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Enhancing the value creation of sustainable fresh seafood export from Oman

Master of Science Thesis in Supply Chain Management

MALIN PFISTER

Department of Technology Management and Economics
Division of Supply and Operations Management
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2018
Report No. E2017:128

MASTER'S THESIS E2017:128

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MALIN PFISTER

Tutor and examiner, Chalmers: ANNA DUBOIS

Department of Technology Management and Economics
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Department of Technology Management and Economics
Division of Supply and Operations Management
Chalmers University of Technology
SE-412 96 Gothenburg, Sweden
Telephone: + 46 (0)31-772 1000

Chalmers Reproservice

Gothenburg, Sweden 2018

Acknowledgements

This master thesis project has been conducted during the fall of 2017 at the department of Technology Management and Economics at Chalmers University of Technology in Gothenburg, Sweden. The study was performed on behalf of Triathlon Group and supervised by Professor Anna Dubois at the division of Supply and Operations Management, Chalmers University of Technology.

The author would like to express gratitude everyone that has contributed to the realization of study. A special thank you to Simon Johansson, tutor at Triathlon Group, and Anna Dubois, supervisor at Chalmers University of Technology for Your invaluable feedback, guidance and encouragement during the course of the study.

The author would also like to thank the representatives at the Ministry of Agriculture and Fisheries and from private companies in Oman, as well as the industry experts interviewed during this study for Your time, interest, and knowledge shared during the interviews.

Malin Pfister

Gothenburg, 2018-01-19

Abstract

Seafood is increasingly valued as food and is considered to have many nutritional benefits. The global demand for fresh seafood has increased over the past decades and around one third of all seafood produced is traded internationally. Fisheries is among the oldest and most important production sectors in the Omani economy and contributes with both food and employment to the country's inhabitants. Over the past half century Oman has experienced growth in various sectors and the country has developed in terms of infrastructure, industry and standard of living. However, the fisheries sector is lagging behind and seafood export from Oman only yields half the value per volume compared to a global average. Therefore, the purpose of this master thesis is to investigate how Oman could enhance value creation of sustainable fresh seafood export by examining the current industrial network in Oman and identifying key success factors for value creation in other countries.

The study includes a mapping of the industrial network for fresh seafood in Oman through interviews with representatives from the Ministry of Agriculture and Fisheries and processing companies within the private sector, as well as field work, in Oman. Furthermore, the study includes the identification of seven key success factors for value creation in Oman through the exploration of three countries with a distinguishable seafood export. This was conducted by the means of a thorough literature review and interviews with industry experts. The theoretical framework of the study is based on the Activities-Resources-Actors (ARA) model, initially presented by Håkansson and Snehota in 1993.

The results indicate that main reason for the inferior value creation in fresh seafood export from Oman is the abundance of small individual actors, with inadequate technology and equipment, and numerous stages of transaction from harvest and plate encompassed in the industrial network for fresh seafood export in Oman. Through increasing the concentration and interaction among actors in the network structure, and by introducing complementary regulations and policies, Oman could better realize the criteria for the identified key success factors. The proposed network structure development is recommended to be initiated in small scale through a pilot project in collaboration with both public and private sector in Oman.

Terminology

Artisanal fisheries	Various small-scale, low-technology, low-capital, fishing practices undertaken by individual fishing households, as opposed to commercial companies
Aquaculture	Farming of aquatic organisms
Capture fisheries	Harvest of aquatic organisms that are exploitable by the public as a common property resource
Fresh seafood	Seafood that is not processed, frozen, dried, salted or similar. It is only cooled and could also be fileted
Seafood	Animals from the sea that can be eaten, especially fish and sea creatures with shells
Seafood export	All movements out of the country of seafood. Data on exports include seafood caught by domestic fishing vessels and landed directly in foreign ports
Seafood production	All harvested seafood, either from capture fisheries or aquaculture. Also referred to as seafood landings.
Sustainable seafood	Sustainable seafood is seafood that is either caught or farmed in ways that consider the long-term vitality of harvested species and the well-being of the oceans, as well as the livelihoods of fisheries-dependent communities
Value	The subjective assessment of the trade-off between benefits and sacrifices
Value creation	The process through which the participants make use of each other's resources in order to generate value

Table of contents

List of Tables

List of Figures

1 Introduction

This chapter provides an introduction to the master thesis and is initiated with a background to the Sultanate of Oman and the seafood industry. The chapter also includes a description of the research field and describes the purpose and the delimitations of the master thesis. The chapter is finalized with a section outlining the disposition of the report.

1.1 Background

The Sultanate of Oman, hereafter Oman, is a country located on the south-eastern coast of the Arabian Peninsula in Asia with around three million inhabitants (FAO, 2015). The country has a coastline to the Arabian Sea, the Persian Gulf and the Gulf of Oman encompassing around 3000 kilometers (Qatan, 2010) with a rich marine life comprising a large potential for distribution and export of seafood. Oman is one of the largest seafood producers in the geographical region with over 200 tons of seafood annually caught in the Oman waters (FAO, 2015). In 2013, 60% of caught seafood was exported, the majority in a fresh and unprocessed condition (Al-Busaidi et al., 2015), and Oman is a net exporter of seafood (FAO, 2015). The seafood export represents half a percent of total exports in the country and seafood exports are the second most important non-oil source of foreign currency (Al-Busaidi et al., 2015). In contrast to the most exported merchandise, oil and natural gas, seafood might be seen as a small contribution to the national economy. However, seafood is deemed to be an important natural resource to diversify the Omani economy and is furthermore increasingly important in the future when the reserves of oil and gas become exhausted.

Seafood is increasingly highly valued as food and is considered to have many nutritional benefits (Trondsen, 2012). The global production of seafood has increased over the past decades and it is estimated that around half of the total world seafood production is traded internationally (FAO, 2017a). The demand and consumption of fresh seafood have increased, and it is considered to be the most important fishery product representing approximately half of the market for human seafood consumption (FAO, 2014). *Freshness* is described as the most valued seafood attribute in all consumer markets (Trondsen, 2012) and thus creates the possibility to charge a premium price and get a higher return on the harvest on fresh seafood compared to processed, for example frozen or dried. Besides the commercial value potential in harvesting nutrition and alimentation from the Oman sea, there is also a prospect to create job opportunities in an emerging country. Fisheries is among the oldest and most important production sectors in the Omani economy. The industry generates both food and employment to the inhabitants and has a great impact on the country's GDP. In many coastal communities of Oman, fishing is the main activity and the industry today employs around 50 000 people (FAO, 2015). Over the past half century Oman has experienced growth in various sectors, however fisheries and related industries are lagging behind (Belwal et al., 2015). Enhancing value creation of sustainable fresh seafood export would thus have a considerable impact in the country.

1.2 Research field

Fresh seafood has a limited shelf life which creates constraints for export and it is estimated by Rialland (2014) that the value of fresh seafood depreciates by one forth after two days and after four days the value is diminished to almost zero. It is therefore of priority to get to market, from harvest to consumption, as fast as possible. The Food and Agriculture Organization (FAO) of the United Nations (2017a) means that post-harvest handling, processing and transportation of seafood require particular care in order to ensure food quality and safety. The post-harvest value chain of seafood must meet particular requirements to retain the nutritional value, preserve the benefits of the rich composition and avoid fish-borne illnesses. This becomes of special importance with regards to export of seafood when the distance from harvest location to consumption location is longer which often is the case in seafood export. Several studies indicate that there are large variations between different nations with regards fresh seafood value chain configuration and exploitation of market opportunities (Trondsen, 2012). There are nations in the world that are prominent with regards to export of fresh seafood, among these countries are for example Norway (Cantillon, 2010). This creates interest to investigate how these countries influence the activities, actors and resources as well as the opportunities, constrains and performances of industrial networks of fresh seafood export with the result of great value creation.

1.3 Purpose

The purpose of this thesis is to investigate how Oman could enhance value creation of sustainable fresh seafood export by examining the current industrial network in Oman and identifying key success factors for value creation in other countries.

1.4 Delimitations

This thesis is restricted to regard *seafood* that is *fresh* and the harvest of *capture fisheries*. Seafood is defined in thesis as animals from the sea that can be eaten, especially fish and sea creatures with shells, in line with the definition of the Cambridge Dictionary (2017). This means that the thesis will only include the seafood that is sold on the consumer market as nourishment to humans. Fresh seafood indicate that the seafood is not processed, frozen, dried, salted or similar, it is only cooled and could also be fileted. Capture fisheries imply the harvest of aquatic organisms that are exploitable by the public as a common property resource and does therefore not include the harvest from aquaculture, defined as farming of aquatic organisms (CWP, 1990). This limitation has been made since the industrial network for capture fisheries and aquaculture are dissimilar in the way that aquaculture enables control of the slaughter according to incoming orders, while the industry for wild seafood is dependent on a fluctuating natural resource (Trondsen, 2012). In addition, aquaculture represents a small share of total production in Oman (MAF, 2016).

Furthermore, this thesis will examine the international trade, export, of fresh seafood from Oman and not the food consumed by the inhabitants domestically. Export of seafood is defined by the CWP Handbook of Fishery Statistical Standards (1990) as all movements out of the country of seafood. Data on exports include seafood caught by domestic fishing vessels and landed directly in foreign ports. This thesis does not include re-export of seafood.

1.5 Disposition

This introduction is followed by a chapter with introductory information divided into four sections: The Sultanate of Oman, Characteristics of the seafood industry, Benefits and risks with seafood and Sustainable fresh seafood export. The purpose of the chapter is to provide background information that is required to comprehend this master thesis. The following chapter includes the theoretical framework based on the ARA-model by Håkansson and Snehota (1993) and related theories in the three layers of the model. The third chapter is concluded with the presentation of the three research questions of the master thesis.

The fourth chapter of the report describes the methodology used during the research study. This is followed by a chapter describing the empirical findings of the industrial network from fresh seafood export in Oman. The sixth chapter introduces the three country cases from which seven key success factors for value creation in sustainable fresh seafood export is identified in chapter 7. The report is completed with a discussion in which the industrial network for fresh seafood export in Oman is contrasted to the identified key success factors. In addition, the chapter includes proposed measures for developing the industrial network as well as governmental regulations and policies in Oman.

2 Introductory information

This chapter includes the introductory information required to comprehend this master thesis. The chapter is initiated with a description of the Sultanate of Oman and the seafood industry in the country. The following section discusses the characteristics of the seafood industry. Furthermore, this chapter presents the benefits and risks with seafood and some of the main associated standards and regulations for quality and safety of seafood. The chapter is concluded with a section describing the concept of sustainability in the seafood industry.

2.1 The Sultanate of Oman

Oman is a country located on the south-eastern coast of the Arabian Peninsula in Asia, see Figure 1, and has around three million inhabitants (FAO, 2015). Oman is a member of the regional organization Arab League and the Gulf Cooperation Council (GCC), including Saudi Arabia, Kuwait, the United Arab Emirates, Qatar and Bahrain.

