contribution to this research. *Why* and *how* they are applied in practice and what requirements, benefits and disadvantages they bring to the *methodological framework*. The next chapter will present the *theoretical framework*.

Chapter 8

Theoretical framework

Theoretical approach

The *theoretical framework* in this project consists of *Design Thinking* as an overall framework along with *Multiplicity* by Annemarie Mol (2002). A summarized explanation of the theories and *how* they are applied to the project will be presented in the following section.

8.1. Design Thinking

Design Thinking applies the principles of design to a broader set of innovation challenges in business, government and society (Brown, 2014). The *Design Thinking* process gives an opportunity to provide creative and innovative solutions to difficult problems, also known as wicked problems. A wicked problem can be difficult to solve due to incomplete, changing or contradictory circumstances, which are often difficult to even recognize. Wicked problems are often made of social complexities with no particular point of passage, as a result, solutions to such problems often reveal or create other problems (VIA uc, 2014). In this project, the wicked problem and point of departure is the landing obligation, with its implications on bycatch and how these can be addressed in a highly complex system. *Design Thinking* offers a solution-oriented approach and takes a current situation, service or product, and adapts it to the needs or desires of the receiver.

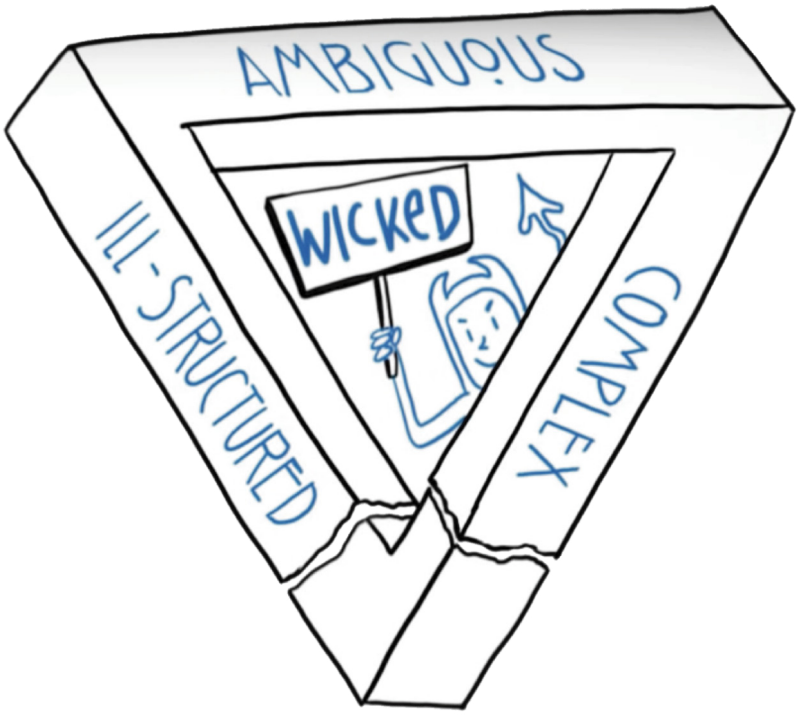


Figure 19 / Problem solving
Design Thinking process offers a solution to wicked problems

Due to the revolution of the internet, the world has become smaller and brings people closer. It presents an opportunity to share perspectives and create new ideas as never before. According to Brown (2009), this was the period where integrated, holistic innovation came to life. Today, innovations are no longer based on single disciplines. Different fields are combined and expertise is shared,

leading to new choices in integrated innovations. This is what Brown refers to as creative collaboration (Khosla Ventures, 2014).

The first principle of *Design Thinking* is to solve problems. As Brown (2009) stresses, *Design Thinking* can be applied to problem solving on a business (strategic) level, governmental issues or social problems. This principle encourages divergent thinking and creation of new choices that differs from traditional problem solving. Thinking in integrated and holistic ways, in other words, integrative thinking, is the second principle of *Design Thinking*. This allows the designer to hold multiple tensions in his/her mind at the same time, while beginning to create solutions to resolve all tensions. Desirability, feasibility and viability are key.

"Using designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" - Brown (2009).

In his TED Talk, Tim Brown describes how innovation traditionally have been convergent e.g., by choosing one of several options and applying it to a problem. By applying *Design Thinking* as a framework, an analysis is not about dissecting a specific subject or a specific solution. *Design Thinking* is divergent and human-centered in the sense that it opens up the needs of the receiver and attempts to create meaning and value from that standpoint through a variety of options on how these can comply with real-life scenarios (Khosla Ventures, 2014). As is the case for this project - by working towards opening the field for opportunities that are desired, feasible and viable, attempting to reveal a market potential for bycatch based on the needs and desires of consumers. In short, *Design Thinking* is focused on asking the right questions, rather than finding one perfect answer (Khosla Ventures, 2014).

By examining bycatch across the chains of the fishing industry, many actors emerge, both human and non-human. Innumerable individuals, groups and *things* can be found, that influences bycatch and the potential use of it. Bycatch can also be seen as a problem of wicked character since it is difficult to describe as a whole and there is not one conceivable truth on how to address the challenges it brings.

VIA University College (2014) has created an applied model that origins from the *Design Thinking* theory, which can be used in a design/innovation process. Within this *Strategic Design Practice 5F* model, there is more focus on the actual activities involved in the *Design Thinking* process, on the business viability and the implementation of ideas. The design process consists of five phases and is shown on the next page.

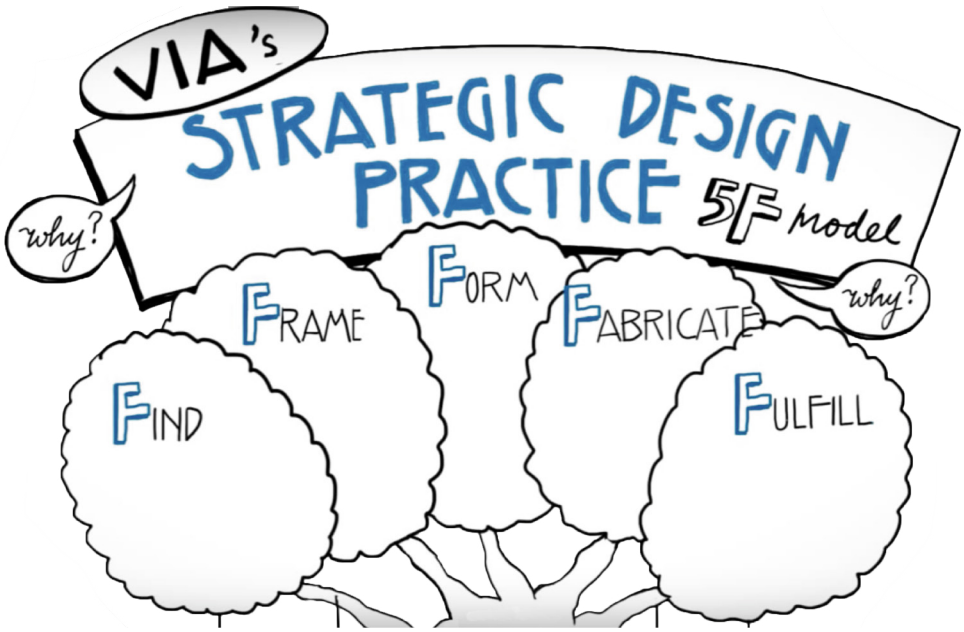


Figure 20 / 5F model
VIA's Strategic Design Practice 5F model

This project focuses on the potential for value creation of bycatch, by offering an alternative approach to the current field of research. By adapting the first three steps of the 5F model, the aim is to complement further research efforts in this field. The aspiration is to serve as a foundation, or pilot study, before applying the remaining *fulfilling* and *fabricating* steps of the 5F model.

This project concludes with completing the *form* phase, to give an understanding if and *how* bycatch can deliver value. So, for this project, the first three phases; *finding, framing,* and *forming*, will be taken into account in the design (thinking) process. The finding phase, includes an exploratory research to identify the problem, by creating a deep understanding of the characteristics of the field such as prevailing economic, technical, cultural and social conditions within the fishing industry. The second phase, the framing phase, is a process that focuses on the understanding of the (core) problem by seeing the problem from many perspectives and understanding possibilities as well as restrictions (VIA uc, 2014). As Brown (2014) explains in his TED Talk, it is about asking the right questions and thinking divergently. The point of departure in the designing process is the questions and those need more attention and thought than specific answers.

The third and in this study the final phase, is the forming phase. Here, new ideas are generated, developed and communicated. By introducing co-creation to the design process, potential customers and consumers are being brought into the design process, this will typically also be the phase in which to explore current and future user needs. In this project, *co-creation* is implemented throughout the use of focus groups. It is acknowledged, that this is the foundation of co-creation. Integrating user perspectives becomes increasingly important with the inclusions of the remaining two steps of the 5F Model.

The phases of the Strategic Design Practice model are *iterative*, as it allows the researcher/designer to move back and forth between phases as needed. This is also why the chronology the process should not be taken too literal. An iterative approach relates to abductive sensemaking, allowing the researcher to present new knowledge and new insights throughout the project (VIA uc, 2014) and is applied to the process of this thesis project.

8.2. Multiplicity

Within this research, the theoretical input by Annemarie Mol (2002), *Multiplicity*, is used order to unfold the multiple realities and enactments of the fishing industry. In order to understand and explore this field in the perspectives of each research participant, contributing to the framing phase that focuses on the understanding of the (core) problem, seen from many perspectives.

By exploring the fishing industry through different patterns and themes in the perspectives of the research participants, as described in *methodological framework,* the term ontological *Multiplicity* becomes of relevance. The fishing industry is multiple while also being one, meaning there is not one distinct reality to the same object or subject. According to Mol (2002a), the aim of using *Multiplicity* is not necessarily to explore all perspectives of the same situation, object or practice, but to describe and explain the situation through its interaction in different practices, in this case throughout the different patterns of the fishing industry.

A common way of thinking is the world consist of one conceivable truth, hence, everybody should perceive the fishing industry similarly. Mol (2002a) argues that ontology is not about fixed things in the world, instead ontologies take shape through daily practices. Mol (2002a) states that you can create multiple realities when you understand situations or objects as things that are manipulated in practice and not only by understanding a situation or object as the point of interest (Mol, 2002a), as visualized by the illustration on the right.

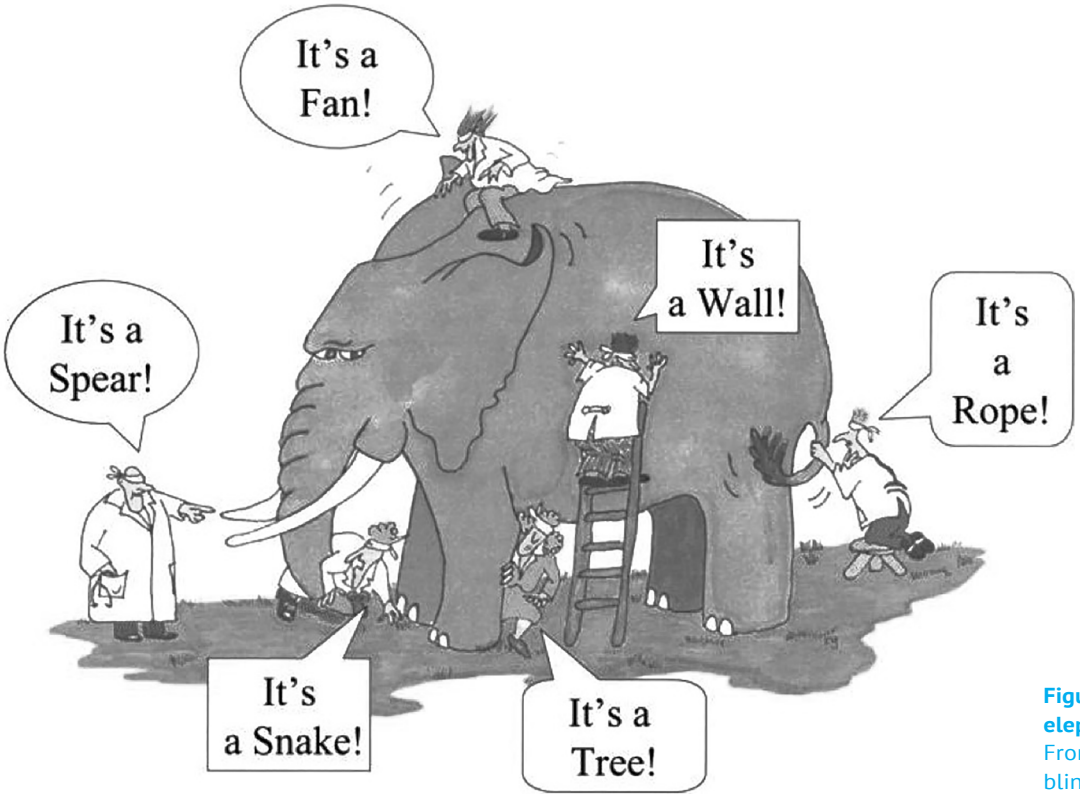


Figure 21 / Seeing the full elephant
From the parable of the blind men and the elephant

In her book *The Body Multiple*, Mol (2002b) describes the case of a patient suffering from arteriosclerosis in the leg, to understand what a philosopher can learn from such a disease. By allowing patients to speak about experiences with their illness, they acted as if they were their own *ethnographer* (Mol, 2002b). Mol (2002b) not only spoke to patients, but also doctors in the polyclinic, surgeons, pathologists and biomedical scientists. They all had their own way of dealing with atherosclerosis (Mol, 2002b). In this study, several field experts with different backgrounds have been included, varying from a Teaching Associate Professor and an Associate Professor from Aalborg University, a Program Manager at the Wageningen Marine Research department, the Technical Administrator at the Port of Hanstholm, the chairman of the Hanstholm Fishermen's Association and consumers. By including these actors, it uncovers perceived realities within politics, science, innovation management, fisheries, retail and consumer sector which contributes to understanding their reality within the fishing industry.

According to Mol (2002b), a subject is never *one* thing. The understanding of the landing obligation and its consequences, may differ depending who is asked. According to politicians it can be seen as a legal framework to motivate fishermen to fish more selectively. The landing obligation for a fisherman can be seen as a legislation that affects their income negatively by restricting their practices. It can also be seen from a consumer perspective, where the landing obligation may be seen as a set of rules to lower waste and thus create a more sustainable industry. Besides these examples, the landing obligation can have even more manifestations.

Patients, researchers and doctors have their own perspective on diseases (Mol, 2002b). And thus, politicians, researchers, fishermen and consumers have their own perspective on e.g., the fishing industry, landing obligation and bycatch as well. In Mol's study, the doctor, the patient and the researcher all interpret *arteriosclerosis* from their own perspectives. Mol criticizes this by indicating we lose sight of the physical reality of the disease. The disease *disappears* behind all its interpretations (Mol, 2002b).

A disease is something that is *performed* or *done* in a certain specific practice, such as a doctor's office. The *performance* or *doing* is essential to Mol's approach. The result of this way of thinking is that there is a change in thinking about illness: it is no longer an isolated *thing*, but a combination of actions in a given context (Mol, 2002c).
The *performance* of e.g., the landing obligation, is reminiscent of the theatre. For example, there may be a script or improvisation when *performing* within the framework of the landing obligation.
Fishermen act according to their usual practices, as their (unwritten) script. Sometimes a fisherman has to improvise due to unexpected weather circumstances or undesired catch composition (for instance high rate of bycatch). Mol (2002c) sees advantages and disadvantages in this metaphor for her theory, since the metaphor of the theatre suggests, that there is also a place behind the scenes, where the *real* reality is found. That is not the case, as everything is reality (Mol, 2002c). For this *performing* Mol uses the term *enact*. *Enactments* suggest more flexibility: how something is perceived is changeable and depends on the practice in which it is realized and manipulated. Therefore, enactment can differ from one practice to another (Mol, 2002c). Enactments take on a fluid form; the similar and dissimilar ontology of realities is a continuous and also absent manipulation of reality where things are not defined by boundaries, time and accessibility, nor associated through relations (Mol and Law, 1994).

The following illustration gives an understanding of the research design of this study. It gives an overview of what steps are taken to answer the research question, along with an insight on which and where the various *methods* and *theoretical frameworks* are applied in the first three phases of the Strategic Design Practice model.

The thesis process is illustrated as a linear process, however, the process of this work has been iterative, as explained previously, in *8.1 Design Thinking*.

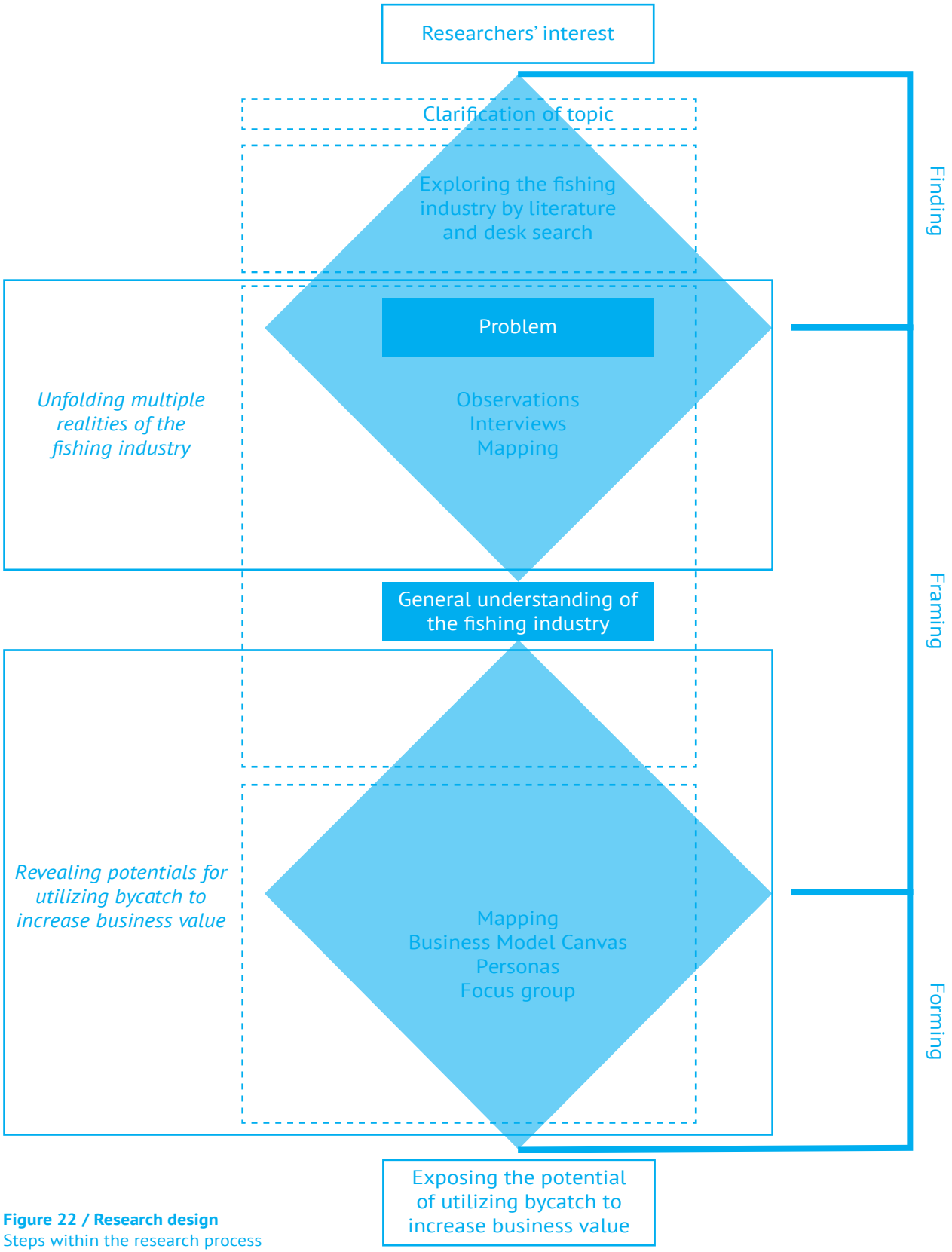


Figure 22 / Research design
Steps within the research process

Summing up

Design Thinking provides creative and innovative solutions to difficult challenges, wicked problems, within business, government and society. In this case, *Design Thinking* is applied in the fishing industry due to the implementation of the landing obligation and in relation to challenges regarding bycatch. The complete Strategic Design Practice 5F model process goes through 5 phases, however, this project goes through the first three phases only. Starting with the finding phase that seeks to create an understanding of the fishing industry in general and identifies the problems within. From here, the framing phase is being introduced, that focuses on the understanding of the topic of inquiry and (core) problem. It is important to seek for many perspectives on the topic and related problem, in order to understand possibilities as well as restrictions. Within the framing phase, the *theoretical framework* on *Multiplicity* is implemented to unfold the multiple realities and enactments on the fishing industry. Seeing the fishing industry through different perspectives leads to the understanding, that the fishing industry cannot be perceived as one fixed situation. The reality of the fishing industry takes shape through daily practices, where actors perform and enact with practices in the industry. The understanding of the *Multiplicity* of the fishing industry derives from perceptions of the industry from empirical data. This will serve as a stepping stone into the third phase of the 5F model, the forming phase, to unveil if and how potential value creation of bycatch can increase. Potential customers are brought into this process, to understand their behavior, needs and desires, aiming at learning if and how bycatch can be introduced to the current market to create business value.