Figure 1 Oman on the world map

During the past half-decade Oman has been transformed from a nation with fishermen and farmers with a total of six kilometers of paved road, into a state with economic growth in several sectors and a modern infrastructure (Export.gov, 2017). Currently, Oman is a middle-income country and the main contribution to GDP is hydrocarbon resources (FAO, 2015). The recent decline in oil price, and the future depletion of the resource, has increased the importance of diversification of the economy and amplified the role of the private sector in the country. His Majesty *Sultan Qaboos bin Said* has developed "*Vision 2020*" that aims to create economic and financial stability, increasing privatization, diversifying and globalizing the Omani economy, encouraging foreign investment and developing human resources by education and training. The vision is divided into five-year-plans and currently the nation is pursuing the ninth five-year plan in 2016-2020. The five-year plan maintains the focus on economic diversification, welfare and social benefits. The plan targets five industrial sectors, in which the fishery sector is one. The government is currently placing effort in infrastructural development, one of which is to revamp the ports' infrastructure to increase the industrial production and export, in exploiting the strategic location for international shipping (Export.gov, 2017).

In 2010, United Nations Development Program (UNDP) classified Oman as the most improved nation in the world in terms of the Human Development Index (HDI) during the past 40 years (UNDP, 2010). The economy has developed in the areas of tourism and trade of fish, dates and agricultural products. This distinguishes the country from its neighbors that are all still largely oil-dependent (ibid). However, it is stated in the report by UNDP (2010) that there are still improvements that can be done with regards to political freedom. Oman is a sultanate with absolute monarchy with a non-elected executive, a nonpartisan legislature and a ban on all political parties.

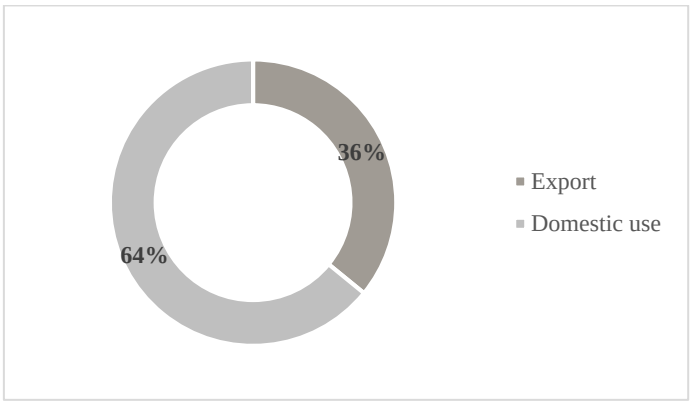
2.1.1 Overview of the seafood industry in Oman

Oman has a long coastline, encompassing around 3000 kilometers (Qatan, 2010), to the Arabian Sea, the Persian Gulf and the Gulf of Oman with rich fishing grounds (FAO, 2015). Fisheries is among the oldest and most important production sectors in the Omani economy. The industry generates both food and employment to the inhabitants and represents around 0,6% of the GDP in Oman (FAO, 2015). In many coastal communities of Oman, fishing is the main activity and the industry today employs around 50 000 people (FAO, 2015) as well as provides the livelihood for around 200 000 people (Qatan, 2010). The majority of the landings are small pelagic fish, this is for example sardines and Indian mackerel. Large pelagic fish is the next-to largest category of seafood caught, this includes for example tuna and kingfish. Other seafood caught in Oman waters are sharks, rays, shrimp and lobsters among others (FAO 2015). Oman is one of the largest seafood producers in the geographical region with around 200 tons of seafood annually caught in the Oman waters (FAO, 2014). Export of seafood is very important for Oman in order to diversify the economy, but further to achieve higher living standards to fishermen in the country (Zaibet, 2000). Over the past half century Oman has experienced growth in various sectors, however fisheries and related industries are lagging behind (Belwal et al., 2015) and there is a great potential for improvement in the industry. The fisheries sector is under the patronage of His Majesty Sultan Qaboos bin Said to be one of the promising sectors in increasing the economic diversification (Muscat Daily, 2017). The reason behind this is the advantage of the sector in utilizing a renewable resource, the possibility to increase food security and provide employment, as well as the ability to double the contribution to GDP within a few years (ibid).

2.2 Characteristics of the global seafood industry

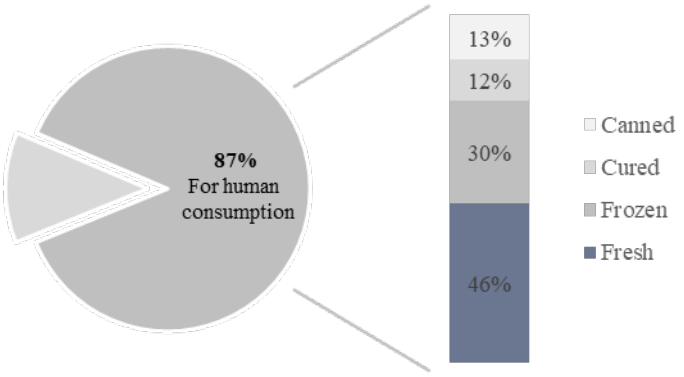
Seafood is defined in thesis, previously stated in section 1.4, as animals from the sea that can be eaten, especially fish and sea creatures with shells, in line with the definition of the Cambridge Dictionary (2017). Fish and seafood is often referred to as a commodity, it is a simple product and variety occurs naturally in terms of size and species (Cantillon and Håkansson, 2009). The global production and international trade of seafood has increased over the past decades and in 2014, 36% of all produced seafood was a subject for export, see Table 1 (FAO, 2014). About three quarters of the total exports are destined for the EU, USA or Japan (Ababouch, 2007). In developing countries fish export is an important source of foreign exchange (Valdimarsson, 2007). Seafood carries low tariffs compared to other agricultural goods (Trondsen, 2012) which enables international trade to be conducted.

Table 1 Export and domestic use of total seafood global production 2014



Seafood is increasingly highly valued as food and is considered to have many nutritional benefits (Trondsen, 2012), see more about the nutritional value in section 2.3. In the western world seafood is increasingly seen as luxury food and these consumer groups value convenience, food quality and flavor (Trondsen, 2012). In developing countries seafood is an important part of food supply (Valdimarsson, 2007) and it is estimated by FAO (2016) that over one billion people depend on fish as their main source of protein. Unlike other food products, processing of seafood does not increase the price of the final product. Oppositely, fresh seafood contains the opportunity to charge a premium price (Valdimarsson, 2007). In 2014, 46% of all seafood intended for human consumption was marketed in a fresh condition, see Table 2. For details regarding Table 1 and 2, see Appendix A.

Table 2 Utilization shares of total seafood global production 2014



The global seafood sector is large, and it is estimated by FAO (2016) that 200 million people are directly or indirectly employed in the seafood industries and that 12% of the world's population rely on fisheries and aquaculture for their livelihoods. Andersson and Valderrama (2007) describe the seafood sector as highly complex and diverse, comprising many different species and technologies. They also state that the sector is very fragmented, with fishermen conducting fisheries from canoes, and simultaneously large, multinational companies conducting trade all over the world. The authors further state that it is the most international and the most wasteful food subsector and that the messy regulatory environment makes it very bureaucratic. Valdimarsson (2007) argues that the market for seafood is strong, but the growth potential is limited with regards to the natural limits of a natural resource in capture fisheries.

However, Valdimarsson also states that the seafood sector encompasses great opportunities in terms of product diversification and value addition. Trondsen (2012) argues that value chain management in the seafood industry is difficult since it is highly dependent on natural resource harvesting influenced by natural variation, harvesting effort and governmental regulation.

2.3 Seafood benefits and risks

Seafood is one of the most important foodstuffs for humans, due to its nutritional benefits and mild taste (Undeland, 2015). However, it is also one of the most sensitive and perishable food groups (ibid). Seafood is adjusted to live in cold waters, which means that the chemical and biochemical degradation reactions occur faster compared to homoeothermic animals (ibid). According to Al-Busaidi et al. (2015), seafood poses a safety risk which has increased with the globalization of seafood production and trade.

Seafood contains many important nutrients that are not as common in other types of food. It is a source of proteins, unsaturated chains of Omega-3 fatty acids, Vitamin D and B12 and minerals such as iodine, calcium and selenium. These nutrients have a documented positive impact on human health and well-being and are in many ways essential to human life (Undeland, 2015). However, it is also the presence of fatty acids that makes seafood into a sensitive food group. When the fatty acids come in contact with oxygen in the air, a chain of oxidation reactions are initiated that result in substances with many negative quality properties. These substances give the seafood a rancid odor and taste and affect the color of the seafood. Furthermore, the oxidation affects the proteins in the seafood and alter the ability to hold water which in turn affect the consistency, making the seafood dry and tardy (Undeland, 2015). If the seafood is subject to raised temperatures the reactions are aggravated. Heat can also alter the proteins, by crosslinking, in the seafood – likewise affecting the consistency negatively (ibid). Furthermore, microbial growth in the seafood is a quality and safety issue. This is also intensified with higher temperatures (Al-Busaidi et al., 2015). Microbial and biochemical reactions is a public health risk and arise from specific activities along the harvesting, production and processing supply chain (ibid). Nevertheless, by handling the seafood carefully and in a cool environment, the biochemical reactions and the microbial growth can be avoided and postponed.

Besides the quality and safety issues related to post harvest chemical and biochemical degradation, the archetypal conditions of the seafood are also of importance. Seafood from certain polluted oceans can accumulate unsolicited substances, such as dioxins and PCP as well as heavy metals, e.g. Mercury (Undeland, 2015). These substances pose a serious safety risk to humans and have impact on the reproduction, immune system, and the central nervous system (ibid).

2.3.1 Seafood quality and safety

The quality and safety of seafood products have received attention from governments, policy makers, food businesses and supply chain stakeholders both locally and globally. There are many different types of quality control and assurance systems in the food sector, but they all have the intention to influence to safe food production and reduction of seafood-born deceases (Zaibet, 2000). Hazard Analysis and Critical Control Point (HACCP) system is a preventive

system based on identifying hazards and controlling risks in different parts of the food chain. HACCP is accepted worldwide and is a requirement in international trade to the EU and USA since 1997 (Zaibet, 2000). Furthermore, HACCP principles are the basis of many quality and safety assurance systems worldwide. (ibid).

The seafood quality and safety standards developed by international organizations (such as FAO), are embraced by the large international importers, such as EU, USA and Japan that often impose additional restrictions to the seafood imported and frequently find batches that do not meet their requirements (Al-Busaidi et al., 2015). This means that export of seafood to these countries have high requirements for seafood quality and safety. The World Trade Organization (WTO) has placed effort in harmonizing standards across the globe, in order for the quality and safety requirements not to vary from market to market (Ababouch, 2007).

Creating a system for quality and safety control is challenging for many developing countries, especially if new standards are continuously introduced or old ones altered. Some developing countries have adopted binary systems in which the seafood aimed for the major export markets are tightly controlled, whilst the seafood for local consumers are less controlled (Al-Busaidi et al., 2015).

Traceability has increased in importance in food safety over the past decades as a consequence of the BSE and dioxin crises in Europe in the 1990s (Vikingur Arnason, 2007). Traceability is basically the possibility to trace and follow the seafood from origin to final consumption. In 2002, EU and USA put forward regulation that all food companies should have the ability to trace their products and ingredients used. This resulted in many companies investing in systems that enabled tracing of their products (ibid). The legal requirements are that the company should be able to know where their supplies come from and where their products go. Vikingur Arnason (2007) argue that the traceability systems need to be coupled with other systems in the company, such as HACCP.

2.4 Sustainable fresh seafood export

Oceans cover around 70% of the earth's surface and is the home for a variety of life that is essential for environmental, social and economic wellbeing. (MSC, 2017a). The world's oceans drive global systems that make the Earth habitable for humankind (UN, 2017). The market potential for seafood is strong, but the growth potential is limited, especially from the capture sector as capture fisheries stresses seafood stocks in all seven oceans of the world (Valdimarsson, 2007). The Marine Stewardship Council of the United Nations estimates that so much as 25% of all seafood stocks are overfished, depleted or recovering from depletion, in which 52% of the stocks are fully fished (Valdimarsson, 2007). Politicians, industry, NGOs and the general public all agree on that sustainable and responsible fisheries must be achieved (Valdimarsson, 2007).

To conserve and sustainably use the oceans, seas and marine resources is the 14th Sustainable Development Goal of the United Nations established in 2015 (UN, 2017). The goal comprises ten targets to be fulfilled before 2030. The targets include actions and endeavors related to, among other things, marine pollution, marine and coastal ecosystems and ocean acidification. The most important targets related to this study include: To regulate harvesting and end

overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans; To prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies; and, To provide access for small-scale artisanal fishers to marine resources and markets.

2.4.1 The sustainable seafood movement

The sustainable seafood movement is taking place on the world's major seafood markets, the European Union, the United States and Japan as well as on smaller markets such as New Zealand, Canada and Australia (Roheim, 2007). The sustainable seafood movement utilizes the market, through retailers and restaurants, to influence the demand for sustainable seafood in an effort to ultimately affect the management of fisheries (ibid). The movement is generally initiated and managed by Non-Governmental Organizations (NGOs) or non-profit organizations (ibid). According to Roheim (2007), the sustainable seafood movement is here to stay.

Tools used within the sustainable seafood movement are boycotts, consumer guides to sustainable seafood and labeling. Roheim (2007) argues that both boycotts and consumer guides tend to generalize with the risk to punish fisheries that actually perform well with regards to sustainability. This is for example true with Atlantic cod, which is red-listed in consumer guides. However, there is no specification in the guides to where the cod is harvested. The consumers are hence not informed that if the Atlantic cod comes from Iceland it actually *is* sustainable.

In place of punishing fisheries that perform poorly, Roheim (2007) means that ecolabelling, and other types of certifications, have the possibility to reward fisheries that perform extraordinary. According to Roheim (2007), it is not always the consumers that drives the demand for ecolabelled products. Rather it seems that the retailers and processors are creating the market, by producing and distributing sustainable products to the consumers. The rationale behind this is threefold, says Roheim (2007): Firstly, procuring sustainable seafood is a means of minimizing supply risk in the future – if fisheries continue to be overfished the retailer ultimately would have nothing to sell. Secondly, the demand is related to public relations and avoiding scandals that can occur from not buying certified seafood. Lastly, sourcing ecolabelled seafood is also expected to increase customer and employee loyalty.

2.4.2 Preservation of seafood stocks

Seafood, and other marine resources in the ocean, belong to the commons, according to Roman law principles (Trondsen, 2012). This means that governments, on behalf of the commons, have the possibility to manage harvesting of seafood within a certain area from land and that private seafood ownership begins when the seafood is caught. (UN, 1982). In order to preserve seafood stocks, EU has implemented catch limits, called Total Allowable Catches (TAC), for seafood with commercial value. The quotas are decided upon yearly by ministries based on scientific advice from advisory bodies. The TACs are distributed between the EU countries into national quotas and is a way of ensuring that the seafood stocks remain sustainable. The different nations have the possibility to trade quotas between each other. The EU countries are respectively responsible for ensuring that the quota is not overfished by registering the reported intake of

seafood each day (European Commission, 2017). Some nations use the national quotas as a common pool of resources in which the different fishers have the possibility to fish until the common quota is depleted that year. This means that when the quota is depleted, no one is allowed to fish no matter the time and equipment available or market demand. Some nations have adopted Individual Quotas (IQ) for certain species, in which the individual fisher can catch a certain amount of seafood per year and thereby plan their own fishing operation without consideration to other fishers (Waldo, 2015). Furthermore, other countries have adopted Individual Transferrable Quotas (ITQ) allowing for transfer of quotas between actors (Bess, 2006). Read more about individual quotas in different countries in chapter 6.

3 Theoretical framework

The theoretical framework for this master thesis project is structured around three main concepts that is used as a basis for fulfilling the purpose of the thesis. The three concepts are represented by the three layers of the Activities-Resource-Actors (ARA)- model, presented initially by Håkansson and Snehota in 1993. The model is a tool used for describing and analyzing an industrial network and is illustrated in Figure 2.

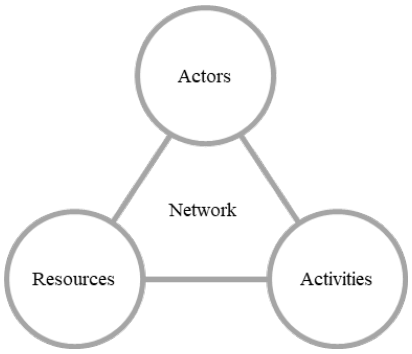


Figure 2 Illustration of the ARA-model, adopted from Håkansson and Snehota (1993)

This chapter will be initiated with a presentation of the concept of value creation in industrial networks. The following sections concern the three elements of the model, activities, resources and actors, respectively. Several developed theories are presented related to each of the three layers of the model that will be used to guide both in the data collection and performing the analysis in the master thesis project. The theoretical framework is synthesized with a problem discussion in which the research questions are formulated.

3.1 Value creation in networks

In fulfilling the purpose of the master thesis project, enhancing the value creation of sustainable fresh seafood export from Oman, it must initially be defined what value and value creation is. The definition in this thesis is in accordance with Forsström (2005) that defines value as the subjective assessment of the trade-off between benefits and sacrifices, and value creation as the process through which the participants make use of each other's resources in order to generate value. This in turn means that enhancing value creation is directly coupled to resource development.

Kähkönen and Lintukangas (2012) describe that the traditional view on value creation, based on Porter's value chain theory from 1985, has been replaced by the concept of *value networks*. Porter's initial model described each firm as a collection of activities, and competitive advantage is gained from performing these activities more inexpensively and better than the firm's competitors. However, this model has over the years been criticized for being too narrow in focusing on only a few actors, and more importantly not considering the customer. Kähkönen and Lintukangas (2012) argue that the efficiency in one chain is dependent on the activities and resources in other chains. An industrial network consists of multiple actors that operate in interconnected relationships. It is the interaction between the actors that affect the performance, and thus the value, of a single firm (Gadde et al., 2010)

As described above, an industrial network according to the ARA-model contains three components; activities, resources and actors. The three components are dependent and have impact on each other (Gadde & Håkansson, 1993). Actors perform complementary or competitive activities and control resources. Activities are performed by actors and consume resources, with the purpose of adding value to other resources. Finally, resources are controlled by actors and their value is hence determined by how they are used in activities. The ARA-model captures the connections between activity coordination, resource combination and the resulting structure of actors (Gadde, 2004). As a result of this, an industrial network can be analyzed by either the patterning of activities, constellations of resources or webs of actors, even though the three layers in reality are highly entangled (Gadde et al., 2010). In this thesis, the control and combination of resources will be the main focus in accordance with the definition of value creation. However, the two other layers of the ARA-model needs to be examined in relation to the resources in order for the complexity of the network to be revealed.

3.2 Activities

All industrial networks consist of numerous activities taking place both within individual companies and beyond firm boundaries. The activity structure can have profound impact on both the performance of a single actor and the network in its entirety. Gadde et al. (2010) state that there are two main drivers of performance enhancement in activity configurations. The first driver involves the efficiency of a single activity and is mainly directed towards economies of scale and standardization. This effort increases the similarity of activities, the exploitation of the same resource and the result is specialization. The second driver concerns the coordination of single activities into an efficient activity configuration throughout the network from supplier to end-customer. Ford et al. (2003) state that specialized actors emerge in a network since these actors perform activities in an optimal manner and have the possibility to develop capabilities due to their narrow scope of actives. This specialization of activities is closely linked to specialization in resources and requires groups of companies working together to performed activities that used to be performed by an individual company.

3.2.1 Activity interdependencies

Interdependencies exist in industrial networks since activities are connected to other activities performed both within firm boundaries but also across the network. Interdependencies can therefore be said to increase with specialization. Interdependencies were initially described by Thompson in 1967. Thompson differentiates, from an intra-organizational perspective, between three types of interdependences; pooled interdependence, sequential interdependence and reciprocal interdependence. The three types are illustrated in Figure 3. The author further describes how to manage different the interdependencies respectively. *Pooled interdependence* means that several departments contributes to the whole, without being directly dependent on each other, which requires a coordination by standardization. *Sequential interdependence,* on the other hand, involves a direct dependence between departments in which the output of one activity becomes the input for the following. This type of interdependence is best handled though coordination by plan. The third type of interdependence, *reciprocal interdependence*, is described by Thompson as a form of sequential interdependence which occurs in a cyclical

manner. To manage the latter type of interdependence, coordination by mutual adjustment is required.

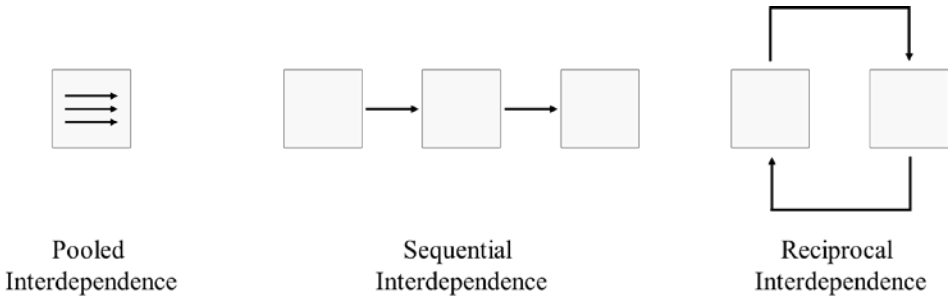


Figure 3 Illustration of the three types of interdependence as defined by Thompson (1967)

Dubois et al. (2004) extend the theory by exploring these interdependencies between activities and resources within and among supply chains. According to Dubois et al. (2004), pooled interdependence includes joint utilization of resources and is therefore closely related to the efficiency of a supply chain, as also described by Gadde et al. (2010) as the first driver of performance enhancement. Economies of scale can be achieved in separate activities within and among supply chains by utilizing common resources, demanding some degree of standardization of the utilization of resources. The authors further state that sequential interdependence among activities is strong in supply chains, and that coordination in the supply chain is consequently required. Activities with sequential interdependences and need to be performed in a certain order, require an even greater degree of coordination and matching of plans ex ante. Also in the occurrence of reciprocal interdependence, ex ante matching of plans is necessary. Gadde (2004) also discusses the subject of interdependencies and state that interdependencies require enhanced coordination among firms, and that increasing interdependence among activities result in increasing integration of resources in the network. Thus, the way the resources are combined have a large impact on the performance of the network, this is further described in chapter 2.3 *Resources*. Dubois et al. (2004) contend that the involved actors need to interact and adjust resources consumed or created by coordinated activities to improve the resource utilization. The interaction among actors is therefore of high importance to understand and analyze according to Dubois et al. (2004), which is further described in chapter 2.4 *Actors*.