Having presented the context, *methods and theoretical framework* used in this project in the chapters above, the *empirical findings* and *analysis* of the project's empirical data will be presented in the following chapter.

Chapter 9

Empirical findings

Key findings from the project's empirical research

This section presents the key findings from the project's empirical research. Key aspects of the data from fields observations, interviews and a focus group have been gathered and will be presented in condensed summaries, leading into the case study description, in order to give the reader an overview of the outcomes from the different methods conducted throughout the project. The aim is to present the findings to allow the reader to understand how the field of research have been opened up and how the different methodologies have contributed to the project's analysis. Elements of the interviews have been sorted from the summaries, however, complete transcripts are available in appendix 1, 2, 3, 4 and 5. The complete focus group transcript can be found in appendix 6.

9.1. Field observations

Specific observation days were initially not at part of this project's methodology. However, by visiting the Port of Hanstholm three times and visiting IJmuiden Harbor (Holland) once, one could argue that experiences derived from those trips, have contributed to understanding the complexity of activities at these harbors. As a result of this, notes and pictures from the visits are rewritten as observation summaries after the visits.

The observations were conducted both singlehandedly at the Port of Hanstholm and at the IJmuiden Harbor, as well as, one (improvised) tour, guided by the Technical Administrator Peter Nyman, at the Port of Hanstholm. It was therefore also chosen to summarize these observations as written narratives from the researchers' point of view. As Hansen (Appendix 5) expresses, even people who live in the nearest towns (to Hanstholm red.), knows very little about the fishing industry and activities at the harbor. The choice was made to express the observations in a sense that allows the reader to learn the experiences of the researchers. By gathering observation data as narratives, it describes both the case of IJmuiden- and the Port of Hanstholm more vividly and unveil some of the complexities that can be experienced when stepping into such a field of research, as opposed to simpler observation notes.

9.1.1. The Port of Hanstholm

When driving to Hanstholm from a southern direction, the first thing that meets you at the end of the dunes of the National Park of Thy, are the walls and buildings of the harbor that are almost stretching out into the rough waters of the North Sea. On top a hill lies the village itself, tucked away from the sea. The village was not visited during the trips.
At the entrance to the harbor you cannot help to notice some kind of activity - whether it be from the local supermarket or workers driving around in forklifts and trucks. Even though the first trip began at 5 in the afternoon, where fishing

activities have gone silent, you can still sense a that there is activity all over the place. When stepping out of the car, the first thing that hit is the smell of the sea and fish, after that you notice the rough wind and the roaring sound of the waves crashing at the walls of the harbor.

There are many different types of buildings located at the harbor. Figuring out that the logistical system can be quite overwhelming, completely impossible at first. You find both public and private auction houses and cafeterias adjacent to storage buildings and repair shops. The public auction house was visited during the guided tour by Peter Nyman. The public auction halls were almost emptied at that time and cleaning practices had started. All that was left were wet floors, endless stacks of empty fish boxes and only a few full fish boxes, waiting to be transported. Regardless of the *empty* auction halls, evidence of activity earlier in the day was clear to see.
The (storage of) fish boxes has a big role in the logistics and success of the harbor and this seemed to be, to the untrained eye, where the most obvious system was found. In the halls you can find towers of about 5 meters of fish boxes in different colors, depending on their ownership and purpose. In here forklifts pass by constantly and there are warning signs all over the place, in order to prevent accidents.

Mainly three types and sizes of vessels are found all across the harbor. Along the quays you see fishermen by the docked vessels cleaning up and organizing nets. Seagulls flock the area to eat the scraps that come from the boats. The sizes of the vessel might seem underwhelming, when compared to the images of the massive trawlers often shown on TV.
Around the harbor lies several cafeterias, that cater to guests as well as workers on the harbor. Probably mostly the latter, seeing as cafeterias open at 5 in the morning and closes at 3 in the afternoon, hardly the ideal hours for casual visitors.

The harbor is about to forego a large expansion, and this is a hot topic throughout the local communities, as the area is also home to lots of leisurely activities such as hobby fishing, photography and surfing. But for now, it seems as if the plans will proceed as scheduled. This along with the many present workers and visitors of different nationalities, tells the story of the fishing industry still being king around these parts. As mentioned earlier, these visits were conducted in the afternoon when most fishing activities were long over. Still, the harbor is home to massive amounts of activity even when after it has gone quiet.

Figure 23 & 24 / Observations
Port of Hanstholm

9.1.2. IJmuiden Harbor

Due to the built of a new sea lock in IJmuiden, which is to become one of the largest sea locks in Europe, there is a lot of passing heavy traffic while driving to the harbor. Diversions ensure that the port is difficult to reach. Upon arrival at the port, around 10 o'clock in the morning, the port is somewhat deserted, and it comes across as a desolated location. Industrial halls, rusted ships, neglected working-class houses and what looks like forsaken eateries, are the first things that meets the eye.

IJmuiden Harbor is segmented, where the fishing port is divided in two quays with mooring possibilities. Small cutters are located in a closed part of the harbor, not to be accessed by visitors. There is also a transport port, where mainly cargo ships and cruise ships are docked.

After a short walk along the quay, where a single, larger cutter is docked, the observation is stopped due to a scheduled interview with Program Manager Nathalie Steins, from Wageningen University. The interview takes place at the Wageningen Marine Research institution, located at the harbor. Steins indicates to go to the information point, called SHIP, where information is given about the new construction of the sea lock, about the port and its activities itself. While driving to SHIP, through the industrial area of the port, many auctions and fishmongers are passed.

There are two types of fishmongers found across the harbor area. The first type offers their fish for auction prices and sells on location, meaning, from a small store located in the halls where the auctions take place for both the retail/wholesale sector and for the food service sector. Nearby restaurants, but also locals and passengers can buy fresh fish from those small in-house fish stores.
The second type of fishmongers, found in the industrial area of the port are more traditional. Meaning, they are located in a private store and not in-house. Those fishmongers buy their fish directly from the auction houses right across the road. At the fishmonger one can buy e.g., fresh- and frozen fish, shellfish, crabs and freshly prepared fish.
In front of the shops, signs with (daily/weekly) offers are placed. Almost every fishmonger is advertising with kibbeling, a Dutch specialty of deep-fried cubes of battered cod. Around 1PM, there is more action going on. The auction houses are cleaned out, employees are cleaning the halls with big hoses and workers who are on a break go to the fishmongers for a quick lunch.
In the visited stores, it is striking that both commercial fish and non-commercial fish are offered. Under the heading of *free-range* fish, or *wild fish* in some cases, bycatch is offered for around €5 per 3 kilos (as shown in figure 25).

Figure 25 / Observations
IJmuiden Harbor

Back at the fishing port where the boats are moored, it is noticeable that more cutters have been docked after their fishing trips. At some boats, there is still some activity going on. Crew members are cleaning the cutters and restoring the nets. All cutters at the harbor at that time, are owned by different owners. Different colors of the boats, names, flags and sometimes a logo on the cutters refer back to the owners.
In the port channel for the bigger fishing boats, it is only possible to land the catch directly on one side of the port. Those ships, which dock on that side, can immediately land their catch at an adjacent industrial hall.

Figure 26 / Observations
IJmuiden Harbor

9.2. Interviews

Five expert interviews have been conducted for this project. One at Wageningen Marine Research department of the Wageningen University in the Netherlands, two at Aalborg University and the remaining at the Port of Hanstholm, as also described previously.

In this section we summarize and present the findings from these semi-structured interviews. It is important to keep in mind that the summaries are based on written transcriptions of the interviews. This can limit the researchers' bias and individual interpretation of the data by relying heavily on transcriptions. These findings serve to underpin the purpose of the study and represents the respondents' points of view in relation to this project.

The following summaries will serve as an overview of the data, collected through expert interviews and will be used to view the research problem from various perspectives. They will follow in the same chronological order as they were conducted. Parts of the interviews have been sorted from the summaries but are available in the transcripts (Appendix 1; Appendix 2; Appendix 3; Appendix 4; Appendix 5.

Peter Nyman
Technical Administrator at the Port of Hanstholm
Interviewee 1 - Appendix 1

The interview with Nyman gave insight into the history and the many daily activities at the Port of Hanstholm. The port was build 50 years ago and has been a key factor to the development of the region, by e.g., supplying many locals with jobs. Due to its importance to the region it plays a big part in the everyday lives of the nearby inhabitants and the collective memory.

It is the biggest harbor in Denmark in terms of revenue of fresh fish and the third biggest in Europe. They house activities in industrialized fish products, such canned and frozen products, as well as a fish meal processing plant. The harbor is scheduled to undergo a big enlargement in the near future, where such activities should increase.

In private and public auction halls around the harbor fish are sold on a daily basis. Private companies can rent buildings at the harbor, mainly used for storage, building and repairing of vessels, processing, auctioning fish and administration. Fish is still being sold in an old-fashioned manner, where a buyer is present at the auctions to check the quality of the fish himself. There are several offices

located across the harbor, which are vacated by buyers from all over Europe. The price of fish is decided by the highest bidder. A lot of the catch, landed in Hanstholm, goes all across Europe and because of the infrastructure and web of transportation, a fish sold today can be in southern France tomorrow morning.

Vessels from Hanstholm are mainly fishing in the North Sea and the Baltic Sea. During the interview Nyman gives a thorough explanation of the operational tasks of fishermen onboard a vessel. Being a fisherman is a physically demanding profession, with many well-planned tasks to fulfill during more than week long fishing trips.

The administration of the harbor is involved with several research experiments and initiatives in fishery. Nyman informs of several projects, focusing on streamlining fishing activities by for example experimenting with storage, bycatch, monitoring and fishing methods onboard vessels. Due to rights and ownership of these projects, detailed information is not allowed for publication.
He explains that finding fishermen to engage in such projects is not always easy. There can be financial incentives and compensations, but often it requires a fisherman with a degree of vision, curiosity, and willingness to invest time and resources into the project.
In his view, nowadays, fishermen have to be more open-minded and innovative because the industry is going through major changes. Nyman believes in fishermen needing to change along with the industry, in order to secure their jobs and livelihoods in the future.

Nyman acknowledges the landing obligation as a regular challenge, mainly in terms of bycatch. He does not believe in completely minimizing bycatch-rates to 0%, but there is an importance within securing reasonable profits from it. There is much complexity linked to the usability of bycatch and juvenile species, and this is subject to lots of debate in harbors across Europe. The current possibilities, is by selling bycatch and juvenile fish for fishmeal and fish oil used for animal feed, cosmetics and medicine. In order to secure future fish stocks, undersized species (juveniles) are not allowed for consumption, but still has to be landed as bycatch.

Søren Eliasen
Associate Professor at the Aalborg University
Interviewee 2 - Appendix 2

Besides from increased bycatch volumes, it is unclear how the landing obligation will change Danish fisheries, but the impact will certainly be big. Due to regionally different markets and national legislations, changes will be felt

stronger in the north of Europe than in the south. Eliasen draws on the example of juvenile species being an integral part of the diet southern Europe, resulting in a less strict legislation on the matter regarding fisheries in the Mediterranean Sea. Not all species are included in the Danish quota system because of expensiveness of research and data, so only commercially important fish are included in this system and allowed for catching.
There is a dilemma in protecting species via the quota-system along with the introduction of the discard-ban. This will result in big amounts of bycatch, that would otherwise be discarded. Due to limited storage capacity, this will cause fishermen to seize fishing activities and go back to shore. However, discarding is not a random practice, but a way for fishermen to adjust their catch. Also, the survival rates of discarding are naturally larger than landing species, that in some cases ends up being destroyed. To meet this challenge, Eliasen suggests a proposal for quotas on bycatch as an alternative, by allowing fishermen a certain degree of bycatch. Naturally there should be established some kind of value for this to be a reality. The landing obligation can be viewed as a mean to collect data on the biomass in the oceans, without relying on reports by fishermen themselves. He believes, that negative public attitude and discourse towards the fishing industry is getting in the way of fishermen's willingness to report their bycatch and discard rates. He describes it as if it will highlight a problem the industry does not want to show.
Although it can be limited through better technology, bycatch is unavoidable. Again, he describes a dilemma; by law, fishermen are not completely free to choose their fishing gear and methods, the available options resembles a one-gear-fits-all solution, potentially getting in the way of optimizing bycatch-levels.

It could be worth experimenting if introducing alternative species can work as a supplement to quota and catches affected by future quota reductions. Danish consumers are, in his opinion rather conservative in their consumption of fish. He highlights the retail-industry as the key actor to finding and creating markets for alternative species and, that such initiatives are most efficient if retail-driven. He adds that in Danish supermarkets 10% of fish products goes to waste, compared to 1-2% in most other food categories. Initiatives to a wider variety of uses of fish and shellfish are underway, with Iceland being a frontrunner in experimenting with products from fish-waste. This is mainly due to the position of large production companies with lots of efforts in innovative product development. He sees a potential for improving the quality of fresh fish, but also in improving fishmeal- and fish oil products, in the end demanding more value from it.

The market for such products might be small and large technological investments are required, but Eliasen believes there is a potential market to be found or created. Fishermen have become very good at adjusting within the system and the *old fashioned way* is still a dominant mantra. There needs to be a proper

incentive for innovation to happen, seeing as the retail market is highly competitive.

There is pressure towards innovating in certain areas of the industry, such as better documentation processes, transparency and improved food security. But progress is slow seeing as mostly the largest and strongest companies are able to participate.
Even though he holds a certain affection for small vessels and small-scale fisheries, Eliasen does not neglect the effectiveness of larger vessels and companies, because they have the financial security that allows them to experiment and improve. Improving the industry, small and large scale, is linked to creating an attractive profession for younger generations, not only as an income, but also a profession that can fit modern lifestyles. By making the fishery and asset not only for the workers of the industry, but also the local communities, consumers and tourists, it can grow to fit the future needs of society.

Thorkild Nielsen
Teaching Associate Professor at the Aalborg University
Interviewee 3 - Appendix 3

New regulations and quotas are changing the Danish fishing industry a lot and are the most important factors to the recent and current developments. Smaller fishing companies cannot afford to buy quota for the most popular species, which puts them out of business. The Danish fishing industry is conservative, so changes do not come easily. For this, Nielsen highlights the small fishing community of Thorupstrand as an example where smaller businesses have created a solution to thrive within the legislative boundaries.
Part of the problems with the current legislations are, that there is conflict between practitioners (fishermen) and scientists (biologists, researchers and policy-makers), the clash between science and practice is evident throughout the industry. Simply put, the data that supports policies does not comply with the everyday experiences and perceptions of fishermen. The fishing industry is generally highly influenced by a minority of very strong actors setting the agenda.
Nielsen has been involved in sustainable management efforts in fishery and explains, that there are many current projects in the fishing industry. He has been involved in research concerning the Icelandic fishing industry on how to develop tools to assess sustainability. On a more *agricultural level* much effort is also being put into selective fishing methods.
Fish cannot be regarded as organic unless it is farmed fish, where it is possible to control the complete lifecycle of fish in a controlled environment. By being part of this, his perspective has been directed towards how consumers perceive organic fish, the potential for innovation in this area and how to communicate

it from a retail perspective. He highlights, that communication of fish products is key in these times of negative public discourses towards the industry.

Nathalie Steins
Program Manager at Wageningen Marine Research institute
Interviewee 4 - Appendix 4

The modern fishing industry is changing a way where constant mergers of activities between companies are seen across sectors. Instead of specializing in separate fields companies expand their fields of work, creating new markets within the industry. One way that is apparent is via an increased role of fishermen, not only at sea, but also by their involvement in processes after catch is landed.
Modern fishermen are being educated in more areas, taking part in more areas of the industry. There is great value in having fishermen who are informed on what happens with the catch, by sharing their experiences with colleagues, nationally, internationally and across sectors.

The Dutch fishery is in large parts running on exemptions. Pulse fishing has been the alternative to beam trawling, due to its reduced impact on the environment and its lower operational costs. Due to the fact that a majority of the fishery in Holland are made up by Plaice fishing, pulse fishing and beam trawling are the currently the only available methods.
The landing obligation is not fully implemented in Holland until next year, but also here is a need for exemptions. The bycatch rates of undersized Plaice are at about 25%, and since there have been a lack of solutions to address challenges of the landing obligation, Steins believe we will see even more exemptions and policy delays in this regard.

She describes three possible scenarios when the landing obligation and the banning of discard is implemented:

1. There will be a potential for products made by quality protein from juvenile species;
2. Fishermen will be more inclined to illegally discard;
3. Bycatch-rates will increase.

Onboard of vessels, fish are being sorted by separating individual commercial species and bycatch. The landing obligation brings a specific challenge regarding the storage of bycatch. With the first scenario, Steins explains that a vessel would require two extra crew members, with the purpose of handling bycatch for quality proteins.
According to Steins, the landing obligation will not have the positive biological

and ecological outcome claimed elsewhere, it is rather a moral solution to a moral problem – limiting waste of resources. Public negativity has put pressure on policy-makers to provide solutions for more sustainable fishing practices. By this, provoking images of fishermen discarding fish at sea (which she explains as a trigger behind the landing obligation) will be limited, but the ecological impacts will remain unchanged (or maybe even worsened). The idea was to force fishermen to fish more selectively, along with putting market value restrictions on bycatch. The problem is that it is hard to maintain authority control and regulate daily practices occurring at sea.
With a healthy stock of Plaice and a fishing pressure that is adapted to the stock size, discarding should not be a problem for the stock, hence the moral solution and not a biological one. Steins emphasizes the challenge of fishermen having to invest a lot to take part in innovation projects. Fishermen cannot afford to be projects owners themselves, they are more likely in paid employment as project participants.