3.3 Resources

An industrial network contains many different resources that are controlled by various actors and consumed and created by the activities performed. An individual resource element is connected to other resource elements and they can be combined and recombined in numerous ways. The value of a resource is not predetermined, it depends on how the resource is used and combined with other resources. This is referred to as *resource heterogeneity* by Gadde et al. (2002). The authors further explain that resources have multiple features and that in a certain use or combination some features of a specific resource is exposed, while others stay hidden. In a network, different actors can though interaction get access to resources controlled by other actors and new combinations of resources can appear without ownership. This means that the potential value of a resource has no limit.

With this in mind, Gadde et al. (2002) conclude that resource development and innovation is more than the acquisition and investment in new resources, it is principally about using existing resources in a new way. This can be achieved by either exploiting unused, currently hidden features of the resource and/or by finding new combinations with other resources that create synergies. Hoholm and Håkansson (2012) state that through actively combining resources, *"… resource heterogeneity can be exploited, and value creation enhanced." (*pp. 255). However, the authors continue by saying that the combination of resources is subject to a paradox in which every resource combination, as stated, result in value creation but also restrict the combined resource elements from being developed in other combinations. This is the result of resource adaptation where a resource develops in interaction with other resources and becomes directed towards toward these. The resource combination hence leads to greater performance in a certain setting, but restrictions for the resource to fit in another setting. The combination of resources can occur both within the individual firm and between different actors in a network. When different actors interact and combine their resources, better utilization of the resources can be achieved and thus the value of the resource is increased, as described earlier. Gadde et al. (2010) express that "*All resources are affected by interaction but they are also used in interaction. Every resource is a product of previous interaction and a basis for current.*" (pp. 56).

3.3.1 Categorization of resources

In order to analyze the resources that are present in a network there is a need to categorize the different resources. Gadde et al. (2002) distinguish between two main types of resources; physical and organizational. Each of these categories further contain two categories of resources respectively. This model is referred to as the 4R-model (R, as in Resource). The physical resources are divided into products and facilities and the organizational resources are divided into business units and business relationships. The different categories of resources have impact on, and affect both, other resources in the same category and other categories of resources. The categorization of, and the connection between categories, is illustrated in Figure 4 and each of the four categories are described in brief below.

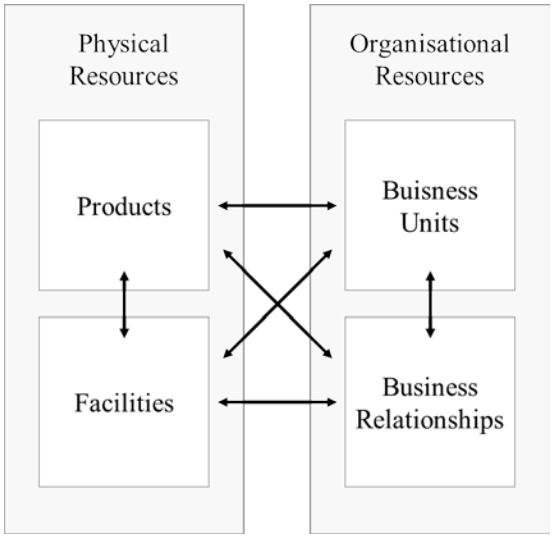


Figure 4 Illustration of the 4R-model, adopted from Gadde et al. (2002)

Products
This category represents the subject of transaction, i.e. what is exchanged, between a supplier and a customer. The characteristics of the product (for example weight, volume and perishability) highly influence the manufacturing, distribution and usage strategies used in the industrial network. In many cases products are adapted to the existing facilities.

Facilities
Facilities are the technical systems that is used in production, consumption and distribution. Facilities include among other things the physical infrastructures, machinery, vehicles, various equipment as well as software. The changeability of facilities varies, and facilities range from very fixed to easily changed. For fixed facilities, the main issue is to find the best use of the existing resource structure.

Business units
The first organizational resource category contains the competencies, capabilities and skills in handling the physical resources. These resources can therefore also be referred to as human resources. Business units have the possibility to bundle other resource elements and therefore alter the structure of the network and change the value of specific resources.

Business relationships
Business relationships give access to the resources across the boundary of the individual firm. This enables the combination and alteration of resources with other actors in the network and hence the possibility of resource development. Not only the physical resources are made available, but a relationship can give access to the relationships of another actor and lead to the enlargement of the focal firm's network. Business relationships can also be important resources in themselves since they contain common knowledge that is developed in interaction with others. They have a large economic impact in terms of sales and procurement but as stated, serve as resource reservoirs.

3.4 Actors

In the previous chapters the resource and the activity dimension of a network have been described. However, activities and resources are not configured and combined spontaneously. The processes need actors who conduct activities and control resources. Actors exist at different levels, from individuals to large groups of companies, all aiming to improve their position and increase the control in the network. The actors organize activities and resources in order to economize and generate value. But the actors themselves are also important, and can be analyzed separately. Gadde and Håkansson (1993) describe a step-wise procedure for actor analysis. The first step includes identifying the main actors and how they interrelate. This is followed by a step which includes reviewing the attributes of the identified actors. These attributes include for example size, geographical location, competence, willingness to cooperate and financial strength. However, the resource and activity layer is closely connected to this type of analysis.

According to Gadde et al. (2010), it is the features of the actor layer that determine what modifications that can be achieved in the other two layers of the ARA-model, but the modifications can likewise transform the actor layer. The authors describe three types of

modifications in the actor layer; individual actor alteration of conducted activities and controlled resources, changes in actor bonds resulting in changed activity links and resources ties and third, the establishment of new and disruption of existing relationships. All these changes affect the actor bonds and alter the position that the individual actor has in the network. In the value generation of resources and activities the role of interaction among actors is of a high importance, which is also demonstrated in chapters 2.2 *Activities* and 2.3 *Resources*.

Interaction involves the establishment and maintenance of actor bonds, activity links and resource ties, and it is therefore impossible to have infinite specific interaction. The position of a specific actor is determined by its interaction with other actors and by the number of direct business partners (Gadde et al., 2010). The more counterparts, the more connections possible to exploit in interaction. However, the number of counterparts also determines what type of connections that can be established. The fewer the counterparts, the more productive connections. That is: with a large amount of business partners, the interaction is limited since resource combination and activity coordination is in itself resource demanding and require the formation of actor bonds. The number of direct business partners, and thus the position of the actors in the network, have an impact on the possibility to coordinate activities and establish an efficient activity structure and an impact on the possibility to combine resources among actors and by doing so enhancing their value. The number of business partners is also closely related to what type of relationship exists between the actors, in which short term, arm's length relationships is often related to many business partners with little content and close, long-term relationships to few business partners with more content. To conclude, a business relationship create prospects for specialized actors to coordinate interdependent activities and achieve efficiency and to combine heterogenous resources to enhance the value creation. Every relationship however has a cost in terms of resource consumption and it is therefore of importance for the individual actor to closely analyze which actors to create which type of relationship with.

3.4.1 The interaction atmosphere

The interaction atmosphere has a great impact on the interaction of actors in a certain network and thus also play a part in determining the position of an actor. Three dimensions of interaction atmosphere are explained below as described in Gadde (2004) and Gadde et al. (2010). The section is further summarized in Figure 5.

Power and dependence

Power is defined as the ability of one actor to influence the activities of others and is closely related to dependence. The more dependent actor A is on actor B, the more power actor B has over actor A and vice versa. With increasing interaction among actors, in terms of activity links and resource ties, the actors become more dependent on each other and the reservoirs of power can be said to increase. However, just because power is present does not mean that it is always exploited. Power can be applied both coercively and collaboratively depending on the content of interaction. For example, in interaction characterized by limited content, power by coercion is unproblematic since both actors can find new business partners in the occurrence of a conflict. However, in interaction with close connections this is destructive and lead to the creation of conflict.

Conflict and cooperation

Conflict is when one actor is perceived to be impeding the attainment of other actors' goals. Interaction always includes both conflicts and cooperation, since actors have both contradictory and common objectives and interests. Conflict is a means of creativity and is deemed to be crucial for long-term development and innovation in a relationship. However, a relationship with a high level of conflict without collaboration is not constructive and is likely to be terminated. On the other end, a relationship with a high level of collaboration and a low level of conflict is not likely to be constructive either since the actors most likely are not placing enough demands on each other. A well working interaction must hence be based on collaboration and the acceptance of the other actor´s conflicting objectives.

Control

Control is the attempt of influencing other actors' strategies and actions. In his article Gadde (2004) describes three types of control mechanisms. Authoritative control is based on ownership and vertical integration and is achieved though exploiting power. Contractual control is based on incentives and compensations and is regulated by contracts. The third mechanism, normative control, is based on shared visions and objectives and is achieved through trust. Gadde states that the control mechanisms have changed from authoritative towards contractual and normative as the need for activity coordination and resource combining has increased among actors in industrial networks. The interaction atmosphere has thereby become more cooperative in the control dimension, but the ultimate goal of the attempts, to persuade others to act beneficially for one's own interests, is still the same.

	Low level of interaction	High level of interaction
Power and dependence	Low dependence → moderate power Coercively enforced	High dependence → substantial power Collaboratively enforced
Conflict and cooperation	Limited potential Destructive effect	Substantial potential Constructive effect
Control	Substantial ambitions Authoritative mechanism	Substantial ambitions Normative mechanism

Figure 5 The three dimensions of interaction atmosphere, adopted from Gadde (2004)

3.5 Problem discussion

Exploiting resource heterogeneity can, as previously stated in this chapter, enhance value creation. This is achieved either by utilizing previously hidden features of a resource and/or by combining resources. By doing so the activity structure is affected and interdependencies are created. The modification also implies increased interaction in the actor layer, which in turn affect the individual actor's position in the network as well as the interaction atmosphere. Thus, by analyzing how resource heterogeneity is exploited it is possible to distinguish key success factors in all three layers of the ARA-model for value creation.