Letting go of legislations on technical regulations by allowing fishermen to decide on gears themselves, could make them more flexible as to reducing bycatch.
There are also lots of experiments with cameras and monitoring, in order to make recording and onboard data collection easier. But there is a lot of conflict regarding camera surveillance and the willingness to implement it.
There is a potential for innovative products from bycatch and fish waste to be a supplement in feeding a growing population, but the volumes simply are not big enough to support an industry for it. Chain integration is where Steins view the biggest potential for improvement in the industry, through communication across the sector is where successful innovation is made.

Jan Hansen
Chairman at Fishermen's Association in Hanstholm
Interviewee 5 - Appendix 5

In the 70's and 80's the regulatory framework of Danish fishery was not as strict as today. Among other things, fish were illegally re-named in order to comply with the allowed catch compositions. The industry has gone through several phases of attempting to optimize the legal framework. The quota system, as we know it today, is one of these attempts, causing fishermen to constantly be able to adjust to the political landscape. The restrictions on fishing quota have caused many fishermen to sell their vessels and switch professions, for that the industry came up with a system that allowed some more flexibility in terms of regulating catch within the laws. The industry has developed a system allowing companies and fishermen to buy and rent quota from one another.

The reduction of the active fishing fleet is not all negative. The ocean and its resources are unpredictable and the amount of fish is limited. Bigger and fewer vessels are more effective and in certain aspects more sustainable than smaller vessels, often providing more stable livelihoods to its employees.

Hansen explains, that the consequences of the landing obligation had originally been toned down by the EU. But the reality that he and other fishermen have faced, is to him more challenging than so. The discard-ban will force issues and challenges mentioned elsewhere in this project as well, especially regarding storage limitations and increased waste of biological and financial resources. He claims that fishermen in Denmark have shown the willingness to accept solutions, that could more efficiently record and gather data. And in his opinion, this is what the purpose of the landing obligation truly is, gathering and recording data. He explains cases where fishermen have participated in projects trying to improve monitoring onboard vessels, that could make the landing obligation obsolete. In his experience, the data on which the quota are made, are skewed compared to reality of what fishermen are experiencing at sea.

Hansen believes, that more freedom to fishermen could be the answer. As he puts it; no fishermen wants to have bycatch or discard unnecessarily, but sometimes discarding can be necessary to adjust the catch. With discarding there is at least a survival rate above 0 %, whereas if you bring fish to land 100 % will be dead. And this is where improved fishing methods and gears can be a factor, in reducing the damage and mortality of discarded fish.

The Danish fishing industry is subject to lots of negative media coverage. The Danish Fishermen's Association have tried several initiatives to spread a positive message about Danish fishery. However, does he acknowledge that initiatives concerning the public opinion on fish and the fishing industry could be immensely improved. As he puts it, outside of the harbors people know very little about Danish fishery. Too much of his confusion, the fish consumption in Denmark is conservative. But there exist lots of discourses about fish in Denmark; that it is expensive, that quality fish is only found at the coast. In general, the industry is highly influenced by contradictions, misinterpretations and misunderstandings between private and public actors, especially between policy-makers and practitioners.

9.3. Case study - the fishing industry

The use of a case study allows the empirical data to be contextualized in a specific point of departure, the Port of Hanstholm, and the use of a case study design can be used to supplement the interpretation and analysis of empirical data. This has proved to be useful when conducting interviews, both by identifying key informants but also by serving as point of departure in discussing

specific topics during interviews relative to real life scenarios.

Findings of empirical data, along with various messy and ordered maps, led to the following understanding of the case, the Port of Hanstholm.

The Danish fishing industry has changed over the past 10 to 15 years. Important changes were made to the regulations after the implementation of the quota system. Quotas are introduced to protect fish species and ensure ownership and rights to fish. During this privatization of the sector, fishermen began buying quota to secure ownership of fishing rights. To protect small-scale vessels, most commonly owned by a family and smaller than 15 meters, quota was reserved by the state.

The privatization of quota had consequences, such as private owners of smaller scale vessels began to merge their businesses for economic reasons. Small-scale vessels are less efficient and are more vulnerable to policy changes and unstable profits. The changing political landscape not only lead to fewer vessels, it also led to fewer landing places and a geographical concentration of fishing activities. Nowadays, almost everything is landed in Thyborøn, Skagen or Hanstholm. Nevertheless, some vessels are still registered in other harbors.

Due to the hard working conditions, recruitment is an issue within the industry. The larger vessels, which are bigger than 24 meters, have a higher survival rate due to their relative stability in e.g., economics. They are able to buy quota rights and are better established to get loans, which can help ensure steady incomes for employees. This same stability has not been the case for smaller vessel, which has resulted in them either being bought by bigger companies or going out of business.

More changes are expected, by all key informants, with the full implementation of the landing obligation in 2019.

Today, the fishing sector is controlled by TAC shares, Minimum Landing Sizes (MLS) and other regulations such as regulations on allowed number of fishing days and gear selectivity. Research in emissions, disturbance of the seabed and/or stock index serve as the foundation of such regulations. However, it is indicated that fish stocks, hence regulations and quota's, does not match the actual amounts of fish in the oceans. Several ideas are being brought forward to report data more accurately. Ideas such as e.g., onboard camera surveillance or self-conducted onboard registration by fishermen. It is debated if these attempts of innovations are halted due to the fear of public negative discourses regarding waste at sea.

Since fishing activities are difficult to control at sea currently, an increasing of illegal practices is expected, such as illegal discarding of quoted species. Seeing

as fish is sold to the highest bidder, there are certain labels of quality between similar quoted species, such as size. Discarding of quoted species is also referred to as high-grading and is the practice of discarding commercial species, in favor of an even better catch composition.

When fish is landed, it is mainly sold via public auctions, owned by a private or public owner. In some cases, fishermen can get licensed to sell their catch directly to the customer.
Fish meal factories are another channel where fishermen can land their catch. Industrial purposes are typically fish meal or fish oil, where certain species are specifically caught for this purpose and directly sold to these factories. However, there is not enough bycatch to meet the desired volumes of fish factories, so it is often supplemented with imported fish.
The income of fishermen generally depends on commercial species since these are most profitable. Unwanted bycatch on the contrary is not profitable, yielding little to no profit. Bycatch requires extra working hours, manpower and storage facilities onboard. Before, fishermen could adjust their catch by discarding unwanted bycatch, making room for larger amount of the targeted catch. Now it will be mandatory to store quoted bycatch on board and land it at the harbor. Since most vessels do not have extra room for storing bycatch it will force them to return to the harbor and land their catch. This will either result in waste of time, and thus money or it will force them to prematurely end their fishing activities. Several initiatives aim to reduce the amounts of bycatch, but informants indicate that bycatch cannot be avoided completely.

Juvenile fish are defined as unwanted bycatch and cannot be sold for direct human consumption. These must be bought by registered buyers, certified in handling undersized fish. Juvenile species unsuitable for sale to indirect human consumption, due to e.g., damages during handling of the fish, can be used as an animal byproduct or in the biogas industry.

Findings of empirical data, along with various messy and ordered maps, led to the following overview of the case, the Port of Hanstholm. Find the larger version of the overview of the fishing industry can be found in appendix 11.

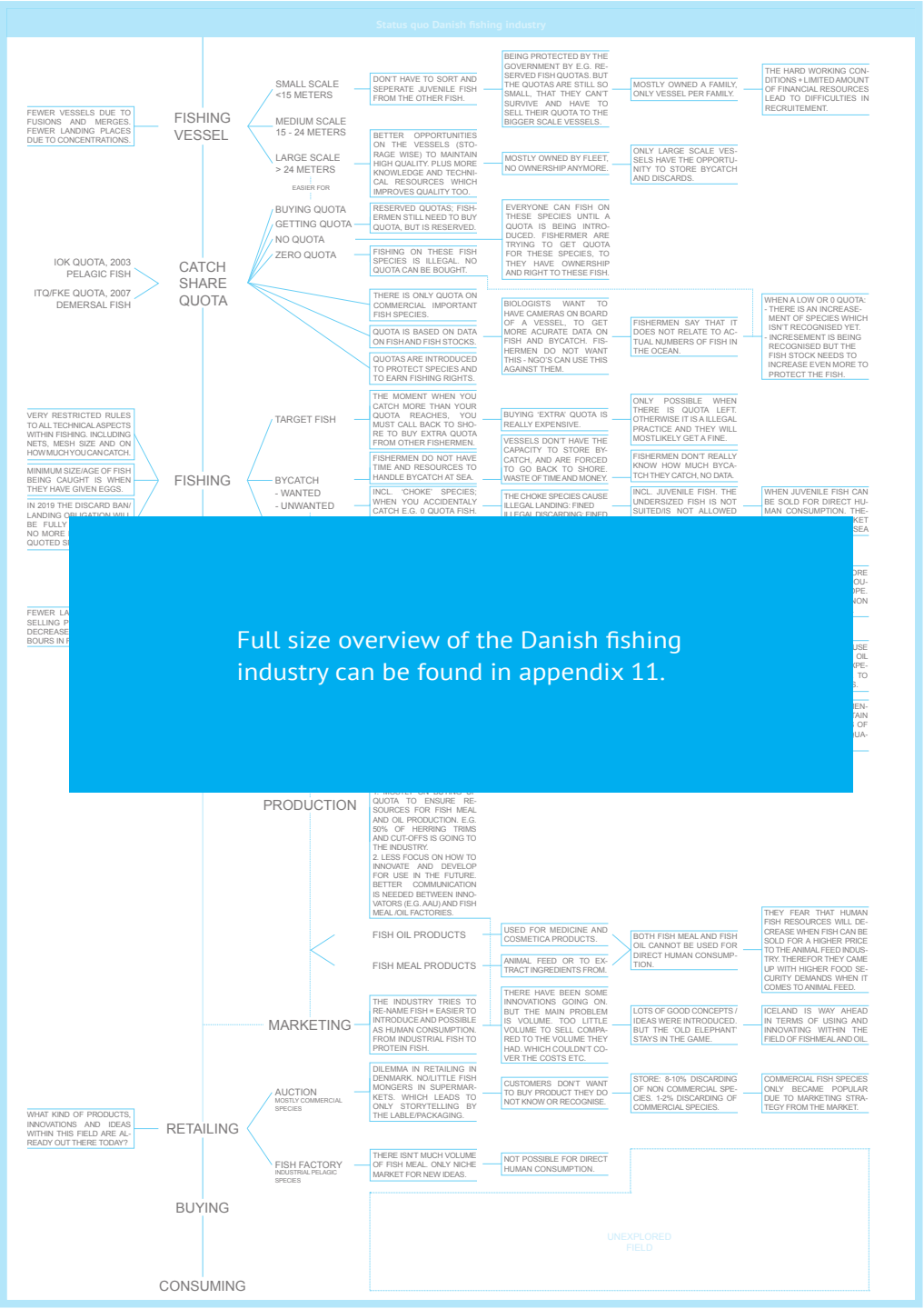


Figure 27 / Fishing industry
Case overview Danish fishing industry

9.4. Focus group

Before the actual discussion, participants were asked about their immediate thoughts on the fishing industry and bycatch, regardless of any prior knowledge. A common theme that arose, was the skepticism about the management of the Danish fishing industry and a general distrust in it. These attitudes where mainly due to recent media attention regarding quota-concentration in Danish fisheries and exemplified, by the participants, through examples of discontent towards politicians and leaders of the industry. Not all participant where aware of the term bycatch, however, most participants associated it to large amounts of waste and inconsiderate fishing practices.
Several participants drew on childhood memories of a romanticized fishery, with clear connections to local communities. These remained as memories, as the current impressions were dominated by negativity, a lack of transparency and distrust.
Participant will be presented in a random order and represented by their first name throughout the remainder of the project, at their own acceptance.

The participants were asked to choose between pictures spread across the table and to relate a comment to their choice.
Martin argued that the pictures he chose related to the *little guy* in competition with industrial giants, again relating it to media attention on the matter of smaller fisheries submitting to larger, wealthier companies and quota concentration. This participant also chose pictures of fish waste by relating it to his associations of bycatch causing lots of waste in terms of money and food.
Nicoline chose pictures she described as *all the bad pictures*, describing how her visions had turned from a romanticized idea of *an honest man's job*, into an industry that she associated with plastic in the oceans, lack of sustainability, high pollicization, animal cruelty and waste.
Frederikke was concerned about how lack of transparency affects her as a consumer. Distrust in political figures, was again highlighted as a result of negative media coverage. She choose pictures of large beam trawling vessels, as it made her think of the negative effects of fishing methods and the system regulating it, resulting in low quality products for the consumers containing toxic microorganisms.
Andreas explained how he viewed bycatch as a reason for fishermen to dump fish in the oceans, leading to depopulation of species, food waste and challenges regarding research and data collection. To him, fishermen are due to systemic pressure, driven into *pretty bad behavior*, an issue he described as having consequences on a global and political scale. He explained how he viewed a conflict in the system towards profit-making and dark sides to human consumption, getting in the way of sustainable and ethical practices.
Anna chose pictures to explain, that we, as consumers are not always aware of the negative effects to our consumption. She linked the pictures to a *dirty industry* and how humanity is contributing to polluting the oceans, and how this

pollution ends up in our bodies when we consume.

Generally, there was great distrust in those practicing and managing fisheries. However, when products reached retailers, the participants regained some trust. Retailers exemplified a need to provide secure products for the consumer, because they would otherwise lose income and by that they become more trustworthy. The reason for this was a transparency, that was definitely not found in the fishing industry itself.

The discussion moved on to how some participants found it complex, that they had moved from being raised to perceive fish as something healthy and good, while as adult consumers realizing that it was not that simple. However, fish was still favored health-wise opposed to red meat, despite of concerns about heavy-metals and other micronutrients. There was an agreement that eating fish was good in terms of nutrition, but bad in terms of supporting an un-sustainable industry.

Most of the focus group participants bought their fish at supermarkets, as visits to fishmongers were linked to special occasions. The reason for this was mainly due to fish being expensive, in the participants' views and therefore also considered a luxury.

When discussing what type of fish-products they mainly consumed, smoked salmon was a popular choice. There was a trust in smoked products, because of its safe and appealing looks. Canned products were the secondly most mentioned type of product. The reason for fresh fish not being a preferred option, was mainly due to the price, whereas the above-mentioned products was found more reasonable in terms of pricing.

The participants showed little inhibitions in terms of buying, cooking and eating fish they had never heard of. The specie did not matter all too much when buying a fresh product, especially if pre-filleted. As to guidance on how to prepare fish, at the fishmonger, advice would be directed at the salesman, whereas buying a packed product in a supermarket, seemed to require some sort of guidance on the packaging.

When the discussion moved on to bycatch, every participant associated bycatch to food waste. Therefore, potential consumption of bycatch was related to limiting food waste. This topic was the only topic, that raised some disagreement among the group. By some, bycatch was perceived as a good way to limit food waste, especially if communicated and marketed properly. Other members were concerned, that promoting bycatch could be another way for the industry to mislead consumers and increase profits on non-selective fishing methods and promote excessive fishing.

Summing up

From the empirical data collection some findings have proven more significant than others, in terms of answering the research question "*How can a Design Thinking perspective help unfold multiple realities of the fishing industry and reveal potentials for utilizing bycatch to increase business value?*". As a result of this, specific key findings have been gathered below and will be addressed throughout the *analysis* and *discussion*:

- There is doubt about the *true* purpose of the landing obligation; if it is an answer to a negative public discourse, rather than a policy to better conditions for the fishing industry, the marine life and ecosystems.
- The Netherlands has a system that allows sales of bycatch directly to consumers at low prices.
- Negative associations towards the fishing industry can affect consumer purchase behavior or choices negatively.
- A market for bycatch is possible, especially when this is retail-driven
- Bycatch should not become profitable to such a degree that it stops selective fishing practices among fishermen. However, value should and could be created for it.

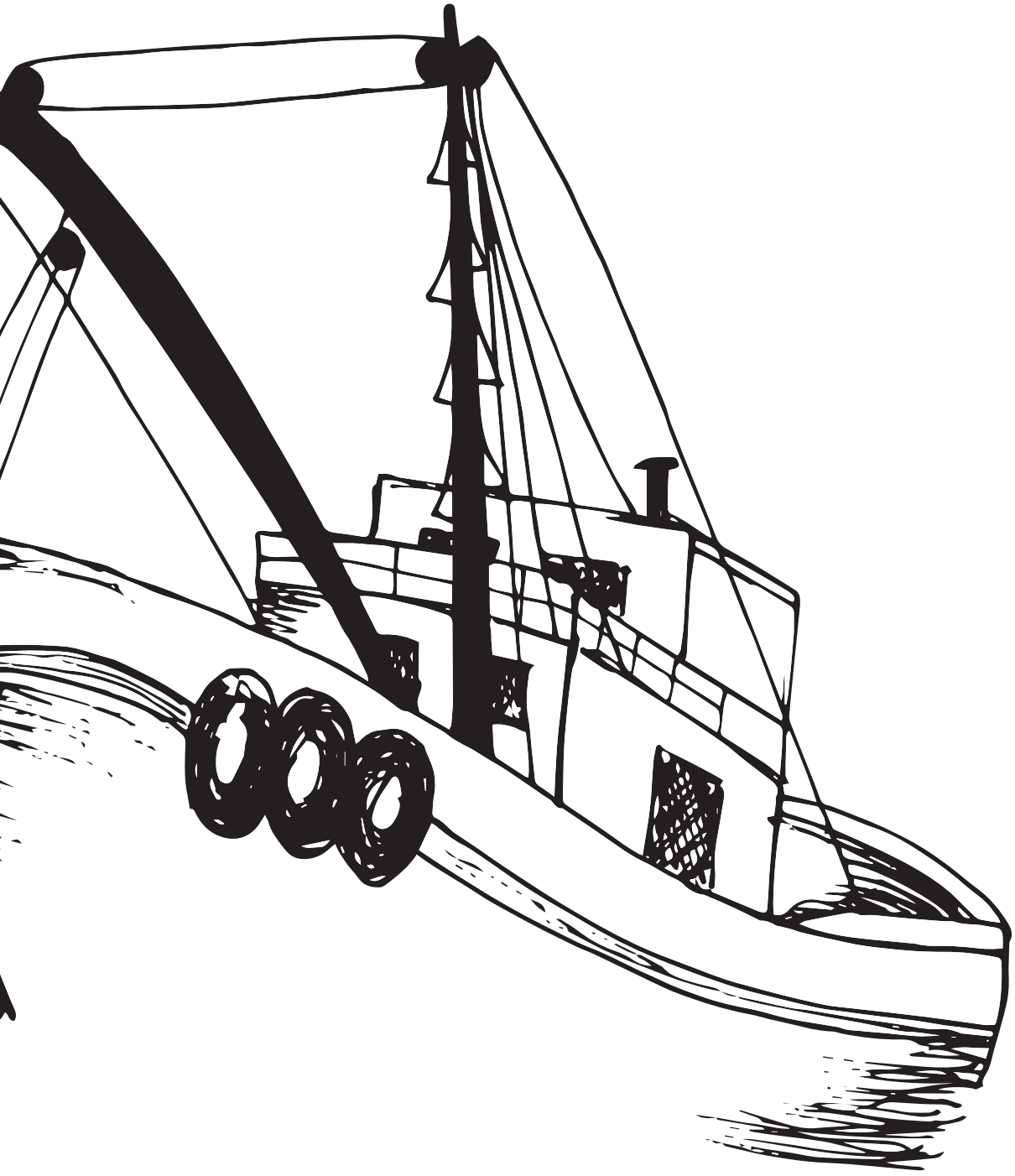


Figure 28 / Drawing
Fishing trawler

Chapter 10

Analysis

Analysis on key findings from the project's literature and empirical research

The analysis chapter will present primary findings of the empirical data and address them in relation to the theories, *Multiplicity* and *Design Thinking*. The chapter is divided into two sections. The first part of the analysis functions as the foundation and serves as the underlying knowledge from a larger organizational perspective, needed in order to explore the potential value creation of bycatch. In this chapter, multiple realities of the fishing industry are analyzed, providing insight in to the complexity of the Danish fishing industry. As earlier mentioned, activities in aquaculture, energy generating, transport and other services in the sector, are excluded from the study.

The second part of the analysis presents a variety of findings towards a business potential for bycatch. Personas and BMCs, along with the use of a focus group discussion serve as the foundation in analyzing the business potential and *Value Proposition* from a consumer-based perspective.

10.1. Analysis 1.0

Understanding the fishing industry contributed to identifying challenges within the current development of the sector and the foundation to explore the potential of increasing business value utilizing bycatch. As a result, specific solutions are not further analyzed and discussed. Instead the findings of the empirical data functions as waypoints to further exploring the research question. Creating an understanding of the research field is the first phase of the Strategic Design Practice model, the finding phase. Understanding and highlighting conflicts, restrictions and possibilities within the research field is part of the second phase, the framing phase (Brown, 2009; VIA uc, 2014). This part of the analysis covers the first two phases of the 5F model.

Based on the theoretical framework of *Multiplicity* and *Design Thinking*, the following section analyzes how various professionals within the fishing industry view current developments in their field. It creates an understanding of wicked problems within chains of the systems, unfolding the narratives of the fishing industry and its multiple realities.

In order to present the general value creation of bycatch, the analysis of the *empirical findings*, in combination with theory and literature, is mapped out using Business Model Canvasses (BMC), with Port of Hanstholm as the organization of the case. This BCMs are presented in the end of the first analysis.

Five expert interviews have been conducted for this project. One took place at Wageningen Marine Research department of the Wageningen University in the Netherlands, two at Aalborg University in Copenhagen and the remaining at the Port of Hanstholm.

The overviews below, briefly present summarized findings from the qualitative interviews, as a part of the study design and methodology.

Peter Nyman
Technical Administrator at the Port of Hanstholm
Interviewee 1 - Appendix 1

- The Port of Hanstholm have been a central part in the development of the region and it has a large part in the collective mind;
- In fresh fish, Hanstholm is the biggest harbor in Denmark and the third biggest in Europe;
- The harbor administration is actively involved in research and projects on improving the fishery in cooperation with several organisations;
- Being a fisherman is a demanding profession. Unstable incomes and constant change mean fishermen have to be open-minded when it comes to innovation and changes;
- The landing obligation will provide challenges regarding bycatch, such as onboard storing and sorting;
- Getting proper value from bycatch can be key, but is subject to a lot of complexity regarding its usability and limitations in the regulatory framework, especially according to its value and profit.

Søren Eliasen
Associate Professor at the Aalborg University
Interviewee 2 - Appendix 2

- There is uncertainty about the impact of the landing obligation, but it will be big;
- Regional legislation will result in bigger impacts in Northern Europe;
- Research and data for quota systems are expensive;
- Only financially important species have quotas;
- *Discard-ban* might not protect species. It may be the opposite;
- Landing obligation will mean more bycatch;
- Landing obligation is a way to report catches, without relying on fishermen to do it;
- Rigid legislation on fishing gear is getting in the way of reducing bycatch rates;
- Bycatch is unavoidable;
- There might be a potential in a market for alternative species, this should be driven by the retail-sector;

- The same goes for innovation in fishmeal and fish oil production and value creation. This should be driven by producers;
- The market is highly competitive, so actors seeking alternative markets needs financial incentives.

Thorkild Nielsen
Teaching Associate Professor at the Aalborg University
Interviewee 3 - Appendix 3

- Changing quotas and regulations are the most important factors in the changes and the future of Danish fisheries;
- There are examples of smaller fisheries that have been able to coexist with the current legal system;
- There is a clash between science and practice in the industry;
- Data that supports policies does not comply with the experiences and perceptions of fishermen;
- There is a potential need for more consumer-based initiatives;
- The industry is highly influenced by a powerful minority.

Nathalie Steins
Program Manager at Wageningen Marine Research institute
Interviewee 4 - Appendix 4

- The industry is changing through mergers of activities and the creations of new markets;
- There is a big potential for successful chain integration;
- The role of fishermen can increase, benefitting knowledge sharing across the industry;
- There are exemptions in dutch fisheries due to lack of solutions for current policy changes;
- The landing obligation will require even more exemptions;
- Bycatch rates will increase, resulting in a need for solutions;
- There might come a need for products made from quality protein from juvenile species;
- The landing obligation and the ban on discarding might make fishermen more inclined to discard illegally;
- An increase in bycatch will result in challenges regarding onboard storage and sorting;
- The landing obligation is not going to have a significant impact on either fish stocks or the ocean environment ;
- The landing obligation is a moral solution to a moral problem, meaning

it is made to change a negative public discourse, instead of addressing an ecological improvement;
- Fishermen experience financial trouble in partaking in innovation, especially regarding improved fishing gear and technology;
- Restrictions of fishing gear and selectivity are counterproductive. More freedom to fishermen in selection of gear can help reduce bycatch rates.

Jan Hansen
Chairman at Fishermen's Association in Hanstholm
Interviewee 5 - Appendix 5

- The Danish fishery has been subject to many large charges regarding management systems, policies and legislations;
- The current quota system has resulted in many smaller fisheries going out of business;
- There is a flexibility in the system, which allows companies to buy, rent and sell quota and catch between them. This is an expensive practice, but ensures a purpose for when quotas and catch does not matched;
- Bigger and fewer vessels are more efficient and to an extend more sustainable;
- The landing obligation results in many challenges, such as onboard storage, waste of fish and loss of income;
- The landing obligation is made to ensure recording and collection of fish stock data. The industry have been prepared to agree to other and more precise alternative, but in vain;
- The data upon which quotas are made, are flawed;
- Fishermen does not discard voluntarily, it is never a desired practice;
- Discarding has higher survival rates and less waste, than the outcome of the *discard-ban;*
- Danish fishery is surrounded by a negative discourse, both because of a lack of public knowledge and negative press;
- There have been very little focus on external communication regarding Danish fishery.

Various subjects were addressed while interviewing the informants and are mapped out using the synthesis sensemaking process of Kolko (2010). These subjects are mapped out by noting down findings, creating messy-, ordered- and relational maps according to the situational mapping process of Clark (2009). As argued for in the *methodological framework,* not all maps are presented in the paper itself, however, the ordered map of the interview themes can be found in appendix 9. As a result of the maps, which are built on the empirical data, this study divides the fishing industry into 6 patterns; fishermen, discarding, landing obligation, quota system, bycatch and market.

This process resembles coding as often conducted in qualitative research. It allows overall themes to emerge from the empirical data, where certain patterns can be interpreted and analyzed (Bryman, 2012g). These findings are based on the individual researcher's ability to translate the empirical data and identify the most important patterns. Therefore, it should also be acknowledged, that the findings might vary depending on the researcher. However, as argued for by Clark (2009), it is not possible to completely separate the themes from each other, as they consistently overlap.

10.1.1. Fishermen

Being a fisherman is a strenuous profession, but nevertheless an integral part of the industry. Low and, at times, unpredictable incomes, along with hard working conditions make it a rough working environment (Appendix 1; Appendix 2; Appendix 5). These, and other factors affect the recruitment of new (and younger) employees, especially for smaller businesses (Appendix 2).

According to Program Manager Steins from the Wageningen Marine Research institute, big(ger) vessels provide security (Appendix 4). Working on smaller vessels mean that yearly incomes are less stable, since earnings depend on the amounts of profitable catch. Steins also state that fishermen have strong mindsets towards avoiding *losses* of valuable catch, which can affect the willingness and ability to engage in innovations (Appendix 4). Losing valuable catch can occur when e.g., new regulations or innovations are being implemented. Due to the landing obligation, fishermen are forced to land all quoted catch, including that of little to no profit. All informants in this project agree that bycatch takes up storage space, time and thus money, which could be used for commercial, hence more profitable species.
As described in *State of the Art* Christensen et al., (2015) state that innovation activities in fishery are largely dependent on external influences and communication.
In the fourth interview with Steins, she explains how external influences, such an increase in Dutch fuel prices, can result in the need for new innovations to lower costs (Appendix 4). New kinds of technology created a less heavy catching method, where nets do not drag over the ocean bottom, but flies a few centimeters above the seabed instead. The amount of demersal fish, that lives on the seabed and are a main part of Dutch fisheries, decreased due this catch method. This case highlighted an unwillingness among fishermen and new innovation, as they kept fishing according to the *traditional* way, neglecting innovations. However, during the interview, Steins highlights that fishermen did not take in mind that their fuel costs went down to a degree where it resulted in a higher income than expense (Appendix 4). She also put emphasis on the fact that the new generation of fishermen is more open towards innovations, as long as these are proven to be more profitable (Appendix 4).
During the interviews with both Eliasen, Associate Professor at Aalborg Univer-

sity, and Steins, they argue that implementing innovations is costly (Appendix 2; Appendix 4). It takes time, money and requires knowledge and manpower. According to Eliasen, Steins and also to Nyman, Technical Administrator at the Port of Hanstholm, many fishermen do not have the resources for implementing new innovations (Appendix 1; Appendix 2; Appendix 3). This supports a notion of innovation needed in several aspects of the fishing industry, such as in retail- or production chains, as Eliasen and Teaching Associate Professor Nielsen, from Aalborg University suggest (Appendix 2; Appendix 3).

Steins describes how the WMR department in the Netherlands creates an opportunity to conduct experiments on research vessels with e.g., technical innovations such as new nets to reduce bycatch rates. Within this period of time, the WMR institute offers the vessel's employees a fixed income, so fishermen are motivated to participate and since they will not lose any income during the research period (Appendix 4). Similar cases are also described at the Port of Hanstholm, while conducting the interview with Nyman (Appendix 1).

"The fishermen really have ideas, but you have to give them the space to be able to do that. But the financial space is primarily a limiting factor" – Steins (Appendix 4)

Including the fishermen in more parts of the industry is an important matter according to Steins (Appendix 4). She stresses that by giving fishermen a voice in the industry innovations, opportunities and changes become more agile (Appendix 4). This aligns with the changes in the industry with new generations and the willingness to cooperate across the industry. Lately, fishermen *"get a lot more 'feeling' in the 'after' part of the chain, that is a big change"* – Steins (Appendix 4). To address future challenges, the industry needs to embrace such cultural changes to manage the industry more efficiently (Jentoft, 2004; Johnsen & Eliasen, 2011). *"The fishermen really have ideas, but you have to give them the space to be able to do that. But the financial space is primarily a limiting factor"* – Steins (Appendix 4).

Chairman Hansen, from the Danish Fishermen's Association in Hanstholm, argues that Danish fishermen have become adaptable to changes due to the many changes in the Danish fishing industry in the past 30 years. He brings forth several examples of fishermen's efforts to coexist in a rather complex legal framework (some cases were also illegal). For one he describes, that fishermen and the industry were on the forefront of developing a system for data collection, prior to the landing obligation, a system that was later neglected by the EU in favor of the current system (Appendix 5). Similarly, the platforms for renting, leasing and buying quotas between fishermen, are developed in cooperation with fishermen. Systems such as this allows them a flexibility in an otherwise unpredictable variable, such as catch composition. Eliasen et al., (2013) describes behavior of fishermen as multi-facetted and often determined by the result of several economic, cultural and social interactions within the industry. Hansen acknowledges fishermen as a driven force, but a force by whom

the main motivation, in his view, is securing a steady income. There is long line of examples with fishermen who actively sought to act along with the changes of the industry through mergers of companies and actively seeking advice from the Fishermen's Association in how to comply with the changing landscape (Appendix 5).

10.1.2. Discarding

"Discarding is a way to adjust the catch to what they can land. It is a tool to adjust the differences between the quotas and the fishing opportunities" – Eliasen (Appendix 2). The main reason for discarding is due to catch of unwanted species and the market value of certain species. While conducting the second interview, Eliasen explains that fishermen can be forced to discard due to limitations of quota (Appendix 2). If a fisherman has caught more than his allowed quota, he can sell the fish or buy or rent quota from other fishermen. However, this is a rather expensive solution (Appendix 5). According to Nyman, the first interviewee, discarding takes time. Time preferably spent on handling the main (valuable) catch (Appendix 1). Contrarily Steins describes that, sorting fish happens on an assembly line on board. Species that are not wanted, stay on that assembly line and are returned to sea, with no extra work needed (Appendix 4). Naturally, the restrictions on discarding will change such a practice and demand extra resources in sorting and storing.

Hansen, from the Danish Fishermen's Association, claims that the survival rate of discarded fish is 10 to 70 percent (Appendix 5). Steins adds, while interviewing her in the Netherlands, that it *"...does not matter for the stock for a good stock management for a healthy stock of plaice, that you return the fish back to the ocean"* and that these mortality rates are already compensated for within the quota system (Appendix 4).
Despite the different professions and affiliations, all interviewees shared their opinions on the newly introduced landing obligation and its impact on discarding-behavior. Both academic researchers Eliasen and Steins, believe that data on discarding is limited and the landing obligation, is partly a mean to ensure greater data collection on the health and size of fish stocks (Appendix 2; Appendix 4). When discussing the landing obligation with Hansen, he poses an alternative solution; *"why not register them and throw them overboard?"* – Hansen (Appendix 5).

Eliasen suggests that, fishermen might not be willing to register discard due to the fact that *"...it takes a lot of time and it also shows a problem which they don't want to highlight"* – Eliasen (Appendix 2). He goes on to explain that fishermen fear public campaigns towards discarding might be a substantial concern to the industry (Appendix 2).
As also touched upon in *State of the Art*, similar to other behavioral patterns of fishermen, discarding behavior is also driven by several biological, technical,

operational as well as socio-economic drivers (Sigurðardóttir et al., 2015). The motivation behind certain actions could and should not be addressed by one-sided approaches, without at least acknowledging other drivers to such behavior.

"Discarding is a way to adjust the catch to what they can land. It is a tool to adjust the differences between the quotas and the fishing opportunities" – Eliasen (Appendix 2)

Bad examples of discarding had created very negative public attitudes towards discarding, resulting in public campaigns against it (Appendix 4). In the IJmuiden Harbor in the Netherlands, Steins states that the landing obligation is a *"... moral solution to a moral problem"* - Steins (Appendix 4) and that the policy is a response to a negative public discourse (Appendix 4). Prior to the implementation of the landing obligation, fishermen were already fishing selectively, due to the fact that certain species are more profitable and high bycatch-rates is never a desired outcome (Appendix 4).

10.1.3. Landing obligation

There was agreement between all interview informants that, the landing obligation will cause great changes to the fishing industry in terms of operational and systemic challenges regarding increased bycatch-rates. Associate Professor Eliasen emphasizes that implementing the landing obligation will impose challenges with regional, social and economic consequences, both industrially and societal (Appendix 2). Likewise, has it been proven that high bycatch-rates are often clustered in specific areas at sea (Lewison et al., 2009).

When discussing challenges regarding non-commercial species; storage space, manpower and time are recurring themes, that might result in less profit (Appendix 2; Appendix 4; Appendix 5). Eliasen contributes to this, by explaining that the landing obligation will make it even harder for smaller vessels to compete with big scale vessels, as they do not have the financial resources to maintain their businesses, *"It might have some local economy consequences, or it can affect tourism. Maintaining productive basis for local communities"* – Eliasen (Appendix 2). Hansen, who works with both small-scale as large-scale vessel owners, agrees with Eliasen and adds that various consequences are linked to the landing obligation. *"A lot of ships will disappear when you did this, because with the current volume, some ships will have to disappear"* – Hansen (Appendix 5). Bigger vessel are also better suited to participate in innovation efforts or improving technological measures, such as systems to identify certain areas with higher bycatch-rates. Both Eliasen and Hansen are ambivalent as to their opinions on the reduction of the fishing fleet, as bigger and fewer vessels are more cost- and energy efficient compared to smaller vessels, that might have stronger ties to the local communities (Appendix 2; Appendix 5).

Despite new innovations and flexibility, the discrepancies between science and practice is evident in fishermen losing patience in the changing industry. This might affect the objectives of the landing obligation. As Hansen explains; *"The*

guy who is creative, he has discarded them and then only brought a small part of it to shore" – Hansen (Appendix 5). Steins, who works in the Dutch fishing industry, argues for this as well and adds; *"This cannot be checked. The landing obligation is simply not to check and that is why we think it is just a stupid legislation here. Because it is not really possible to check what happens"* - Steins (Appendix 4). She goes on to explain, that due to low levels of acceptance from the practitioners (fishermen), a possible increase in illegal discard behavior can be expected. A point which is also made by Sigurðardóttir et al., (2015). Lack of data or misinterpretation (or in this case disagreement) of scientific data, often leads low levels of compliance towards policies based on arguments from that data. In the end resulting in the opposite outcome, then the intended aim of the policy (Sigurðardóttir et al., 2015).

10.1.4. Quota system

Given its importance in the fishing industry and fishing practices, the quota system is discussed in all interviews and is a recurring topic in this project. Quotas were introduced to protect and control fish stocks, preventing excessive fishing and exhaustion of the stocks, as well as ensuring ownership and fishing rights. A side-effect is that, this privatization of quotas has resulting in a reduction of fishermen, seeing as bigger companies buy the majority of quotas (Appendix 2; Appendix 5). *"It's impossible for smaller fishermen to buy commercial fish quotas"* – Hansen (Appendix 5).

While interviewing Eliasen at the Aalborg University, he states that privatization of fishing rights began, as a mean to boost the economy of the sector, with little focus on actual policies. Due to this, smaller vessels were bought up by the bigger fleets which led to the concentration of fishing activities, such as the number of harbors for landing, fishing vessels and fishermen in general (Appendix 2).

Both Aalborg University employees Nielsen and Eliasen putting emphasize on the fishermen's discontent towards the quota system and a clash between science and practitioners in the industry. The *realities* of fishermen does not necessarily comply with the conclusions of science. Collecting data on fish stocks can be subject to inaccuracy, given the unpredictability of the movements of fish between regions in the ocean. Therefore, the accuracy of the quota system has been criticized. Also, maintaining low quotas, might help establish and strengthen fish stocks. Naturally this have been met by critical views, given that it is the livelihood to a whole industry (Appendix 2; Appendix 3). This again leads back to the conclusions of Sigurðardóttir et al., (2015), that misinterpretation and disagreement with scientific data have consequences to the acceptance levels of policies relying on such data.

While conducting the second interview, with Eliasen, he explains that the quota

system can have a negative impact on the profits of fishermen (Appendix 2). Fishermen are allowed to rent quota from others when they reach their own quota limit. However, renting quota is expensive and only possible when other fishermen have enough quota left. This is similar to the system described by Hansen, the chairman of the Danish Fishermen's Association (Appendix 5), which is flexible but expensive.
If a fisherman exceeds his quota he will get fined, or worse, forced to stop fishing. This is not always in the control of fishermen, as Eliasen describes. He gives the example of fishermen targeting Cod, directly affected by the restrictions on discarding. As they reached their quota limit, they switched to targeting Nephrops. However, as they incidentally kept catching Cod it forced them to stop fishing. The Cod, a regularly targeted specie, in this case became an unwanted bycatch due to the fact that they were unable to control their catch composition (Appendix 2).