The purpose of this thesis is, as described in chapter 1.2 *Purpose*, to investigate how Oman could enhance value creation of sustainable fresh seafood export. This is achieved by examining the current industrial network in Oman and by doing so identifying the preconditions and constraints for resource heterogeneity and thus value creation. This is followed by the identifying key success factors for value creation in countries with a distinguished fresh seafood export with respect to resources controlled, combined and created. This discussion leads to the following research questions:

1. How is the industrial network for fresh seafood export currently organized in Oman?
    a. Who are the actors and how are they interacting?
    b. What activities do the actors perform and how are they configured and coordinated?
    c. What resources are consumed, combined and created?
2. What key success factors for value creation can be distinguished from investigating countries with a distinguishable sustainable fresh seafood export and trends in the seafood industry?
3. What are the key success factors for Oman in exploiting resource heterogeneity and enhancing the value creation in sustainable fresh seafood export?

4 Methodology

The following chapter describes the research approach and strategy of the master thesis research study. Furthermore, it designates the organization of the research study into four phases. The chapter is concluded with a section about the validity and reliability of the study.

4.1 Research approach and research strategy

The research work performed for this master thesis was based on an inductive research approach, which is characterized by the development of theories and generalizations from observations and findings (Bryman & Bell, 2003). Different categories of data have been compiled and analyzed with the intention to build knowledge and create an understanding about how Oman can enhance the value creation of fresh seafood export.

Bryman and Bell (2003) describe two different research strategies, quantitative and qualitative. Quantitative research accentuates the measurability in the collection and analysis of data and is mainly used in deductive studies with emphasis on testing existing theories. A qualitative research strategy, on the other hand, puts emphasis on words and meaning and is connected to inductive research. The research strategy is hence closely linked to the research approach and it is stressed by Denscombe (2014) that the approach and strategy are, moreover, closely linked to the purpose of the study and the data that needs to be collected to fulfil it.

In the case of enhancing the value creation of fresh seafood export in Oman a qualitative research strategy was used the primary strategy. A qualitative strategy was required in order to map the industrial network in Oman and in the three selected case countries. This enabled the identification of challenges and opportunities with regards to value creation in sustainable fresh seafood export. The qualitative research was complemented with quantitative data and statistics in order to determine the current state of value creation in fresh seafood export in Oman, and to conduct a fair comparison between Oman and other countries, in this area.

4.2 Organization of the study

The study was divided into four phases, each with a clear purpose respectively, see Figure 6. The first phase of the study included a wide literature and web search with the purpose of creating a general overarching understanding and knowledge about the Sultanate of Oman, the characteristics of seafood, the seafood industry globally and more specially, fresh seafood export. The result of this phase can be found in chapter 2 of this report. Furthermore, the phase resulted in the dentification of the key actors in Oman that would have to be contacted for further data collection. The succeeding two phases (Phase 2-3) are described in more detail in sections 4.2.1 – 4.2.2. The fourth and final phase included a comprehensive analysis and exploration of the existing opportunities in enhancing the value creation of sustainable fresh seafood export in Oman.

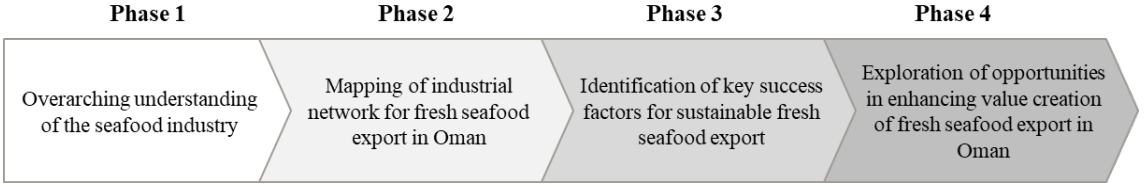


Figure 6 The four phases of the master thesis study

4.2.1 Phase 2: Mapping of industrial network for fresh seafood export in Oman

Throughout this phase a local actor within the marine sector in Oman (henceforth referred to as *Company M*) provided support in arranging contact and getting access to data about the industrial network. Three methods for data collection was used in this phase for the purpose of increasing the reliability of the research, a method known as method triangulation (Denscombe, 2014). Yin (2014) also highlights the importance of having several data sources when performing a research study so as to eliminate subjective viewing. This is especially important in collecting data in Oman where it has been explicitly expressed that "A*ccess to accurate data in Oman is a big issue!*" by a representative at Company M with experience from data collection in the Sultanate, see more in section 4.4. The data compiled in this phase is presented in Figure 7 and further described below.

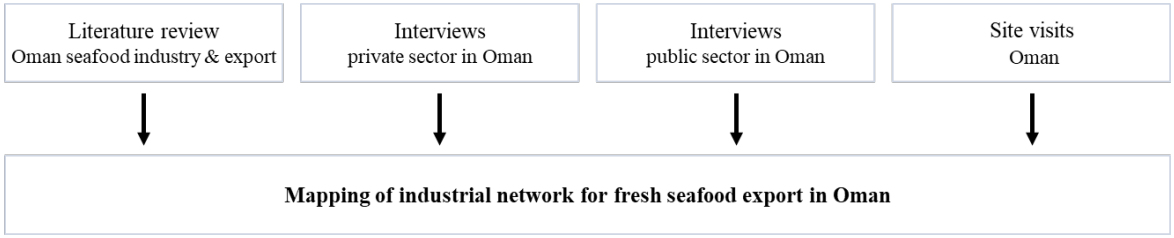


Figure 7 The data collection in Phase 2 of the research study

Literature review about the Omani seafood industry and export

A thorough literature review was conducted encompassing a large part of the existing articles about Omani seafood industry and export. The literature review was conducted in parallel to the primary data collected through interviews and site visits, see below. This enabled an iterative analysis of the data collected and guided the research in line with the purpose of the study.

The literature review also included gathering of statistics regarding the Omani seafood industry. Data analyses were conducted in Excel and the result was an understanding about the current state of fresh seafood export from Oman. Data was gathered from yearbooks and statistical queries of the Food and Agriculture Organization of the United Nations. Furthermore, data was provided upon request after the interviews with the public sector in Oman. The data from the two sources were triangulated and compared to ensure that no major discrepancies existed.

Interviews with actors in the public and private sector in Oman

Through Company M, a director at the Ministry of Agriculture and Fisheries (MAF) in Oman was contacted. The director provided contacts to, and arranged for, interviews with three representatives with different focus areas within the Ministry, referred to as *Snowball sampling* by Denscombe (2014). The representatives had knowledge about the different actors, resources and activities within the industrial network, as well as the efforts taken by the government and specifically by MAF. The interviewees wished to stay anonymous in this report, but details of the interviews can be found in Table 3.

Table 3 Interviews public sector, Oman

Division of MAF	*Date of Interview*
Seafood Safety Implementation	2017-10-11
Fisheries Investment	2017-10-11
Fishery Quality Control Center	2017-10-11

An initial search on the web and existing literature resulted in a gross list of actors in the private sector to be interviewed. Through discussions with Company M, the gross list was narrowed down into a short list with three actors within the processing industry to be appeached for interviews. It was deemed that these companies would cover the spectra of different processing companies ranging in size and with different ownership structures. One company was not willing to participate but, since this was brought to light during the last week of the stay in Oman it was not possible to find a substitute. The two companies interview wished to be anonymous in this report, but details of the interviews can be found in Table 4. Difficulties in collecting data in Oman is further described in section 4.4.

Table 4 Interviews private sector, Oman

Organization	*Interviewee*	*Date of Interview*
Large processing company	Marketing Manager	2017-10-19
Medium-sized processing company	Marketing Executive	2017-10-04

Company M provided the information that no other actor categories in the industrial network would be possible to interview due to the small scale of these actors and their limited knowledge. However, the actor categories with whom interviews was performed in Oman were deemed to create a complete, multi-faceted representation over the industrial network for fresh seafood export.

All interviews in Phase 2 were of semi-structured character. This approach was chosen so that specific topics were predetermined but there was room for flexibility and additional issues to be covered if the interviewer found it interesting for the research, as described by Bryman and Bell (2003). The interview topics, as well as the interview questions, can be found in Appendix G, for the private sector and Appendix H, for the public sector. During the interviews a representative from Company M accompanied the interviewer, as to reduce possible language- and cultural barriers and for support, see more about this in section 4.4. The interviews were transcribed shortly after the occurrences and sent to each interviewee for respondent validation.

Site visits in Oman

Site visits were conducted to one seafood wholesale market and one landing site in the old town of Muscat, in Oman. The site visit observations acted as complementary information and clarification to the interviews about practical constraints and opportunities in the network. The field work was organized in cooperation with Company M and one representative accompanied the researcher during the site visits to reduce possible language- and cultural barriers with the fishermen and truckers – that mainly speak Arabic. During the observations field notes were

taken to ensure the minimization of the frailties of human memory as recommended by Bryman and Bell (2003).

4.2.2 Phase 3: Identification of key success factors for sustainable fresh seafood export

The third phase of the research study was carried out in two steps. The first step encompassed a literature review of three selected case countries with the result of the mapping of the industrial network for fresh seafood export in these countries. The next step included combining this data with data compiled from interviews with industry experts and an additional literature review exploring the seafood industry trends. From compiling all data several themes were identified and categorized through a systematic analysis with the aid of mind maps. This is described by Denscombe (2014) as Grounded Theory Approach in which theories, in this case key success factors, are developed and grounded in empirical research. The data collected in this phase is presented in Figure 8 and further described below.

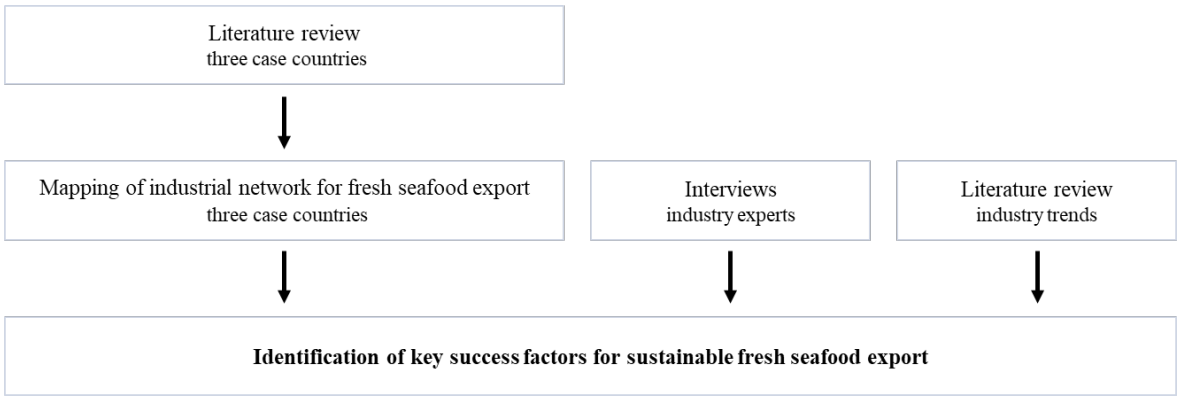


Figure 8 The data collection in Phase 3 of the research study

Literature review of three case countries

The selection of case countries was based on empirical data analysis with regards to value creation in seafood export as well as several articles indicating that the selected countries (Norway, Iceland and New Zealand) were notable with regards to sustainable fresh seafood export. There are certainly other countries with industrial networks that perform well with regards to value creation in seafood export, however, the three countries deemed to provide sufficient information to distinguish key success factors. In addition, the three countries have similarities to Oman with regards to a extensive maritime and fishing traditions, long coastlines and the dependence of seafood as a natural renewable resource. Data was collected from the Fishery and Agriculture Organization of the United Nations' web resources as well as scientific articles on the topic.