This provides an example of the unpredictability of the catch composition. In spite of selective fishing practices, the landing obligation have direct implications on fishing activities. It is likely, that the bycatch in this example was destroyed, given that the fisherman was not able to rent or buy extra quota of Cod (Appendix 2).

10.1.5. Bycatch

As presented in the *background* chapter, the term bycatch is difficult to grasp. According to some of the research participants, bycatch can distinguish between wanted bycatch and unwanted bycatch (Appendix 1; Appendix 2; Appendix 4). Despite the different categories in the term of bycatch, all interviewees agreed that bycatch cannot be completely avoided or minimized to 0 percent (Appendix 1; Appendix 2; Appendix 3; Appendix 4; Appendix 5). Eliasen stresses that relief on selectivity of gear, could reduce the amount of (unwanted) bycatch. Currently this is not possible, due to regulations on fishing gear and methods (Appendix 2).

The first interviewee, Nyman, addressed another surfacing issue regarding bycatch that, fishermen are not allowed to profit significantly from it (Appendix 1). As a result, it is often less costly to demolish the catch, as opposed to operational costs related to properly landing and handling it. As previously stated, Eliasen, Steins and Hansen argue that handling bycatch takes up storage space, time, manpower and thus money. Currently, operational costs eliminate the profit and motivation to sell bycatch to anything other than processing plants, such as fishmeal factories (Appendix 2; Appendix 4; Appendix 5).

"... yes, maybe we can get something for it, but there's the cost of the work here, the rent of boxes, paying for delivering it, so it's not worth the work" - Eliasen (Appendix 2). Although not significantly profitable, there is still a slight motivation, as

Hansen describes; *"I don't like it, but I have to, so I'm doing it. I'm taking it inland and then 1 – 2 Crowns is better than nothing"* - Hansen (Appendix 5).

In the interviews with both the first interviewee Nyman and fourth interviewee Steins, they argue that the reason fishermen are not allowed to profit from bycatch as a prevention of an actual market for fishermen to target in their practices (Appendix 1; Appendix 4). Profits on bycatch would take away the stimuli to fish selectively (aim of the landing obligation). However, other businesses of the value chain are allowed to earn money from the use of bycatch, such as the cosmetic industry using fish oil, or producers of animal feed using fish meal (Appendix 1).

Addressing future challenges calls for a need for management systems to widely accepting cultural changes and perspectives towards problem solving, with less restricted views than traditionally (Jentoft, 2004). In Hansen's views, value creation of bycatch and finding a market for it can be as simple as; *"Just put it on ice so that it would be fresh, go in and try to find some value for this fish"* - Hansen (Appendix 5).
Other *solutions* were given on how to process, market and using bycatch during the interviews. There are other initiatives on using fish that is not consumed directly. Eliasen, who works at Innovative Fisheries Management at Aalborg University, describes projects in Iceland working towards turning fish waste into various consumer products (Appendix 2).
Steins suggests, that high-quality proteins can be extracted from bycatch. Proteins that can be used in products to e.g., feed the growing world populations. Products like fish fingers or fish burgers are also in higher demand (Appendix 4).
Hansen is not opposed to the idea of selling bycatch as a fresh product (Appendix 5). Eliasen gives an example of a fisherman supplementing his income through licensed, direct sales of both commercial and non-commercial fish. Through extensive storytelling and excluding a middle man, he was able to increase the product value (Appendix 2).

"Just put it on ice so that it would be fresh, go in and try to find some value for this fish" - Hansen (Appendix 5)

Regardless of the solution or end product, all three interviewees agreed that, if bycatch is to be used in a product, it should be treated similarly to commercial species before entering a market (Appendix 2; Appendix 4; Appendix 5).

10.1.6. Market

While being at the Port of Hanstholm, Nyman states that the port is the biggest fresh fish harbor of Denmark and distributes fish both nationally and internationally (Appendix 1). However, even though the Port of Hanstholm is a big stakeholder on (inter)national fish markets, fish consumption in Denmark is lower than the recommended intake. Several informants mention that Danes are highly conservative in their consumption of fish (Appendix 2; Appendix 3; Ap-

pendix 5). In the interview with Nielsen, whose work has been involved in food policy, he indicates that several campaigns have been launched by the Danish government, trying to promote fish consumption amongst Danes (Appendix 3). The last interviewee, Hansen, adds that Danes prefer to eat fish when they are close to the coasts and harbors. Consumers mistakenly believes it increases the likelihood of consuming the *best* possible local fish (Appendix 5).

Along with several projects by the Danish government to promote fish, the Danish retail cooperative, Coop, has tried to introduce local fish in their supermarkets (Appendix 2). Eliasen explains that it is difficult to enter the market with a new product. The market demands a certain volume of fresh fish all year round, which might be challenging due to ecological and economic circumstances, such as varying seasons and differentiating stock populations. Therefore, Eliasen suggests creating niche markets, which have the storytelling to demand higher paying local trades. He argues that, due to the fact that there are no fishmongers left in Danish supermarkets the industry have been separated from the consumers, resulting in limited storytelling and transparency. He exemplifies other countries, like France, who increase sales by in-house fishmongers available to promote products and guide customers. In Denmark, promotion and communication of the product is limited to the packaging itself (Appendix 2).
Other challenges in entering (new) markets are meeting various customers' demands and needs (Grudin and Pruitt, 2002). During the fourth interview, Program Manager Steins explains that one of the key developments of the fishing industry, is exactly the creation of new markets. Examples like Eliasen described, happens more often these days in the Netherlands, here fishermen are permitted to sell their own fish directly to customers (Appendix 4).

Observations in the Netherlands identified sales of bycatch happening frequently at IJmuiden Harbor. For €5 per 3 kilos, customers can buy bycatch at the fishmongers located at the harbor, under the heading *free-range* or *wild* fish. The fish is presented as a cheaper alternative to commercial species, in a separate section of refrigerated counters.
Hansen, last interviewee, claims that this would be illegal in Denmark, seeing that bycatch is not allowed for direct human consumption. He argues that the same goes for Holland (Appendix 5). There are no indicators of illegal practices occurring with the sales of bycatch in IJmuiden Harbor, as these obviously took place without signs of blurring or misleading in front of the public. Steins confirms, that this only includes undersized fish (juveniles), which are not allowed for direct human consumption (Appendix 4). This has also been part of the motivation to delimit this project from focusing on juvenile species.

Aalborg University employee Nielsen, argues that creation of new markets is often driven by the most powerful industrial actors, which he exemplifies by product-innovation in bycatch and fish-waste in Iceland, similarly to previous examples by Eliasen (Appendix 2; Appendix 3). Steins confirms evidence in the

involvement of fishermen throughout the whole chain and general chain integrations. With a broader perspective in general and increase involvement of fishermen, challenges such as high rates of bycatch can be targeted with a wider variety of solutions and knowledge-sharing, in favor of innovations in e.g., increased focus on value creation of bycatch inspired by other industries (Appendix 4). As previously mentioned, this again aligns with several sources of the *State of the Art*.

Summing up

The following summaries are based on *empirical findings* from interviews with all five key informants. As presented in analysis 1.0, the stakeholder map in the chapter *methodological framework 7.2 Interview* and explained more thoroughly in the *discussion* chapter *11.1.4 Key informants,* it can be concluded that the informants' level of knowledge and participation is not equally distributed per theme and/or in general.
As shown in figure 14. stakeholder map and discussed in 11.1.4 Key informants, both Associate Professor Eliasen from Innovative Fisheries Management at Aalborg University, Program Manager Steins from Wageningen Marine Research (WMR) and chairman Hansen at the Danish Fishermen's Association in Hanstholm contributed most to this research, whereas Technical Administrator Nyman from the Port of Hanstholm and Teaching Associate Professor Nielsen from Aalborg University contributed less. Meaning that results are predominantly based on an academic researchers' perspective and Hansen's operational insights. Despite their levels of contributions and expertise there were clear general agreements between the informants throughout the empirical data collection

Fishermen

Fishermen are important actors in a fishing industry, where a traditional mindset towards operational practices is still dominant. However, fishermen are becoming more open towards new innovations and merging with other parts of the chains. Yet, innovations take time, are costly and require knowledge and extra manpower. Therefore, many fishermen cannot afford it to introduce and partake in innovation efforts. As a result, they have to rely on compensation to participate in such projects. Today, the majority of innovations are on a technical level, innovations such as new nets or machinery to fish more selectively. Nonetheless, completely controlling the composition of catches is impossible, with discarding as a way to adjust the catch composition.

Discarding

Data on discarding is limited. Registering discards takes time and fear of public campaigns could be getting in the way of optimizing data collections.

Landing obligation

Despite limited knowledge on discard data, the landing obligation, also referred to as the discard ban, was introduced in 2015. Fishermen and experts highlight that by discarding 10 - 70% may survive, compared to a 0% survival rate when all catch is landed. However, not all landed catch is used and is, in some cases destroyed. Since the landing obligation is not fully implemented yet, it will be in 2019, the extent of the impact of the new legislation is uncertain. Regional-, social- and economic consequences are expected. Experts assume that the motivation behind the landing obligation is to register data on fish stocks and highlighting that it is seen as a *moral solution to a moral problem*.

Quotas

Quotas based on the abovementioned data on fish stocks, are applied to commercially significant species with the aim to protect and control fish stocks. Privatization of fish stock rights began due to the introduction of the quota system. This has resulted in a concentration of quotas and reduction of the Danish fishing fleet. Practitioners disagree with the current quota system, stressing they are based on old or skewed data.

Bycatch

The term bycatch can be divided into wanted- and unwanted bycatch. Despite the fact that fishermen try to lower the amount of bycatch with e.g., technical solutions such as mesh sizes, it is not possible to minimize bycatch to 0%. Fishermen are limited in terms of profit from bycatch, causing many fishermen to destroying or discarding it. Today, bycatch is primarily used for animal feed or biogas.

Market

The Port of Hanstholm is a big stakeholder when it comes to supplying fresh fish both nationally as internationally. However, the Danish intake of fish is not that high. Campaigns were introduced over the past decades to increase fish consumption amongst Danes. Supermarkets joined in, introducing new fish concepts, such as local fish or seasonal fish. Promoting fish is key when it comes to increasing fish sales. Fishmongers can advise, persuade and influence the choice of the customer. Due to the fact that there are little fishmongers left in Danish supermarkets, promoting and informing the customer about the product, is by the packaging only.

10.1.7. The Multiple fishing industry

Summing up all the themes of the data collection, resulted in a substantial understanding of the fishing industry, especially related to bycatch, as intangible systems began to take shape in relation to one another. By showing that the fishing industry and elements within it, is not a *fixed ontology* of one overall truth, or one reality. The fishing industry is multiple with different realities within it. It has a fluid form meaning that it is not limited by e.g., time, location, accessibility or associated through relations (Mol and Law, 1994). It consists of interactions between both human and non-human actors, discourses and elements that are the enactments of the fishing industry. Ontologies of an object or situation can be manipulated, shaped and differ with daily practices (Mol, 2002), which is shown in how the research participants' views of the fishing industry and the many aspects related to it. The industry is constantly shaped and defined by enactments with several different stakeholders, both within and relative to it systematic coherence. Examples of this could be the ever present clashes between science and practice expressed through the interviews, or the lack of transparency experienced by consumers affecting patterns of consumption.

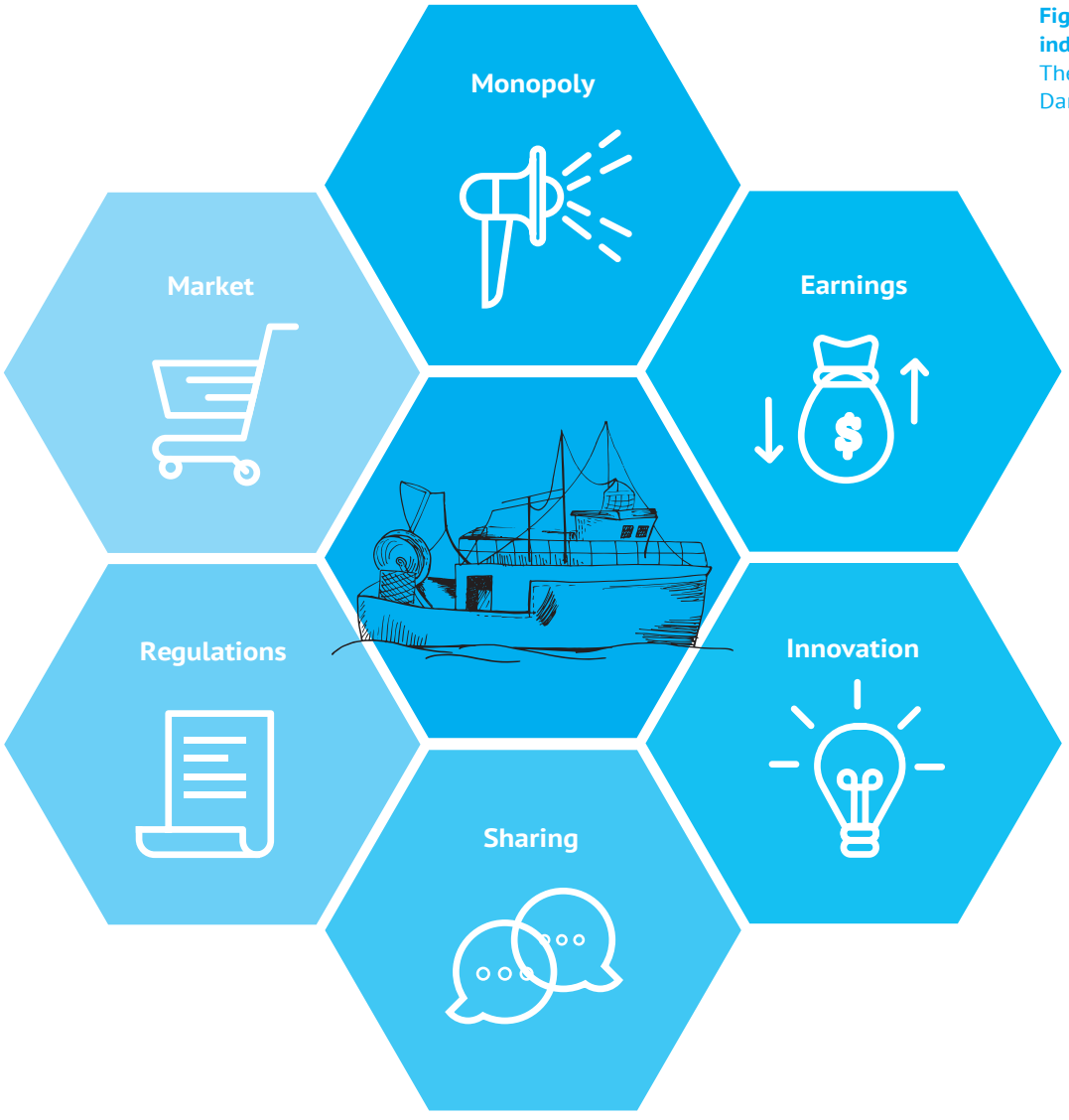


Figure 29 / Multiple fishing industry
The multiple realities of the Danish fishing industry

During observations and interviews, the fishing industry was enacted as a profit-oriented industry, dominated by a powerful minority; an industry where hard working conditions and low income go hand in hand; an ever-changing system where innovation try to tackle future challenges; a conservative industry with the *traditional way* as a mantra; an industry, as any other, with legislations and regulations; an industry where illegal practices occur; a gridlocked sector with little inspiration, innovation or knowledge-sharing; an open environment where fishermen collaborating across the sector; an industry where there is a market for bycatch and an industry's limitations on the profitability of bycatch.

These a just a few enactments that unfolded from the empirical data, by observing, interacting and discussing the fishing industry.

10.1.8. Business Model Canvas

Although contributing to an understanding of the fishing industry and its current developments, we have yet to reveal the potential for the use of bycatch and business value creation. With the BMC, complexities in the fishing industry, as an organization, are mapped out. This contributes to highlighting specific areas as subject to deeper analysis, with the aim of exploring the possible value creation of bycatch.

This knowledge, obtained from empirical- and literature data, results in the first BMC. The BMC (figure 30), presents how the Port of Hanstholm currently creates, delivers and captures value. It highlights problems, restrictions but also on the possibilities within the current *Value Proposition* of the harbor as an organization. As previously stated, this study does not focus on activities in aquaculture, energy generating, transport and other services that the fishing sector deals with, therefore, such activities are excluded from the BMC.

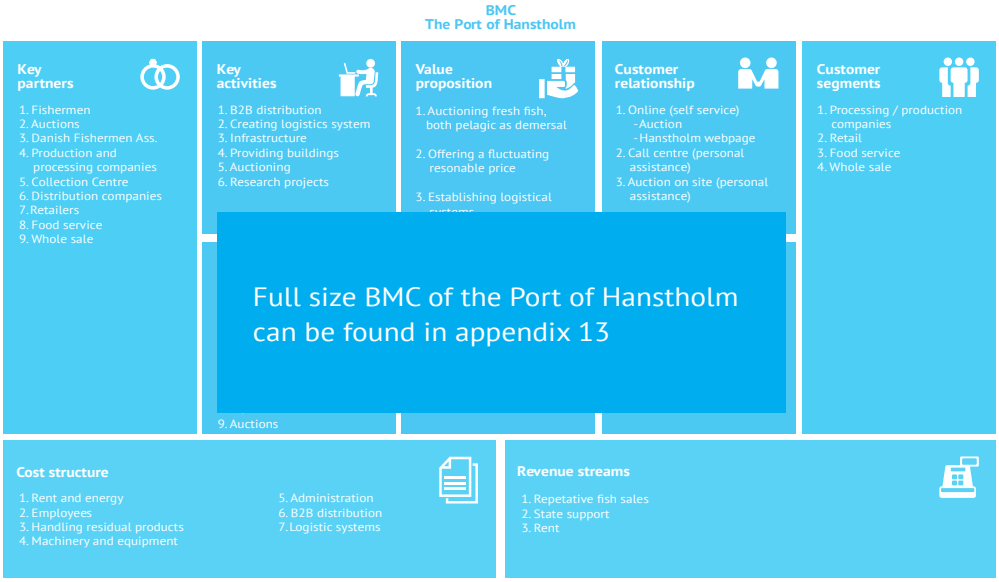


Figure 30 / Business Model Canvas
BMC - Port of Hanstholm

The aim of this BMC was to create an overview of the process of value creation in the Port of Hanstholm, this is done to bring clarity in where and how bycatch is (or can be) enacted in the *organization*.

As shown in the *Value Proposition* in figure 29, the Port of Hanstholm mainly creates value due to its position as Denmark's largest fishing harbors for fresh fish, located close to '*... the best fishing sites in the North Sea and the Skagerrak*'– (Port of Hanstholm, 2018). Value is created by offering fluctuating and reasonable prices or consistently upheld prices on fresh fish. According to their website and the Technical Administrator Nyman, the port establishes logistical systems, that are vital to the value creation as well (Appendix 1; Port of Hanstholm, 2018). There are currently no indicators of bycatch being part of the current *Value Proposition*.

Bycatch is not shown in the BMC, however, it is indirectly present. The *Cost Structure* reveals, that demolishing *rest* products is part of the expenses of the harbor. While conducting the first and fourth interview, Nyman and Steins explained that cut-offs, trims, intestines and bycatch fall under the heading *rest* products, which is considered waste (Appendix 1; Appendix 4). Currently bycatch is an expense, indicating a challenge or weakness in the system.