Literature review of industry trends

The literature search was initially wide, but was narrowed down through iterative analysis of the literature. Selection of article samples in this literature review was based on *Theoretical sampling*. Theoretical sampling is a method selected to help generate theories, in accordance with the Grounded Theory Approach (Denscombe, 2014). The sampling includes selection of instances, in this case articles, that follows a route of discovery based on the development of a theory. New data is used to either modify of confirm a theory and the sample of instances increases until the researcher has sufficient information for the developed theory (ibid).

Interviews with industry experts

The selection of interviewees was based on articles found in the literature review of industry trends. Two researchers were interviewed over Skype. The researchers have published articles within the area and it was deemed interesting to receive their current view on industry trends in seafood export. The researchers and the date the interview was conducted can be seen in Table 5. The interviews performed were of semi-structured character, as this method is particularly good at allowing the researcher to explore in depth the thoughts, feelings and reasoning of the interviewee. Some questions were open-ended, and the interviewee had the possibility to elaborate points of interest. For interview questions, see Appendix I. The interviews were transcribed and sent to the interviewees for respondent validation.

Table 5 Interviews with industry experts

Interviewee	*Date of Interview*
Håkan Håkansson	2017-09-27
Morten H. Abrahamsen	2017-10-24

4.3 Data analysis

Data analysis has been conducted iteratively be conducted throughout the study. The theoretical framework previously described in chapter 3 has been be used as a framework for structuring the collection and in the analysis processes. The major part of the analysis was conducted in Phase 3 and 4, and serves to answer the second and the third research question concerning the key success factors in value creation in sustainable fresh seafood export and opportunities for Oman to enhance the value creation of fresh seafood export in a sustainable manner.

Since approximately 50 articles, around 20 other references as well as data from interviews and field work was collected throughout Phase 1 – 3 of the study, there was a large amount of input data to process. To structure the findings diagrams, tables and mind maps were created as well as transcriptions from the interviews. For example, this was particularly helpful in moving from the country cases towards the key success factors.

During the project, informal presentations of findings have been held at Triathlon and at Company M. For example, the first presentation included early findings regarding statistical data and a hypothetical industrial network structure. Through the presentations discussions have been held that have constructively improved the research with input from both people with extensive knowledge in business management and people that have been involved in the marine sector both in Oman and globally.

4.4 Quality of the study

Collecting data about the industrial network in Oman was at times challenging and may have an impact on the quality of the study. Firstly, the interviewees in Oman had different nationalities and spoke different languages, so the Arabic-speaking representative from Company M that accompanied each interview was sometimes unable to provide translation support. English was applicable during the interviews; however, one must consider certain limitations and misunderstandings. To mitigate this issue, all interviews were transcribed and sent to the interviewee within 24 hours from the interview for respondent validation to assure the accuracy of data, as recommended by Denscombe (2014).

Besides the language barriers in collecting data in a foreign country, there was also the issue of cultural barriers. Performing interviews and field work as a woman in Oman was demanding and the male, local representative from Company M acted as a chaperon to ensure that everything went according to plan. In addition, the interview forms were examined by a local representative before the interview as to reduce the risk of offensive questions that would affect the quality of the interview.

An additional issue with regards to data collection in Oman was the low interest in contributing to the master thesis. It required several phone calls, e-mails and personal visits to get interviews with the processing companies. As previously mentioned, other actor categories in the network were not even contacted as a representative from Company M certified interviews would neither be feasible nor helpful. However, since the data from interviews and field work was complemented by data from articles it is deemed that a fair representation of the industrial network has been displayed.

Statistical data regarding production and export from Oman was collected from both the United Nations' Fisheries and Agriculture Organization and from the Ministry of Agriculture and Fisheries in Oman. Authoritative documentation tends to have a high credibility (Denscombe, 2014). However, in the statistical data regarding production and export from Oman prior to 2007 there may be inaccuracies due to the lack of human and technical capacity at this time. Nevertheless, data collected after 2007 is reliable due to investments in systems for statistical gathering and analyzing. The data from the Fisheries and Agriculture Organization of the United Nations and from the Ministry of Agriculture and Fisheries in Oman was further analyzed through data triangulation in which the validity of the data was investigated (Denscombe, 2014). Some discrepancies were discovered and in those cases the data from the United Nations, employing large resources and expert professionals, was deemed to have the higher accuracy.

With regards to both qualitative and quantities data a prevailing issue has been collecting to data regarding seafood export in a *fresh* condition. Generalizations have been made in which seafood in all conditions have been included.

5 Oman fresh seafood export

The following chapter is divided into two sections. The first section describes the current state of seafood export from Oman by presenting statistical secondary data over relevant parameters. The second section outlines the current industrial network for fresh seafood export in Oman from both primary and secondary data collection.

5.1 Current state of seafood export

This section describes the current export state in Oman through presenting statistical data. Data has been gathered from several Fishery and Aquaculture Statistics Yearbooks (years 2007, 2009, 2012 and 2014), compiled by the Food and Agriculture Organization (FAO) of the United Nations. Furthermore, data has been collected from the Fisheries Statistics Book years 2009-2016 produced by the General Doctorate of Planning and Development, Fisheries Statistics Department at the Ministry of Agriculture and Fisheries (MAF) in Oman. The latter data was provided by the Ministry upon request. If nothing else Is stated, these two data sources have been used throughout chapter 5.1. For additional details on the data see Appendix B-D.

5.1.1 Export volume and value from Oman

As previously mentioned in section 2.1.1, the seafood industry has been an important area of development for the Omani Government. The production of seafood has steadily increased over the past 50 years, see Table 6 and in 2014 the country was the 55th producer in the world with regards to volume. Oman initiated export of seafood in 1977 and since then the overall export, as well as the export share with regards to the total production volume, has steadily increased. In 2015, the country exported 51% of all seafood produced, see Table 6, which is significantly higher than the global average of 36% (Table 1, pp. 6). Over the past decade the total seafood production and export have continued to increase, yet the export share has stabilized and the average over these years is 55%, see Table 7.

Table 6 Export share of total production in Oman 1965-2015

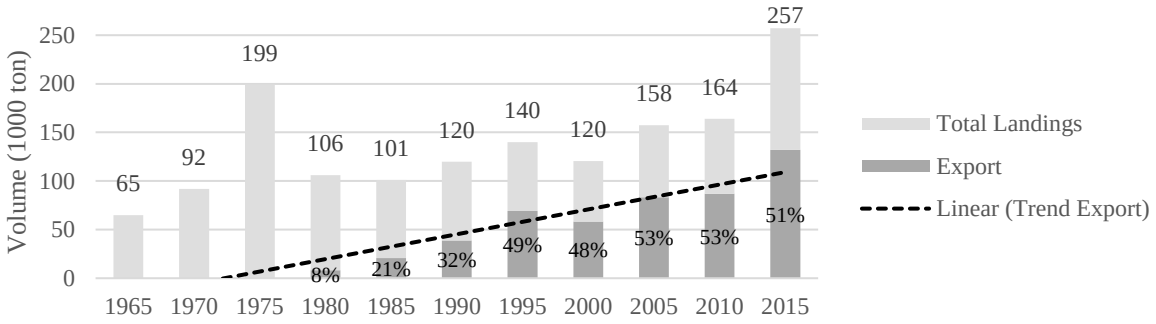
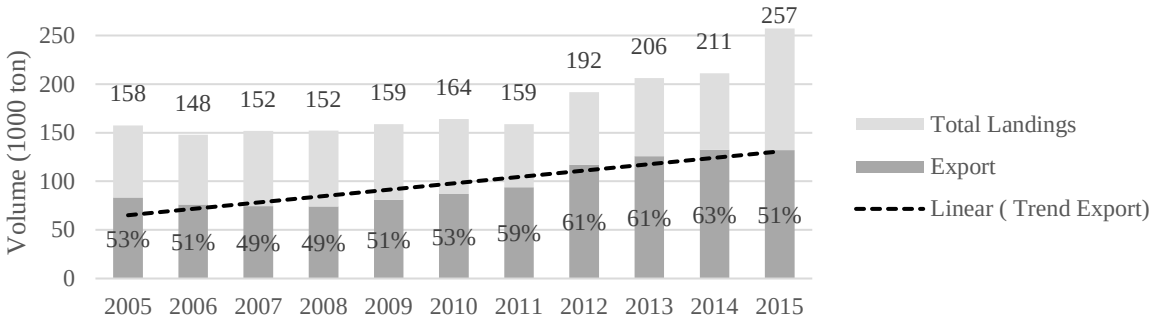


Table 7 Export share of total landings in Oman 2005-2015



When examining the current state of export of seafood, it is possible to distinguish between the volume of seafood exported and its value. The value and volume of total exports for Oman is illustrated in Table 8, and for a global average in Table 9. The global average demonstrates a pattern in which the total quantity exported in the world is relatively steady, but the value of exported seafood has gradually been increasing over the past years. This pattern is not as visible in Oman and Table 8. In comparing the value per volume (USD/ton) over the years 2003-2014, see Table 10, it can be determined that the global average value per volume is 52% higher than Oman, with a peak in 2014 with 131% difference in value per volume (see calculations in Appendix C).

Table 8 Export in value and value, Oman

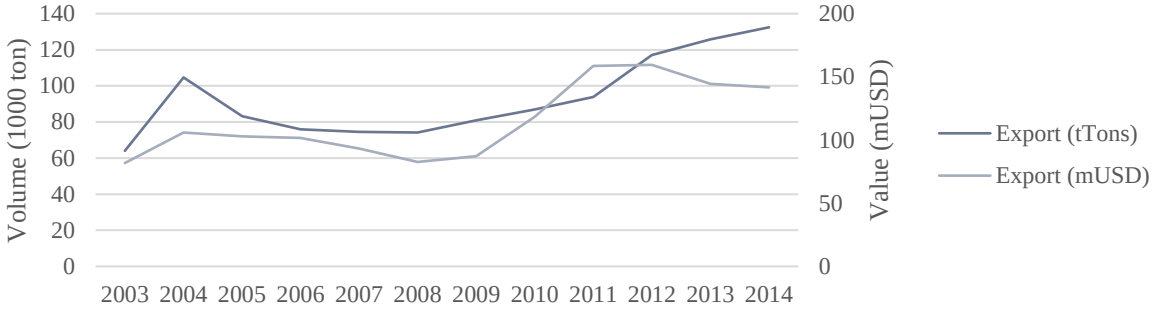


Table 9 Export in volume and value, Global average

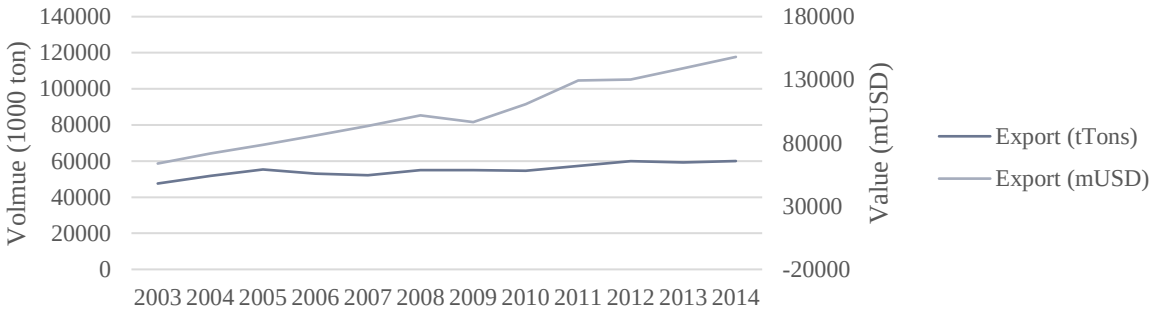
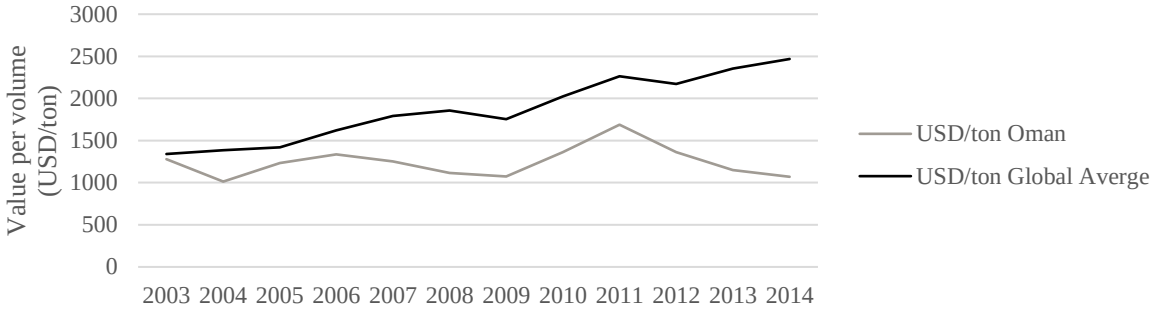
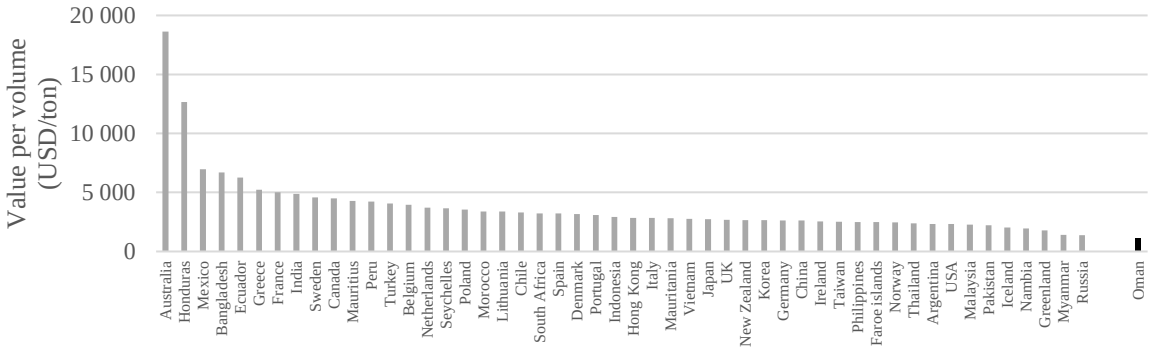


Table 10 Export value per volume, Global average vs Oman



When comparing the value per volume exported from Oman to other nations, it is apparent that Oman lags when it comes to value creation in export of seafood, see Table 11. This data is certainly affected by what species that are exported and to what markets the exporting country distribute to, see for example Australia, with a well-developed strategy only to export high-value seafood, such as lobster, to markets with a strong purchasing power. However, the difference in value per volume is deemed to be the result of processes and methods in the countries. In addition, the countries in Table 11 are spread across the world with access to different species and markets. The comparison is made between export value per volume from Oman and from the fifty largest exporters with regards to value in 2013 (collectively representing 94% of total exports in the world).

Table 11 Export value per volume, comparison between nations in 2013



5.1.2 Omani seafood export markets

Export of seafood and seafood products from Oman is conducted to over 50 countries. The main part, 67% of the total export, in terms of volume (ton), is distributed to neighboring GCC (Gulf Cooperation Council) countries, with the United Arab Emirates representing approximately 70% of this share. Around 19% of all seafood is exported to other Asian countries and the remainder is exported to Africa, South America, the European Union and North America in descending order. Table 12 displays the average volume exported to different regional markets, as well as the average share of total export that this market represents. The average is calculated from export values over three different years namely 2010, 2013 and 2016, see Appendix D. This is deemed to denote a fair representation over the average export volumes, and was furthermore possible to calculate with respect to the scarcity of data.

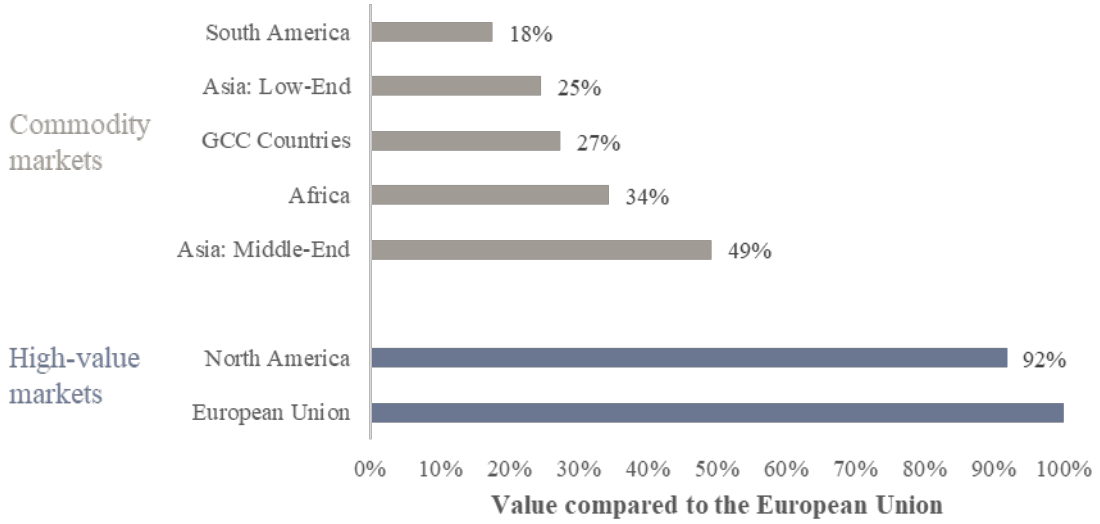
Table 12 The average export volume and average export share of seafood from Oman

Geographical market	Average export volume (ton)	Average export share (%)
GCC Countries	81 300	67%
Asian Countries	23 300	19%
European Union	1 400	1%
Africa	6 700	6%
North America	100	0%
South America	5 600	5%
Others	2 800	2%

The value per volume varies significantly over the different geographical markets. The majority of the geographical markets in Table 12 are homogenous with regards to value per volume. However, the Asian market is significantly heterogenous with a wide range in value per volume, see Appendix D. To enable a fair comparison with other geographical markets, the Asian market has been divided in three sub-segments, see the rationale behind the division in Appendix D.

When examining the value per volume from Oman the high-end Asian market, represented by the Maldives and Hong-Kong has a value that is five times higher than the next most valuable market. However, it represents a small share of export and it is deemed that the value is high because of reasons related to certain species or processing methods. This market is hence excluded from further analysis. After the high-end Asian market, export to the European Union result in the highest value per volume followed by North America, that is: USA. The European Union is moreover, according to FAO (2015), the most important market for fresh seafood generally, resulting in higher revenues for exporting companies. Following the high-value markets there is a value-gap towards the other markets. These markets will henceforth be collectively referred to as *commodity markets*. In Table 13 the value per volume for the different markets is presented in comparison to the European Union. Notable is export to GCC Countries, representing 67% of export volume, result in one fourth of the value per volume compared to the European Union, representing only one percent of total export from Oman.

Table 13 Export value per volume of different export markets from Oman compared to EU



5.2 The industrial network for fresh seafood export in Oman

In the following chapter the industrial network for fresh seafood export in Oman is described. The activities and resources of the different actors are presented from catch to export. Figure 9 provides an illustration of the network that describes the physical distribution and the interaction between the different actors in the network. The different actors and markets in Figure 9 will be further explained in this chapter. Data and information presented has been collected from interviews and site visits in Oman and contrasted to existing secondary data collected from scientific publications and newspaper articles.

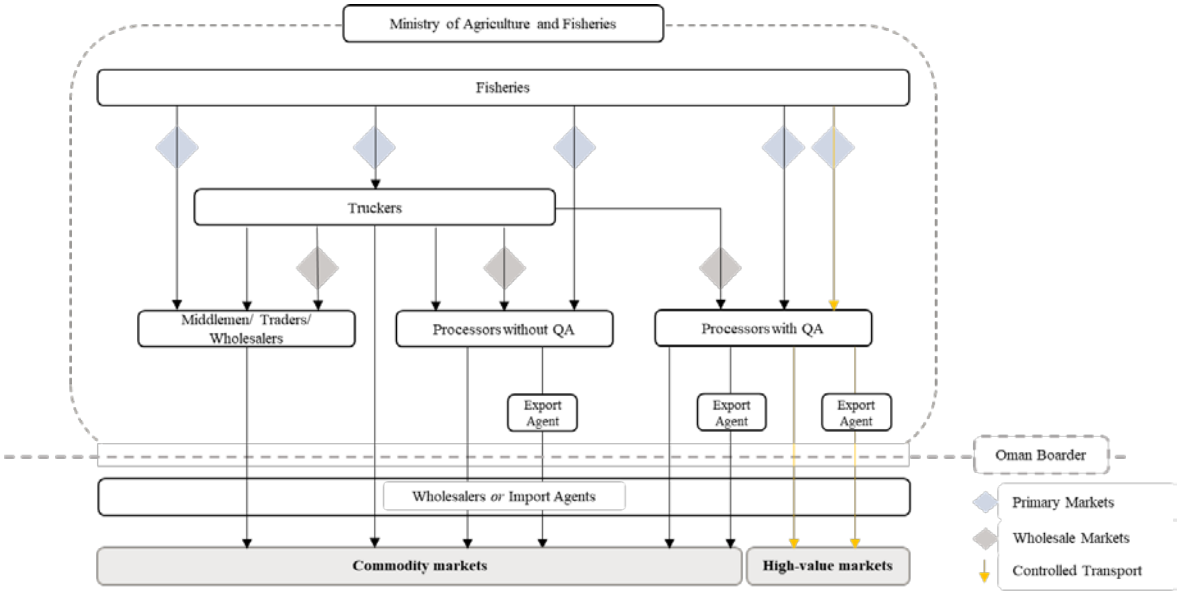


Figure 9 The industrial network for fresh seafood export in Oman

5.2.1 The fisheries sector in Oman

The fisheries sector in Oman can be divided into the three sub-sectors artisanal fisheries, commercial fisheries and aquaculture sector. The artisanal fisheries sector has during the past decades represented the main share of the total catch in Oman and in 2015, 99% of the total seafood production came from this sector (MAF, 2015). This sector is further described below. The commercial fisheries sector comprises coastal fisheries, long liners and internationally contracted trawlers (Qatan, 2010). Total landings from commercial fisheries have decreased over the past decades and since this sector currently represents a small share of the total catch it will not be specifically investigated in this paper. The aquaculture sector is recently developed and is one of the measures taken by the government in order to diversify the economy (FAO, 2015). Aquaculture is, as described in chapter 1.4, outside the scope of this study and will not be further examined.