With the expectations of bycatch volumes increasing due to the implementation of the landing obligation, it is essential to explore possibilities to face challenges regarding bycatch. Exploring potential value creation requires further analysis and a supplementing methodology.

Summing up

Numerous realities emerged in the fishing industry leading to the emergence of the multiple industry. It is shaped and manipulated through daily practices, by varying ontologies from interviewed actors in the field, suggesting that the fishing industry cannot be seen as a fixed thing. This first BMC is based on understanding the complexity of the industry, by focusing on the organizational case of the Port of Hanstholm. This indicates that bycatch can be portrayed as a challenge, that costs money and has no additional value of significance to the *Value Proposition* of the port.

10.2. Analysis 2.0

Based on the theoretical framework of *Design Thinking*, the following paragraph will, as an extension of the first BMC, explore the potential value creation of bycatch. The aim is to unfold the market through needs and desires of consumers. Personas and focus group statements will be presented provide an understanding of behavior and mindsets of consumers in relation to commercial fish and bycatch products. Two BMCs will be introduced to analyze the potential of bycatch and identify a *Value Proposition* for it.

The previous analysis unfolds complexities of the fishing industry relating to value creation and bycatch in the Port of Hanstholm. From here the project moves on to the third phase of the Strategic Design Practice process, the forming phase, where behavior, needs and desires of customers are unfolded.

The next, and second BMC is created (figure 31), based on a hypothetical case, with the aim of unfolding and highlighting the weaknesses and strengths of bycatch value creation. This BMC presents creating, delivering and capturing potential value from bycatch, in a retail perspective.

Figure 31 / Business Model Canvas
BMC from a retail perspective

As shown above, the *Value Proposition*, *Customer Relationships*, *Customer Segments* and *Channels* boxes remain empty. The *Key Activities* and *Cost Structure* boxes are filled out, however not yet complete.

As stated earlier Associate Professor and Teaching Associate Professor at Aalborg University, Eliasen and Nielsen argues that, in line with findings of *State of the Art*, creating a new market is (and should) driven by retailers and/or powerful industrial actors (Appendix 2; Appendix 3). However, developing a commercial product with the intend to serve many people, requires in-depth information of the target audience (Grudin and Pruitt, 2002). According to Grudin and Pruitt

(2002), it does not matter how great new products are, as long as they do not solve problems, or meet the users' needs, they remain useless. An understanding on who, what, where and how to target the customer is required and considered inevitable when increasing value (Grudin and Pruitt, 2002).

10.2.1. The target group

In order to successfully introduce a new product to the market, it is of great importance to raise the level of user participation by understanding and representing the target group according to Grudin and Pruitt (2002). As argued for in the *methodological framework 7.7 personas* and *7.4 focus groups,* personas were created to match a target group profile of fish consumers with the aim to understand this group (Grudin and Pruitt, 2002), hence, knowing who to invite to the focus group discussion. Different criteria were taken into consideration when creating personas, based on both literature and empirical research results. Aspects as e.g., gender, age, nationality and relational status are supported by the Danish statistic database, Statistic Denmark (Appendix 10). The study from Christensen et al., (2005) shows that innovation activities within Danish AFF industries correlate with geographical locations, which is taken into account when choosing the personas' residence. Seeing as levels of innovation activities are higher, in companies of close proximity to larger cities, the personas are also located close to or in Copenhagen, similarly to the focus group participants. The aspect of Danes' fish intake and consumption is based on statistics and interview findings (Appendix 10; Appendix 2; Appendix 3). Criteria's revolving the personas' mindset are based on *empirical findings*, resulting from the interviews where beneficial aspects of bycatch were highlighted (Appendix 1; Appendix 2; Appendix 4), as shown in figure 32.

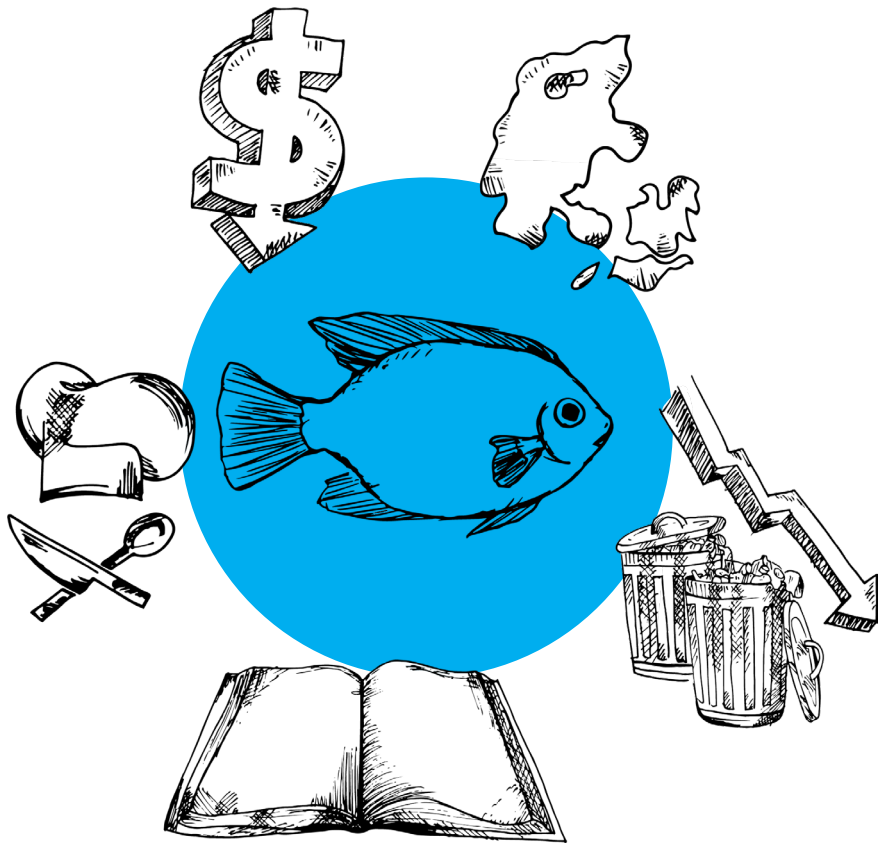


Figure 32 / Benefits of bycatch
Aspects that can be seen as beneficial in relation to bycatch, when introducing it to the market

The aim of creating multiple and contrasting personas is to try to get a more accurate understanding of the behavior, needs and experiences, from different angles and attitudes of varying potential consumers.

The overview on the next page presents the personas created to serve as the foundation to the selection of focus group participants.

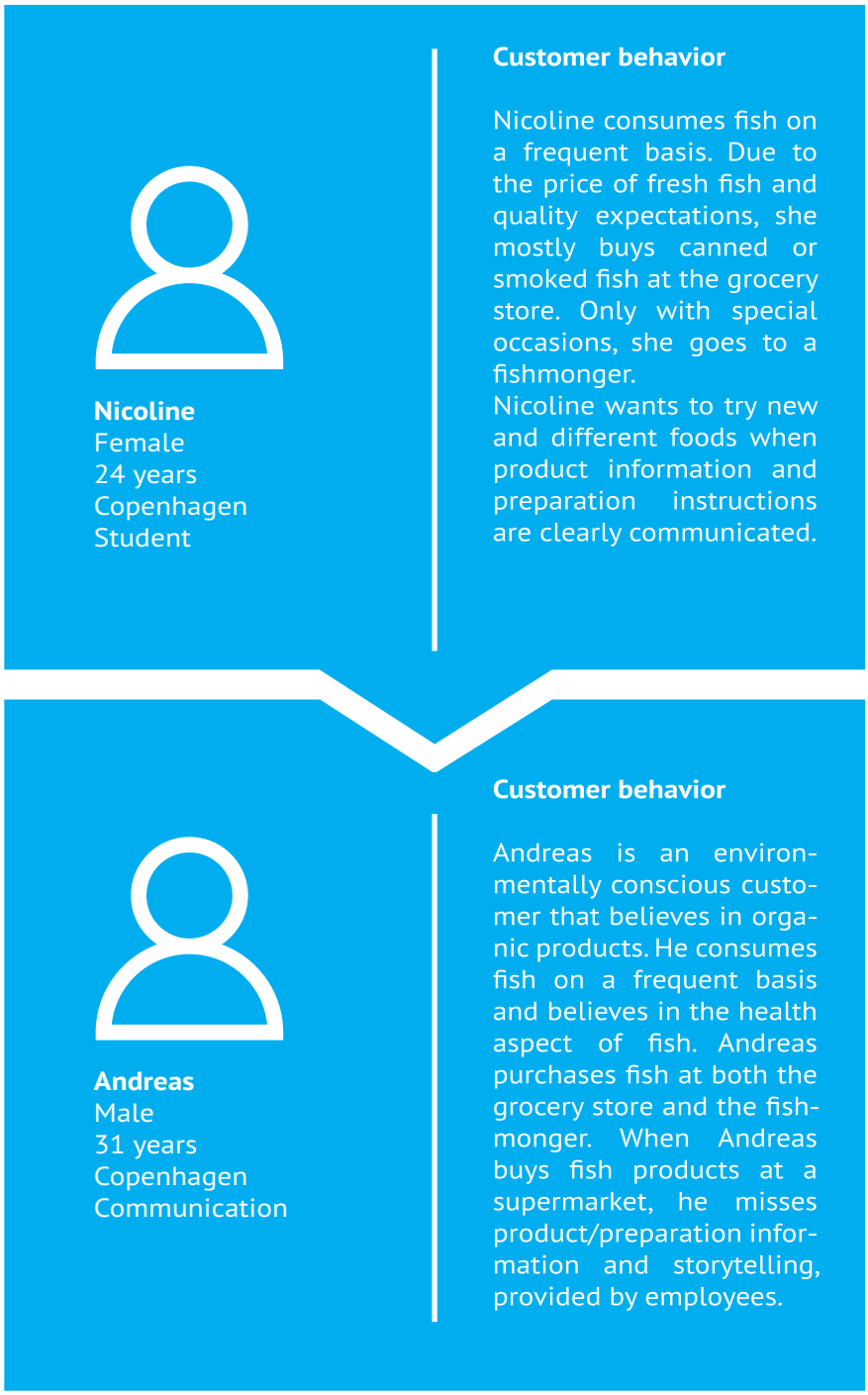
Name	Thomas	John	Pernille	Caroline	Christoffer
Gender	Male	Male	Female	Female	Male
Age	33 years	30 years	41 years	25 years	27 years
Nationality	Danish	Danish	Danish	Norwegian	Danish
City	Copenhagen	Copenhagen	Roskilde	Copenhagen	Copenhagen
Relational status	Divorced	Relationship	Married	Single	Single
Household	Living alone	Living with girlfriend	Living w/ kids and husband	Living with roommates	Living alone
Children	1 boy	0	2 boys	0	0
Occupation sector	Journalism	Communica-tion	Care	Student and food service	Craftmanship
Full or part time	Full time	Full time	Part time	Part time	Full time
Mindset	Convenience oriented	Environmen-tally aware, but not completely dedicated	Health orien-tated. Goes along with food trends such as superfoods and gluten free	On a student budget, however, she wants to eat rather healthy	Tasty foods on a budget
Other	He eats canned fish products since it is quick and easy	Wants to eat more fish to lower meat intake. Likes trying new foods with his girlfriend and experiment in the kitchen	Cannot rule out meat or fish intake. Therefore she looks for the best solution which is fish in her opinion	She likes to cook with her roommates. Associates fish with health	Mostly buys on sale, processed or frozen fish products
Touchpoints	Supermarket	Supermarket: everyday Fishmonger: special occasi-on	Supermarket: everyday Fishmonger: when there is budget for it	SupermarketS	upermarket
Fish intake	Every now and then	Once a week	Minimal once a week	Once every two weeks	Not often

Figure 33 / Overview personas
Personas overview on demographic specifi-cations

10.2.2. Focus group

The focus group was conducted among a pre-existing group of friends, leading to an evenly distributed discussion. As argued in Social Research Methods (Bryman, 2012f), this can help to set a natural and secure atmosphere. The five participants matched several elements of the personas' characteristics, as shown below.

Figure 34 / Overview focus group participants
Background information on the focus group participants



Anna
Female
32 years
Copenhagen
Publishing

Customer behavior

Anna is an environmentally conscious customer that believes in organic and local products. She consumes fish on a frequent basis and prefers fish over meat. Anna purchases canned or smoked fishat the grocery store and at fresh fish at a fishmonger. Due to the price of fish she goes to the supermarket more often, but prefers the fishmonger fish due to the expertise and product knowledge of employees, the quality of the fish.

Frederikke
Female
28 years
Copenhagen
Communication

Customer behavior

Frederikke is a concerned customer with an obvious distrust regarding the fishing industry. She does not consume fresh fish that often due to the high price. She would like to increase her fresh fish intake but expects that the quality at supermarkets is not what she desires. In addition to that, she is intimidated by preparing fish species (she is not familiar with).

Martin
Male
29 years
Copenhagen
Strategy consultancy

Customer behavior

Martin consumes fish on a weekly basis at work, there they serve fish once a week in the canteen. Martin feels obligated to eat it. However, he prefers meat over fish due to quality, taste and price. When Martin buys fish, which is not on a frequent basis, he chooses to buy smoked or canned fish at the grocerystore. He believes that storytelling could persuade him to increase his fish intake.

As argued for in the *methodological framework 7.4 focus groups*, a guide was created prior to the discussion, with the aim to remain focus. The guide included elements concerning customer behavior, needs and desires, in relation to fish consumption and the interviewees' view on bycatch. The focus group discussion was observed to ensure documentation on non-verbal communication and interaction between participants and to record the vibe of the group, which can be found in the figure below, whereas the full observation can be found in appendix 12.

Prior to
There is a natural and easy vibe going on. Participants writing down their perceptions and thoughts down on the fishing industry and bycatch.

In the beginning
The participants know what the aim of the focus group is, they are not afraid to give answers (negative or positive) and they listen to each other. The start of the discussion is kind of a group interview. The participants are asked to answer a question or respond to the topic.
The moderator is helping the participants to start the discussion. He asks what the participants mean exactly, encouraging them to keep on going. The questions are asked individually. The discussion needs to *start* a bit more. The moderator still talks and asks quite a bit. The participants are talking more to the moderator than to the others.

Half way
Everybody respects the rule of raising the hand before talking, so no one interrupts the other.
People are laughing about others' jokes. And on the other hand, participants are not afraid to express their negative associations with the topic or start a discussion with each other.The moderator is a bit less involved and people are reacting to others' stories and opinions.

At the end
The participants immediately reply. The moderator is still quite involved. Asking the question, making sure the participants are understood (repeating/summarizing the answer). However, the participants are more involved than they were in the beginning of the focus group. Everybody feels comfortable to state their own option even though it is not similar to the moderator's opinion.

Figure 35 / Observation focus group
Atmosphere of the focus group discussion

Figure 36, 37, 38 & 39 / Focus group pictures
Selection of 50 pictures, presented during the focus group discussion

To begin the focus group, participants were asked to write down their immediate thoughts on the Danish fishing industry, along with their perception on bycatch. They were also asked to make a selection from 50 printed pictures, that represented the Danish fishing industry and bycatch to them (see *appendix 8* for all pictures). Examples of these pictures are shown below.
Those tasks served to open the focus group, as argued for in the *methodological framework 7.4 focus group*, creating a non-threatening atmosphere according to the focus group method described by Lucassen and Olde Hartman (2007). The pictures that were presented were chosen by the researchers, based on different parameters from e.g., the BMC. Meaning that the picture with the fisherman could represent a cultural ideal of how the industry should look and be communicated to the consumer, according to the participant's preference. While picture of fish market or fishmongers (Torvehallerne), might show the participant's perception on the physical setting where bycatch could be introduced or found on the market.

Through discussing each participants' initial thoughts and their choices of pictures, showed that not all participants were necessarily aware of the term bycatch. However, most participants related the term bycatch to large amounts of

waste and inconsiderate fishing practices. A common theme arose; that participants were sceptic towards the management of the Danish fishing industry and had a general distrust in the sector.

"The industry is not being transparent enough" - Frederikke (Appendix 6)

"This industry is much affected by the fact that, it is controlled by a few powerful people" - Anna (Appendix 6)

These negative attitudes were mainly present due to recent media attention regarding e.g., quota-concentration in Danish fisheries and opinions on the Danish Ministry of Food and Environment. Martin argued that the pictures he chose related to the *little guy*'competing with industrial giants, which related to the media attention on smaller fisheries submitting to larger, economic stronger companies (Appendix 6). However, Anna and Nicoline still romanticized fishery with clear lines to local communities, by drawing on childhood memories (Appendix 6). These findings ties with Eliasen's comments on current developments in fisheries having consequences to local communities and society in general (Appendix 2). Even though Nicoline also states that her romanticized perception on the fishing industry fades away due to stories on corruption and misbehavior (Appendix 6). Plastic in oceans was also a recurring theme in the discussion, as participants often related horrific images of e.g., sea turtles caught in plastic at sea, to the fishing industry. This is not to discuss whether or not fishing activities contribute to such pollution, but simply acknowledging it as a continuous association of this consumer group (Appendix 6).

This distrust has an effect on the participants as consumers. Frederikke states that she, as a consumer wants to know more about what she consumes, while Andreas expressed that more transparency could be the answer to targeting the distrust (Appendix 6). Anna adds, that her relation to the product is completely lost due to the lack of transparency in the industry (Appendix 6). Nonetheless, all focus group participants eat fish on a regular basis.

The patterns of consumption vary from consuming fresh, smoked or canned products. In terms of quantity, smoked and canned products were most frequently consumed. The majority of these purchases are done in supermarkets, where visits to fishmongers were described with words such as *special occasions* and *luxury*.
Fresh fish was viewed as expensive and sometimes even overpriced by all participants. According to Nicoline, and Martin, commercial fresh fish, such as salmon, tuna and cod, have become products they relate to luxury (Appendix 6). Anna, stresses that fresh fish is not that pricey when comparing it to red meat (Appendix 6). However, Nicoline and Frederikke, do not agree that consuming fresh fish is comparable to consuming products like (red) meat (Appendix 6). To Nicoline and to Anna, meat and fish are comparable as they both are main

element to a dish and therefore, not consumed at the same time (Appendix 6). However, when choosing between meat and fresh fish, both Frederikke, Martin and Nicoline will choose meat, despite the fact that fish was generally perceived as the healthier option (Appendix 6).

The perception of fish is drawn on memories when growing up and how modern society has changed it. Both Andreas and Anna mention to remembering advertisements, informing people to eat fish due to health benefits, as well as referring to *back in the day* (Appendix 6).
Regardless of the perception on the health aspects of fish, neither participants described it as a significant part of their consumption. A recurring issue while discussing the purchase of fish products, was the price of fresh fish. Nicoline states that price is one of the main reasons she buys canned fish such as mackerel in tomato sauce or sardines, as opposed to fresh fish (Appendix 6). Martin and Frederikke rarely, to never buy fresh fish (Appendix 6). Smoked or canned fish products are more often the choice, due to more appealing looks and the perception of being a safer option in terms of food safety (Appendix 6). Frederikke states that she would like to increase her fish intake, however she never buys fish at the local fishmonger due to the prices (Appendix 6). Fishmongers were related to being representatives of quality and storytelling, that is lost when shopping at supermarkets (Appendix 6). Nevertheless, the focus group participants purchased the majority of their fish in supermarkets.

"If you wanna buy quality fish you don't get that at the supermarket. You have to go to a fish place, for instance Torvehallerne" - Anna (Appendix 6). Where Andreas adds to buying fish at the supermarket where: *"It is hard to find something that even looks delicious and then you also have it in the back of your head, if it looks like really red and nice, it's probably synthetic in color"* - Andreas (Appendix 6).

When discussing product communication and storytelling, Andreas stresses that product explanation and storytelling is a key quality when shopping at a fishmonger (Appendix 6). Employees at the fishmonger will recommend different species, explain how to cook it and share their knowledge of the fish. Martin adds that knowing the story behind a product, motivates him to purchasing it (Appendix 6).
Nicoline put emphasis on retailers (are obligated to) provide secure product to the consumer in terms of food safety (Appendix 6). Part of the trust lost in the industry is restored once a product has made its way to the retail-chain.

Nicoline also stresses that to her, it would be enough to have storytelling and cooking description communicated on the packaging when buying (unknown) fish products (Appendix 6). Altogether, in spite of cooking abilities (or lack thereof) participants were optimistic towards purchasing unknown species of fish, especially if the packing contained guidance on cooking methods (Appendix 6). To Martin, when purchasing fish, it does not depend on what type of fish it is,

it is a matter of how the fish is sold, whole or filleted (Appendix 6). According to him, he would buy an unknown fish product when it is fileted, to him all fish should be cooked similarly.

When discussing bycatch, Martin, Nicoline and Frederikke, directly associate bycatch with food waste (Appendix 6). Anna, Nicoline, Andreas and Martin share the same thoughts on the use of bycatch, which is that there is none. They believe consuming bycatch could contribute to limiting food waste. In addition to that, Anna, Nicoline, Andreas and Martin believe that bycatch can be seen as the more sustainable option. To them, this would increase their positivism towards the industry, by perceiving it as more sustainable (Appendix 6). Martin stresses that it is all about storytelling. Selling fish that contributes to a more sustainable world, has potential on the current market, in his view (Appendix 6). All participants agree that bycatch has market potential (Appendix 6) However, not all participants see it as something positive.

Frederikke is concerned if bycatch is being promoted, because it would be another way for the industry to mislead consumers and increase profits on non-selective fishing methods and promoting excessive fishing (Appendix 6). Nicoline shares the same concern, stating *"I would be worried that we would be getting into a new industry, it would turn into this new profit making, because they know that they can sell it"* - Nicoline (Appendix 6). However, when directly asking Nicoline if she sees bycatch market potential, her answer is yes, *"... as long as it remains local"* - Nicoline (Appendix 6).

Summing up

Based on literature- and empirical data, the second BMC is created to analyze how bycatch can be used to deliver, create and capturing value from a retail perspective. However, when creating the second BMC, several boxes i.e., *Value Proposition, Customer Relationship, Customer Segment* and *Channels* could not be filled out, while boxes like *Key Activities* and *Cost Structure* were not completed due to the lack of customer knowledge.
Personas aided in understanding and capturing the audience group to target for the focus group discussion. Despite this project not aiming towards actual product development, it should be viewed as a contribution to further research and product creation.
The focus group discussion identified several themes regarding the fishing industry; negativity towards the industry affects their consumption, a potential market for bycatch can be explored with attention to transparency and communication, as well as insight into the behavioral patterns, needs and desire of the focus group participants.

The analysis on the focus group discussion showed that most participants are optimistic towards the market potential for bycatch. However, it did not answer *how* value can be created from bycatch, therefore a final BMC (figure 40) is introduced. This BMC builds on top of the information from the previous BMCs. The aim of this BMC is to unveil and map out the how introducing bycatch a broader market, can deliver, create and maintain business value from a retail perspective. This BMC is presented and explained in the following section, concluding the forming phase, as described by VIA University College (2014).

Figure 40 / Business Model Canvas
BMC from a consumer and retail perspective

The outcome of the *Value Proposition, Customer Relationship, Customer Segment, Channels* and the added information on *Key Activities* and *Cost Structure*, are based on the results of the focus group, and naturally, on previous empirical- and literature research.

The value of which a product delivers is central when creating a business model (Osterwalder and Pigneur, 2010). There are a few questions to keep in mind when creating a BMC: *'what customer problems are we solving?' or 'which customer needs are we satisfying?'.* Simplified, solving the customers' problems and/or fulfill their needs, is the essence of value creation.

As negativity and distrust regarding the industry are recurring themes of the empirical data should therefore be included as a key finding. The focus group generally associated inconsiderate practices such as food waste to the industry (Appendix 6), while, Frederikke, Nicoline and Andreas addressed a lack of transparency throughout the whole industry, especially relating politics and fishing practices (Appendix 6). Others, like Martin and Anna addressed the concentration and monopoly-like conditions within the industry (Appendix 6). High prices and low quality of fish was viewed as a problem, especially regarding (fresh) fish in supermarkets (Appendix 6). Storytelling was often emphasized when

discussing marketability of products, related to bycatch. As both interviewee Nielsen and focus group participants Martin and Andreas state, the absence of communication on product information, specifications and preparation instructions causes is preventing customers from purchasing fish and fish products in general (Appendix 3; Appendix 6).

Needs of consumers are different than problems, but, needs often arise from problems in everyday lives of consumers (Osterwalder and Pigneur, 2010). In this case, customer needs are quality products with sensible external communication and transparency, along with e.g., cooking instructions, sold at a fair price.

Summing up

The final BMC provides an overview and understanding on *how* bycatch can be used to create value. It presents *how* bycatch can create business value, when it is introduced as a sustainable product contributing to lowering food waste. It should have clear continuous communication concerning transparency in the product and its background. It should provide a compelling storytelling, which precisely addresses the *Value Proposition* of the product as well as guiding consumers on how to make best use of it.
There is also a potential in bycatch providing price levels, that can reduce the gap between price and quality, as experienced by focus group participants.
This *Value Proposition* derives from conclusions based on the key *empirical findings* throughout the project. Firstly, the aim of the landing obligation is repeatedly found in the empirical data. In the interviews it is agreed, that the major aim is to collect and record data as foundation to policy-making. However, it is also discussed whether there is an underlying purpose of the landing obligation being a moral solution to a moral problem. It is speculated whether it is a policy aiming to better conditions of the oceans and fisheries, or to prevent further negative discourses regarding the industry. However, increases in bycatch are expected, making relevant to discuss the true aim and outcome of the landing obligation. It also relates to the distrust explained by the focus group participants and provides an incentive to explore how distrust and negative discourses affects consumer behavior. This also presents the second key finding, which explain that negative associations towards the fishing industry is affecting the behavior of focus group participants. The project is delimited from showing how much it is affecting, but rests on statements from participants. The data explores several aspects, that describes participants' distrust and how it prevents them from having fish as an integral part of their diets and their worries related to consuming fish. Thirdly, it is found that there is a potential for creating a market for bycatch in Denmark. This should rely on a retail-driven initiative, giving that this part of the industry are closer to the consumer, both in terms of innovation activities, communication with target groups and regaining trust, which the industry itself does not provide. This aligns with the

fourth finding, the identification of a system for direct sales of bycatch in the Netherlands. Here, bycatch is sold at a fraction of the general prices in separate monitors at established fishmongers. If such a system exist in another EU member state, it is worth exploring if similar conditions could apply in Denmark to prevent waste of increased volumes of bycatch. This leads to the fifth and final key finding, that bycatch should not be profitable to an extent where it negatively affect selective fishing practices. Increasing profit potential of catching bycatch could reduce incentives for fishermen to fish selectively, depending on its value. However, there is a potential for increased value in other parts of the industry. In a consumer perspective, bycatch could provide a cheaper alternative to current options of fresh fish. With qualities such as transparency, storytelling and fair prices, bycatch can provide value in a consumer perspective.
As described in *2.3 delimitations*, this design process did not include a the *fulfill* and *fabricating* phases of the 5F model. However, when successfully implementing bycatch in order to create/increase business value utilizing bycatch, it will necessary to include final steps of the 5F model. This, and other considerations on the study design e.g., *methodological-* and *theoretical framework, validity* and *most important findings* will be discussed in the following chapter, discussion.

Chapter 11

Discussion

Discussing research approaches, limitations, findings and the future perspective

This section discusses the advantages and disadvantages of the *methodologic* and *theoretical* choices throughout the project. It does so by discussing the limitations of the study design followed by a discussion on key findings in the project and the significance of these, as well as the further use and application in the academic field.

The purpose of the project is to explore a potential in an increased business value utilizing bycatch from Danish fisheries. It does so without designing specific ideas/solutions, but by highlighting key findings of value to further research and development. This has been done with the use of *Design Thinking* and *Multiplicity* as *theoretical frameworks* along with interviewing key actors to develop an understanding of the general fishing industry in Denmark and its current developments, related to bycatch. Following, consumer-based perspectives were collected through a focus group discussion, as a mean to explore the business potential of bycatch based on a specific consumer group's needs. This also served as the retail perspective of the project, seeing as consumer needs are to an extend also the needs of retailers, by showing these in the *Value Proposition* of BMCs. This study design places itself between a vast amount of other research projects and initiatives, while introducing a different perspective to the field of research, that is otherwise dominated by technological innovation and managerial- and legislative systems. By discussing the potential value creation of bycatch, the aspiration is to make use of a resource that is currently considered a problem or challenge in the fishing industry. This again separates the scope of the project from previous research, by not trying to limit or reduce the amounts of bycatch (or increasing it), but by exploring the possible use for an unavoidable part of the catch in fisheries, that is otherwise considered as waste. In reference to that, it is important to note that the aim is not to make bycatch profitable in a fishermen's business perspective, seeing as this might lead to un-selective fishing practices and overfishing. But since it is claimed that bycatch cannot be completely avoided, the aim is to explore its potential value elsewhere in the value-chain, preventing the extra volumes of landed bycatch from becoming a wasted resource. Therefore, the aim is neither to explore the value creation in operational chains, such as fishing and processing companies, but in the retail sector instead.

The specific key findings of the project will be presented below, but will discussed later in this chapter:

- There is doubt about the *true* purpose of the landing obligation, that it is an answer to a negative public discourse, rather than a policy to better conditions for the fishing industry and the marine life and ecosystems;
- The Netherlands have a system, that allows for sales of bycatch directly to consumers, at low prices;
- Negative associations towards the fishing industry can be affecting consumer choices negatively;
- A market for bycatch is possible, especially if this is retail-driven;
- Bycatch should not profitable to such a degree that it prevents selective fishing among fishermen. However, value should and could be created for it.

11.1. Method critique

Firstly, a discussion on the *methodological framework* will follow. This section aims at discussing the limitations of the methods applied in this project and alternative approaches to collecting empirical data.

11.1.1. Interviews

Not interviewing retailers

By not adding retailers to the list of informants, the second and final BMC remained a hypothetical estimation based on real-life experiences and empirical data from informants, who are not directly linked to retailers in the sector. This project chose to collect empirical data on consumers, as opposed to retailers, seeing as consumers (mostly) represent the interest and target-groups of retailers. Personas were used as a tool to identify the target group, as Grudin and Pruitt (2002) argue, a product has to fit with the needs and desires of customer, in order to be of value. Interviewing sources in the retail industry might have contributed to examining the part of the value-chain, expected that it would especially relate to sales. This aspect has therefore not been taken into account in this project. As a result, the potential for value creation of bycatch can only be analyzed based on data from a focus group with a specific group of consumers. This delimits this project from concluding on a commercial value in a retail perspective, besides those identified by the focus group in this project.

Not interviewing fishermen

Actual fishermen were not interviewed for this project. Although Hansen is currently the owner of two vessels and a retired fisherman himself. This informant was chosen due to his position as chairman of the Fishermen's Association in Hanstholm and the former chairman of the Danish Fishermen's Association. Interviewing fishermen could have opened up perspectives that might not be obtainable through the Fishermen's Association. Although they represent the interests of fishermen, a degree of bias can affect the outcome, given that a direct source is not interviewed. However, the project was limited to including the Fishermen's Association being representative of fishermen. By choosing Hansen as informant, he served as gatekeeper of the most important interests and challenges of Danish fishermen. This informant is part of a managerial system, that exists within the industry and therefore has to be especially concerned with practical matters fitting into the framework of the system and its mechanics. However, it has to be acknowledged that speaking directly to the source, may have opened perspectives, that were more practice oriented towards topics such as bycatch.

11.1.2. Focus group

The size of focus group and the amount of conducted focus groups

Due to a last-minute cancellation, five persons participated in the focus group for this project. According to Bryman (2012f), the recommended number of participants is 6 to 10 people. It is recommended to lower the amount of focus group participants if it is expected that participants will have a lot to say on the research topic, when the topic is complex or when the participants are emotionally involved (Bryman, 2012f). Although being by chance, the lowering of participants resulted in well distributed engagement from all participants. Even as the discussion was reduced towards the end and was finalized, discussions continued. This clearly showed an interest and motivation among the focus group. After turning off the recording device, the group stayed together and the discussion mainly kept revolving around the similar topics of the focus group discussion. Notes from this discussion were also kept, but only served as memo's and not as specific references in the project. Including more participants could have resulted in a less equal distribution and depth of reflection in each participant.

We acknowledge that more focus groups can complement the degree of which this methodology can be applied generally. Participants were, as a result of them already being friends, a rather homogeneous group in terms of social life, but not in terms of professions and background. Conducting more focus groups with a similar demographic will strengthen the validity and generalization in the consumer segment that this group represents. Likewise, conducting focus groups with different consumer segments, allows for a broader perspective in terms of reach. In retrospect, the choice could have been made to include more focus groups with similar demographics, in order to present a stronger case of the specific consumer segment. The reason for not doing so, is that a broader demographic could have made the findings more superficial and too broad, where a more focused effort can be put into targeting a more concrete persona. Multiple personas were created as a mean to create an overview of potential consumers. Personas were used to capture a target group leading to the choice of participants for the focus group. These can aid in capturing *representatives* of the market potential for bycatch, by potentially being future consumers (Grudin and Pruitt, 2002).

11.1.3. Questionnaires

Questionnaires for consumers

Sending out questionnaires to potential consumers regarding consumer patterns and perceptions of the fishing industry and bycatch has been a methodological consideration throughout the project. It was argued that the data derived from it could give a quantitative argument, as to eventual elements relevant for the *Value Proposition* of bycatch. The inclusion of consumer questionnaires could have been targeted towards customers in a specific Danish su-

permarket chain. Questionnaires offer a fast and low-cost method to collecting big amounts of data. When handing out questionnaires, there is not interviewer present, which allows the participant to anonymously answer without the interviewing affecting their answers too much. An advantage relevant as opposed to focus groups and interviews, where the interviewer is in direct interaction with the informant, hence possibly enforcing a researcher bias (Bryman, 2012h). However, this method was cut from the project, seeing as the aim was deeper insight into informants' understandings, perceptions and behavior in relation to the topic(s). A questionnaire does not allow for follow-up-, elaborate- and reflective questioning (Bryman, 2012h). The topic in general was considered too complex for a questionnaire and would require a considerate amount of explanation (both for the researcher and respondent), that would not be ideal.

11.1.4. Key informants

Ranking of key informants and their contribution to the study

There were differences in the levels and areas of involvement from informants, depending on their field of expertise and purpose of the different interviews. The interviews with Peter Nyman, Technical Administrator at The Port of Hanstholm and Teaching Associate Professor Thorkild Nielsen from the Aalborg University, mostly served as background interviews, but still contributed with valid points for analysis, however, not as much as the remaining informants. The real life cases and storytelling by the chairman of the Fishermen's Association in Hanstholm Jan Hansen, gave great inputs. Due to this way of answering questions through telling stories, made dissecting this empirical data a challenge, but contributed greatly to understanding the operational challenges of the project. The main contributors of this project among the interview informants, are Program Manager at Wageningen Marine Research, Nathalie Steins and Associate Professor at Aalborg University, Søren Eliasen. Both are employed at universities and deeply involved with fishery management and innovation. Clearly, they were accustomed to answering questions and provided well thought out and precise answers. From the interviews it was evident, that they had already been reflecting on the topics addressed in the interviews and this project in general. Nyman and Hansen contributed to most of the insights into operational practices, the historical development and management of Danish fisheries. Nielsen presented insight into the current challenges of the industry, assessment of management systems and information on the industry as a whole. Eliasen and Steins contributed with vast knowledge on innovation and current projects and dilemmas of the industry, both as being authors to several studies and through participation in such projects in their professions. Their expertise was very wide, as they were able to discuss all fields that were touched upon during interviews. It should be noted that, in spite of different levels of contribution, all participants were able to engage in all topics covered through the interviews

The distribution of involvement was to little surprise, given that academic researchers like Eliasen and Steins might share similar mindsets to a research

group like ourselves. The result was optimistic discussion on creation of value from bycatch and the possibilities of finding or creating markets for it in the current state of the fishing industries in the Netherlands and Denmark. By contributions of the other informants, these aspects were complemented with vast background knowledge of the fishing industry and the many operational and managerial activities and perspectives it is subject to.

11.2. Theoretic considerations

The following section will present a discussion on choices of theory and *theoretic considerations* in the study design, as well as reflecting on the outcome and limitations of these choices.

11.2.3. Design Thinking

A common critique towards *Design Thinking* is that it claims to make designers' methods seem more scientific than they are, by supporting and professionalizing its role. Brown (2009) claims that everyone can be a designer. This particular claim can be viewed almost as a magic pill to solve all problems that organizations may have or come across. By making such claims, *Design Thinking* might remove itself from its own relevance, because if everything (or everyone) is design, then nothing is design (Kimbell, 2011). It has to be recognized, that not all are equally trained in the skillsets of designers and not all designers are trained in all kinds of design. Designers are more often than not highly educated and skilled, with the abilities of operating specific or several technologies and methods.

Design Thinking makes successful solutions by combining user perspectives with what is technically feasible and what is commercially viable to an organization (Brown, 2009). However, in a critical review by Kimbell (2011) she argues that *Design Thinking* reflects little on traditions of social sciences, relating to the user perspective.
"In contrast to much contemporary design practice and education, social scientists are trained to question what theoretical, political, or other commitments they bring to their work and how these shapes their research findings. Construed in this way, Design Thinking fails to reference wider theories of the social and misses opportunities to illuminate the context into which the designer is intervening" - Kimbell (2011).

Such critique is what has brought this project to include wide theories and methodologies from social sciences. Likewise, has it been part of the reasoning behind excluding the remaining steps of the 5F model, to emphasize the importance of contextualizing the project into the field of research, before attempting to develop an actual solution. This is why the project should also be viewed as

the initial step into further developing and designing a solution by thoroughly exploring the potential business value in utilizing bycatch.
It can be suggested if *Design Thinking* and its heavy focus on abductive thinking, is better suited to complement management resources when these tend to rely too much on analyzing problems. To an organization, a main challenge with *Design Thinking* is, that it does not *"... give form to things; instead, it concerns action and the artificial"* - Kimbell (2011), hence results are not proven before they are invested in and tested. The flexibility and fluid form of the theory is also part of it limitations, it does not offer concrete principles, effects or descriptions of practices. This means that each case often stands on its own, limiting the perspective of generalizing successful cases of *Design Thinking* to other contexts and organizations.

Kimbell (2011) describes three ways of *Design Thinking*; as a cognitive style, as a general theory of design and as an organizational resource. The latter being the represented approach for this project. This way of utilizing *Design Thinking* is described as being focused on businesses or organizations with a need for innovation. It can be applied to various contexts and centered around organizational problems. Again, it has to be acknowledged that this case of the Danish fishing industry can be limited regarding its generalization in to other industries. Kimbell (2011) suggests designers to situate their work in a larger historical framework, inspired by the work of anthropologists. Here designers take departure in relation to other practitioners' research in e.g., other social practices and institutions. By understanding what happens in designing and exploring how political, socio-cultural, and economic developments have shaped design practice over time, it could move closer from *Design Thinking* to *knowing* (Kimbell, 2011).

11.2.4. Multiplicity

The motivation for including the theory of *Multiplicity* with *Design Thinking*, is the above-mentioned challenges of situating *Design Thinking* in the context of the case by the use of a wider choice of *theoretical framework*. *Multiplicity* offers a framework for including a wide spectrum of perspectives to the complex case. This approach along with situational mapping have complimented the study, by providing a *theoretical framework*, that successfully have opened up a field that initially seemed impenetrable.
This is complemented by the changes in studies of design acknowledging its place in cultural and sociological practices, as well as its growing focus on consumption (Kimbell, 2011).
In this project *Multiplicity* is used to enlighten various perspectives of the same issues. According to Mol (2002), objects are enacted by multiple practices as opposed to e.g., being constructed. By addressing a certain topic or challenges, such as bycatch in fisheries, one cannot help but reflect if these subjects are forced on informants. Are respondents being forced to have an opinion on

something of little importance to them? Reflecting on how this enacts the *Multiplicity* on the topic is of relevance, especially when addressing it as a wicked problem, as the terminology of *Design Thinking* would call it. Because what is really gained by identifying multiple perspectives of a phenomenon? This is sought to be answered in this project, through finding and framing a potential, that arose from several informants' perspectives and an understanding of the fishing industry. There were identified similar patterns across the findings in the empirical data. This is where we believe the potential lies. By working with *Multiplicity* within the *Design Thinking* framework, it allowed continuous divergent and abductive thinking and constant emergence of new perspectives. Naturally, the challenges then, is to critically delimit and focus on the scope of the project. A natural delimitation was the exclusion of technical innovations, which is already receiving attention regarding bycatch. Even though technology is regularly included in Actor Network Theory, to which *Multiplicity* is closely linked, the study design did not allow for any particular attention towards non-human objects such as new technology.
Realities can be manipulated and changed through practices (Mol, 2002), which means that opinions of informants can change as well, through changing practices. An understanding of an ever-changing industry, such as the fishing industry, can never be completely finished. It can, as in this project, serve as the informed background to identify and target future efforts by addressing and being aware of the multiple realities of such a complex system and the multiple enactments that shapes it.

11.3. Most significant findings

Although the empirical data brought forth several findings, an analytical view on these findings have resulted in certain key findings, that have been dominant in the data and to answering the research question. This section will present and discuss the significance of these key findings.

11.3.1. Finding one

There is doubt about the 'true' purpose of the landing obligation, that it is an answer to a negative public discourse, rather than a policy to better conditions for the fishing industry and the marine life and ecosystems.

Among the interview respondents was a general agreement in perceiving data collection on fish stocks, as a primary aim of the landing obligation. All described a clash between scientists and practitioners in this regard. Hansen, Chairman of the Danish Fishermen's Association in Hanstholm, was especially concerned with a disagreement between data provided by biologists, that serve as the data upon with quotas are build, and the experiences from fishermen on a daily basis. In short, they questioned the accuracy of the data with the healthy fish stocks they believed to be in the oceans. This naturally results in discontent

among fishermen, as they view it as an unnecessary limitation to their quotas, hence also their profits (Appendix 5). Steins, Program Manager at Wageningen Marine Research, complemented these views by describing the landing obligation as a moral solution to a moral problem.

As identified in this project, the fishing industry is subject to negative discourse(s). As we were not able to collect empirical data with a source directly partaking in policy-making in fisheries, this project cannot confirm the aim of the landing obligation besides referring to public sources, as covered in the *background* chapter. Such informants were found, but as we did not succeed in getting any interviews from it, should be considered a limitation of the study and should optimally have been included. However, we are able to raise questions of further discussions on the implications of the landing obligation. Further investigation in the generality of whether negative attitudes among consumers are affecting consumption of fish negatively, could be of value to targeting future efforts in turning the discourse. Whether or not the landing obligation is a policy with that purpose, remains unclear. But, it should be addressed that the expected increase in bycatch can be an important area to address in a consumer-oriented approach, as it proved to have significance to some of the negative discourses.

11.3.2. Finding two

The Netherlands has a system that allows the sales of bycatch, directly and indirectly to consumers, at low prices.

The reason for the discrepancy between the understanding of Hansen, Chairman of the Danish Fishermen's Association in Hanstholm and the legality regarding sales of bycatch in IJmuiden Harbor did not appear from this project's findings. However, should it be acknowledged, as has already been argued for several times during this project, that the fishing industry is a big and complex system. Although EU member states are bound together through the Common Fisheries Policy (CFP), each state can have individual policies specific to their region, which could explain a possible misunderstanding between actors of different countries.

The fact that direct sales of bycatch exists within the Dutch fishing industry, makes it worth considering if the same could be applied to Denmark. As it was not a focus for this project, the underlying mechanisms of bycatch sales in the IJmuiden Harbor were not further investigated. However, due to the significance of this finding relative to a possible value creation of bycatch in Danish fishery, it should be worth investigating if a similar approach could be applied in Denmark. When working with the remaining steps of the 5F model, *fabricating* and *fulfilling*, the experiences in this project suggests investigating the system and market for bycatch in the Netherlands. When exploring a potential for bycatch in Denmark, the discrepancy between actors in Denmark and their understanding of Dutch markets might not be relevant. But the fact that the findings in this project show such a system, could be highly relevant to value creation of

bycatch in Denmark.

11.3.3. Finding three

Negative associations towards the fishing industry can be affecting consumer choices negatively.

It was clear that the participants of the focus group were regularly keeping up to date with current media and had an understanding of practices in the fishing industry, both in terms of operational practices and managerial- and political aspects. However, did their somewhat similar attitudes towards the industry not extend to a similar consumer behavior. In spite of agreeing to the same discourses, their behavioral patterns often pointed in different directions. Some participants hardly ever ate fish and fish products, some relied mostly on smaller fish and canned products, while all agreed towards purchasing smoked products such as smoked salmon and that fresh fish were mainly a luxury for special occasions. Discrepancies also came to show in whether fish was a healthy or unhealthy thing to eat. The participants generally shifted between being concerned with harmful microorganisms, such as heavy-metals, in fish, while also linking consumption of fish to wellbeing and a healthy source of protein Appendix 6).

This makes a general statement complicated when it comes to *how* it affects the behavior of the focus group participants.

But whether or not it does, is explained through the distrust in the fishing industry which reveals distrust and worry among this particular group of consumers. Consumption of fish was, in their opinion, traditionally perceived as a sustainable and healthy way of eating. Currently all were negatively affected by stories in the media which affected their behavioral patterns in different ways (Appendix 6).

11.3.4. Finding four

A market for bycatch is possible, especially if it is retail-driven.

Several informants expressed belief in the creation of a market for bycatch, especially if it is driven from a retail-perspective. The focus group participants generally had trust in the Danish retail sector, but not in the fishing industry itself. Somehow, there was a consensus that once a product had reached the retail-chain, it was considered reliable. This understanding was, that retailers simply cannot afford to make mistakes. If they do not provide the necessary security and quality, they will lose customers (Appendix 6).

Although not through similar perceptions, Associate Professor Eliasen, Teaching Associate Professor Nielsen of Aalborg University and Program Manager at Wageningen Marine Research Steins, agreed the creation of a market had to be driven by the retail-sector. Industrial companies and retailers make up the part of the value chain with the most efforts and interests in product innovation and creations of new markets (Appendix 2; Appendix 3; Appendix 4). Christensen et

al., (2015) compliments by suggesting, that such innovation is highly affected by proximity to larger cities and knowledge-sharing within- and across industrial sectors.
Focus on the production- and retail sector could be of aid to the efforts already commenced in the technologic and managerial fields. By being attentive to consumer needs, through the retail could support efforts to improve technology and management systems, and vice versa.
Transparency, sustainability, food safety and food waste were highlighted as topics mentioned by the focus group, as important aspect in securing their preferences towards making use of bycatch in the retail sector. When commencing further research in this field, these aspects could serve as key points, to keep in mind when discussing consumer needs and preferences.

To conclude, these results are optimistic in the possibility of creating a market for bycatch but is closely linked to the discussion and limitations of the following key finding.

11.3.5. Finding five

Bycatch should not be profitable to such a degree that it prevents selective fishing among fishermen.
With this result comes the dilemma of *how* and *where* value is created. The *empirical findings* suggest that increasing the value of which bycatch can be sold, by fishermen, might result in the reduction of selective fishing practices. This is not a desired outcome of this projects, seeing as it will which would go directly against the aims of the regulatory frameworks (Appendix 2; Appendix 4).
Bycatch is currently being sold at levels that makes it unprofitable to fishermen, when including operational costs, such as e.g., handling and sorting the catch. The introduction of the landing obligation and its regulations on discarding, might increase amounts of bycatch that would otherwise have been discarded at sea (Appendix 1; Appendix 2; Appendix 4).
Herein lies a potential of making use of bycatch, that are otherwise destroyed or sold cheaply to processing plants. It could be worth exploring a possibility if, or how much, fishermen's profit can increase without dis-encouraging selective fishing. An increased incentive towards using bycatch might limit cases of illegal behavior among fishermen, as addressed by Steins and Hansen (Appendix 4; Appendix 5). It might also serve as a mean to lighten part of the impact the landing obligation is expected to have on the economies of fishermen, especially those at smaller vessels.
If the value of bycatch can increase elsewhere in the value chain there is a potential to change it from being waste (or otherwise destroyed) into a resource of interest to the retail sector, and ultimately the consumers.

As previously stated, this project is mainly concerned with value creation of bycatch from a consumer-based perspective. As an industrial perspective, such as

increased value and profit making for fishermen is subject to several issues, like increasing profits risking un-selective fishing practices and possibly a greater lack of transparency. These can have greater consequences as mentioned earlier in the project

As part of modern consumption patterns, value is no longer restricted to profit and currency. Pine & Gilmore (1999) argues that value creation derives from many other aspects, then mere profits. They even argue that a product might no longer be enough by itself without any kind of experience related to it. As also addressed in the focus group, storytelling could provide value in terms of an intangible service provided in bycatch products. Examples of these could be health-motivations, environmental concerns or even buying a luxury product (Appendix 6). Consumers define themselves through their consumption and this presents a significant change in what value products have to deliver (Pine and Gilmore, 1999). Consumers are increasingly looking to develop themselves through consumption, products that enlighten or increase their emotional well-being are sought after, by the aspiration to transform one self.
The same goes for businesses, where exact liquid value might be the end goal, but the means to getting it have multiplied. By providing experiences through goods that contributes to the arguments of Pine and Gilmore (1999), retailers can stay on track as regards to providing (and being) the transformations consumers want.
Consumers show they are still concerned with prices, however storytelling and experiences, are becoming a great motivations of direct consumption towards goods that provide such kind of value (Appendix 6). If fish consumption in Denmark is rather conservative (Appendix 2; Appendix 3; Appendix 5) and a distrust among consumers is restored in retail-chains (Appendix 6). Then, it is likely to hypothesize, that once consumers' trust has been gained, it will likely remain as long as it maintain its value.
Value should also be discussed in reference to negative discourses and external communication of the fishing industry. This project has by now established a correlation between focus group participants' attitudes towards the industry and its negative effects on their consumption patterns. Seeing as it has been subject to many discourses and an acknowledged lack of external communication from the industry (Appendix 5), such values that Pine and Gilmore (1999) present, could be of even greater value than direct profits. If the landing obligation truly is a moral solution to a moral problem, the industry should certainly be concerned with consumers' interests in storytelling and food waste (Appendix 6) and the value of experience economy, that can be related to bycatch. This is not to conclude on the motivation of the landing obligation but is meant to serve as an argument to accept a wider definition of the term value creation in future efforts on improving within the industry.

11.4. Validity and reliability

The discussion on key findings will be followed by a critical view on the reliability and validity of this project's study design and the results and findings derived from it.

11.4.1. Reliability

The reliability of this study design should be expected to be a variable, since the qualitative nature of the study design and *Multiplicity*'s aspiration to explore the multiple in situations, hence lowering the chances of replicating the results of such a study design. This need not be a critique of the project, seeing as reliability is mostly an issue connected to quantitative research (Bryman, 2012b). This project can to a degree be replicated by other researchers in terms of the *methodological* and *theoretical framework* but given the large role of the researcher in such a study design, the results should vary depending on the informants' and researchers' interpretations of results and findings.
The internal validity in this project is closely related to the limitations of *Design Thinking*, as it does not provide proof to the implementation of results derived from projects using *Design Thinking*. The result of this project, the *Value Proposition* of bycatch, derives from the result of analyzing parts of the fishing industry. The validity is affected since we cannot be sure if and how results could be different by changing either of these variables (Bryman, 2012b). Internal validity is also concerned with how empirical data collection matches the theory chosen in the research. There is congruence between these, seeing as the data collection is collected over a research period of 8 months. This results in strong ties between the theory and data, due to several re-evaluations of methods and theoretical approaches.
External validity has not necessarily been a key emphasis in this project. Given the theoretic choices, several views and perspectives are accounted for throughout the project. This complies with Bryman's (2012b) statements on external validity in qualitative research, which in short, revolves around a critical view on absolute truths. In social sciences the aim is to explore and argue for several views and truths (Bryman, 2012b), similarly to the aims of *Design Thinking* and *Multiplicity*.
The ecological validity, which *"... is concerned with the questions of whether social scientific findings are applicable to people's every day, natural social settings"* - Bryman (2012b), is obtained through the approach to conducting the focus group in this project. This is a side-category to external validity. The focus group consisted of participants in an existing group of friends, who regularly come together, which results in findings that are closer to the natural social settings and realities of each participant. This validity was also evident in the focus groups participants' eagerness to continue and contribute to the discussion, even after it was finalized.
As this project revolves around exploring potential, it is not particularly concer-

ned with identifying concrete uses of bycatch or systematic changes needed in the creation of value or a specific market. This project has explored a potential for value creation of bycatch in the Danish fishing industry, partly by examining the overall systems and multiple perspectives of the industry related to bycatch. As extension of this, the study design has collected empirical data that, along with the framework of *Design Thinking* and *Multiplicity*, are able to identify consumer interests in directly purchasing bycatch products. Further suggestions are to include an extended attention to target groups in terms of validation and generalization, along with addressing these within the legal frameworks of both the fishing- and retail industries. The examples of the direct sales of bycatch in the Netherlands could be analyzed as an inspiration to the systematic of the Danish fishing industry.
In future perspectives, these results can be assessed in relation to the limitations of the project especially with the implementation of the final steps of the 5F model, revolving around designing and producing specific goods from bycatch.

11.4.2. Researchers' reflections

This project began with the landing obligation being point of departure in discussions between us. As student of Integrated Food Studies, the approach of problem based learning is rooted in our academic mindsets. The project initially began with the motivation to designing specific solutions to the use of bycatch. However, due to the research design, we realized that implementing all phases of the 5F model, would result in the exact superficial results that spurred our attention to problems in the current field of research. As students of the food industry, the negativity towards the industry also expressed through the empirical data, has also had it effect on us as researchers, through our initial interest of the topic.
The overall goal was then reset to provide the necessary groundwork before commencing a push to product development, and hopefully inspire policy changes of bycatch regulations. As also mentioned in the project, misinterpretations or lack of scientific data often forsake holistic policy making. We wanted to (and did) explore a gap in the current fields of research and initiatives in dealing with challenges of bycatch in Danish fisheries. The aspiration was to explore human-centered solutions to unavoidable amounts of bycatch. Given recent attention towards products providing storytelling on sustainable properties in all kinds of product categories and consumer's demand for it, it seemed like an obvious subject to explore. The goal is therefore to unfold the fishing industry and bycatch, by presenting and analyzing different ways of enacting and discussing it, as other than an inevitably wasted resource. Directing focus towards its potential value among several stakeholders and identifying a purpose for it in similar regions, the results of this project successfully provides a first step in addressing future governmental, industrial and commercial purposes to the use of bycatch, that does not necessarily result in unselective fishing practices.

Chapter 12

Conclusion

End conclusion of the thesis project

This project unfolds multiple realities of the fishing industry relative to bycatch, with the aim of revealing a potential for utilizing bycatch to increase its business value. Applying a *Design Thinking* perspective along with the theory of *Multiplicity*, allowed several perspectives and challenges to unfold. This first phase of the project, unfolding multiple realities of the fishing industry, revealed a gap in bycatch related consumer-based initiatives, compared to efforts in legislative, managerial and technological improvements. The view towards bycatch and the challenges regarding it, is not shared by every stakeholder of the industry. The multiple realities of the fishing industry suggest that the inclusions of multiple perspectives are necessary when addressing a wicked problem, such as the potential for value creation on bycatch.
Despite new innovations and technologies to reduce bycatch, it cannot be completely avoided. Due to the implementation of the landing obligation, fishermen are forced to land all catch, including (un)wanted bycatch, leading to an expected increase in landed bycatch volumes. Bycatch yield minor profits and its primary use is in production of fish meal, fish oil and biogas. In worst case it is destroyed. Due to potential risks of wastage, this project turned to uncover the potential use of bycatch through an increased business value. This is done by researching the first three phases of Strategic Design Practice 5F model, leading the way to motivate future efforts in fabricating and fulfilling solutions to this potential of creating value from bycatch

Observations at the Port of Hanstholm (Denmark) and at the IJmuiden Harbor (Holland), along with five expert interviews and a focus group discussion has served as the empirical data in answering the research question.

The main barriers and constraints to utilize and introduce bycatch to the Danish market relates are highly related negative discourses and distrust among consumers towards the fishing industry. The industry is viewed as non-transparent, un-sustainable and wasteful (when related to bycatch), negatively affecting consumption patterns according to focus group participants. Topics covered in the focus group discussion created insights of customer behavior, needs and desires resulting in a final BMC, showing the necessities when introducing bycatch to the Danish market and the exploration of its potential value.
This project, based on the empirical data, has revealed several aspects which could provide a potential for value creation of bycatch.
By incrementally mapping, knowledge gained throughout the project. BMCs were introduced for identifying a *Value Proposition* of bycatch in a consumer perspective. External communication of Danish fisheries could be emphasized as a mean to turning around negative discourses among consumers. Value creation of bycatch is suggested to be retail-driven. Distrust towards the industry was to a degree regained in the retail-chain of the industry. Retailers are closer to the end consumer than practitioners and producers of the fishing industry, providing them with stronger relations to consumers and target groups.
Storytelling can provide an important message and a mean to externally com-

municate benefits of utilizing bycatch, to consumers. Proper storytelling should also address increased transparency, a topic of great importance to focus group participants. Bycatch could provide stronger ties between quality and pricing to increase fish consumption. Fresh fish is considered luxurious and expensive, leading to canned and smoked products being the preferred choice of fish product. This along with instructions of preparation and visually appealing products and packaging is where this project identifies the potential to increase the value of bycatch in a consumer-based perspective.

By exploring the first three phases of 5F model, this project should be considered as an important first step in research of identifying potentials for value creation, before proceeding to engage in creating a market for bycatch and addressing future challenges of the landing obligation.

This project identifies the potential to increase the value of bycatch in a consumer-based perspective.

Chapter 13

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