Artisanal fisheries sub-sector

The artisanal fisheries sub-sector consists of small-scale fishermen operating in small fiberglass or wood vessels with limited storage and passive handling equipment, such as hand nets, gill nets, long lines and fish traps (Belwal et al., 2015). According to one interviewee, Oman is 60 years behind Europe, with regards to fishing equipment. The fishermen are provided with a cool box to storage the seafood from the government that is filled with ice before departure. In 2014 there were around 50 000 fishermen operating in circa 18 500 vessels (FAO, 2014) which implies that each fisherman caught in average 4,3 tons of seafood (Appendix B). The average catch per fishing tour is around 100kg (Omezzine, 1999). Fishing activities are carried out exclusively by men (Al-Jabri et al., 2015) and about half of the fishermen have their own enterprise, one third work in partnership with other fishermen and only a small share works as laborers for larger businesses (Belwal et al., 2015). Attempts have recently been made in creating labor unions for fishermen to collect and accumulate the seafood. However, this attempt failed as the fishermen only reported a portion of their catch, and kept the remainder to themselves. There are mainly two categories of artisanal fishermen which are differentiated depending on the size of their vessel. The main difference between the two is the quantity they are able to catch, the distance that can be covered and the time spent out on the sea. Besides this, the two types have many similarities.

Everyone harvesting seafood in Oman require a fishing permit designated by the Ministry of Agriculture and Fisheries. This includes fishermen fishing for an income, as well as people that fish for leisure or for their own consumption. However, in a study by Belwal et al. (2015) only two thirds of the working fishermen sampled had valid fishing licenses during the time of the study. Many fishermen have an alternative job alongside the fisheries, and around one third of all fishermen have fishing as their second source of income (Omezzine, 1999). Omezzine (1999) states that "*For most small fishing units, fishing activity could be defined as a way of life, rather than as an investment or labor use alternative*." (pp. 57). There is a great variation in fishermen income and a large share of this variation remains unexplained (Al-Jabri et al., 2015). According to an interviewee at the Ministry of Agriculture and Fisheries, the fishermen in Oman receive a rather stable income, but it is still possible to improve the value of their products by improving equipment, facilities at landing centers and handling procedures. It is stressed that the fishermen should receive a fair price for their effort. Al-Jabri et al. (2015)

found that Omani fishermen who are engaged in relationship marketing, i.e. developing and maintaining relationship with business partners, receive a higher income and competitive advantage compared to those who do not. The authors found that the main motivation for the fishermen pursuing a relationship is that it results in better prices, a secure income and a higher quality of catch in a descending order of importance. In addition, trust and the sharing of information in the relationship between the fishermen and the buyers resulted in a higher income.

According to interviewees in both the public and private sector, the fishermen are motivated by catching large quantities of seafood and selling it as quickly as possible as they reach the shore, and are less keen on ensuring a high quality of the seafood. According to Belwal et al. (2015), around 70% of fishermen in the Batinah coast dispose of their catch within an hour, and yet another 20% within three hours after reaching the shore. Because of the volume focus, the fishermen encounter a trade-off in filling the provided cool box with ice versus filling it with seafood that can be sold. The fishermen are out on the sea in average five to six hours without proper cooling of the seafood. The result is often large volumes of seafood being provided to the primary market, with a poor quality.

According to Omezzine (1999), many fishermen that deal exclusively with processors states that cooling the seafood by placing it on ice on-board does not result in any significant monetary benefit, but the price premium received barely covers the cost of ice. One representative from the Ministry of Agriculture and Fisheries states that efforts are being placed to enlighten the fishermen on the importance of keeping the cold-chain and the possibility of higher value from high-quality seafood.

Belwal et al. (2015) conducted a situation analysis regarding the fishermen on the Batinah coast of Oman, representing 35% of all fishermen in the country. The study indicated that "*the majority of fishermen were not appropriately educated and trained. Most of them followed irregular routines, earned little money from fishing, had low savings, faced financial constraints, and lacked knowhow of modern fishing techniques and post-harvest dealings*." (pp. 237) One of the interviewees from the Ministry of Agriculture and Fisheries believe that changing the structure of the artisanal fisheries, shifting from the small-scale artisanal fisheries to larger industrialized vessels would result in larger volumes per landing and also greater cooling possibilities, and further stated "*The small vessels are not suitable for fulfilling the demands of the market*".

5.2.2 Primary markets

The off-loading of the vessels takes place at landing sites, also referred to as primary markets, that range from open beaches, simple fish stall markets with concrete floor and a shaded area, to modern landing centers, i.e. ports, that accommodate wholesale and retail seafood markets, ice plants, water, electricity and other services. Oman currently has 24 ports and six more in construction, but the main part of the landing sites are still not ports. The construction and establishment of ports is deliberate by the government in an effort to improve the quality of seafood directly from landing. A representative from the Ministry of Agriculture and Fisheries expresses that it is not possible to establish ports at every landing site since Oman has a long coastline, a large distribution of landing sites and a low population density in provincial coastal

communities. The investment would hence not be feasible. The infrastructure and facilities at the landing sites are described as a major challenge in high-value seafood export by all representatives from the Ministry of Agriculture and Fisheries. Figure 10 is a photography of artisanal fishermen at a landing site in the old town of Muscat.

Figure 10 Artisanal fishermen at a landing site in the old town of Muscat

The landing sites are where most of the seafood trade in the network takes place. The sellers on the primary markets are the fishermen themselves, family members or others part of the same small business. The seafood is sold directly to local consumers, or to truckers, traders and processors through either direct sales. Sales are made through individual negotiations, by the means of contractual agreements, or though auction – in which the auctioneer takes a nominal fee in certain markets. There is no minimum price level for the seafood at the markets, excluding the starting price on auctions. It is stated by a representative at the Ministry of Agriculture and Fisheries that the current market system provides enough control without a minimum price level. Al-Jabri et al. (2015) argue that common problems arising at the primary markets include low prices, inefficient marketing and poor quality control – all problems that according to the authors, hamper a sustainable fisheries sector. The fishermen come into shore at different times during the day, and do not always sell their catch in one transaction which obstruct a clear overview of total supply.

The government recently established new regulation regarding seafood markets in Oman in which the control of all seafood markets was shifted from the municipalities to the Ministry of Agriculture and Fisheries. By controlling all markets, the government aims to bring the entire supply chain under one authority and, by doing so, improving the procedures throughout the chain. The markets have been updated in terms of infrastructure and equipment since the shift from municipality to Ministry control. The Ministry has placed effort in increasing control in terms of hygiene, money transfer, marketing and management of the market. One representative from the Ministry of Agriculture and Fisheries summarize the transformation by stating "*We control everything*". Nonetheless, the standards still vary between the different landing sites and in some markets the seafood is displayed directly on the floor in the warm air.

5.2.3 Truckers

The actor group referred to as *truckers* play an important role in the post-harvest handling and distribution of fresh seafood (Al-Jabri et al., 2015). Truckers are basically people that own a truck in which they collect and transport seafood from the primary markets to various locations and actors. It is estimated by Al-Abri et al. (2009) that around 3000 truckers are operating in Oman. The truckers transport the raw material and do not add any further value, apart from place utility. Truckers are described by Qatan (2010) as the major players in the seafood network.

The truckers have diverse roles in the network and it is possible to distinguish between three types of truckers. The first type of trucker acts as a *trader* and has direct contact with the fishermen and distributes directly to local marketplaces, wholesale markets and retailers as well as conducts export directly from the landing sites to neighboring countries. It is estimated by representatives from the Ministry of Agriculture and Fisheries that the truckers perform 70% of all export to neighboring countries. According to FAO (2015), the truckers' poor handling and weak control of the cold chain often result in deficient quality of the seafood. The fishermen and the truckers sometimes have long-term relationships resulting in mutual benefits in which the fisherman gets access an assured outlet market and the trader gets a steady supply of fish. The fishermen and the truckers may also be part of the same company, or even the same small family business, in which one person does the fishing and another conducts distribution and sales. Other times the truckers procure the seafood through the auction at the primary market. In a study by Al-Abri et al. (2009) it is revealed that truckers prefer transporting the seafood to export markets, instead of domestic markets, because of the possibility to sell large quantities at the neighboring export markets.

The second type of trucker acts on behalf of a processing company as a *middleman*. This is either conducted through vertical integration, i.e. the trucks are owned by the processing company, or through contractual agreements. The seafood transported by this type of trucker is sometimes designated for export to high-value countries and is then referred to as *controlled transport* and is transported to processing companies that have a Quality Assurance certificate, see more in section 5.2.5. The third type of trucker acts as a *middleman* on behalf of other middlemen, traders or exporters and has varying demands and controls depending on what type of business they are connected to.

The vehicles used by the truckers can be categorized into two categories: small trucks and large trucks. Small tucks, representing approximately 40% (Omezzine et al., 2017), have the capacity of one to three tons, do not have a cooling system, and carry the seafood in fiberglass cold boxes with ice during transportation. Large trucks have a capacity of three to ten tons and have automatic refrigerating systems. The smaller category of trucks is mainly used for transport to domestic markets and has recently been refused by the neighboring countries' authorities due to the deterioration of seafood. Likewise, processors exporting to high-value markets require cooled transportation and it is hence been regulated, see section 5.2.5. Also, in local distribution refrigerated trucks are becoming increasingly more frequent. According to several interviewees, the handling of seafood by transporters often result in poor quality, especially if the seafood is transported longer distances. The transportation by the truckers can, according to

the Ministry of Agriculture and Fisheries, take up to four days. According to Omezzine et al. (2017), there are several studies indicating that the inadequate cold chain management of freshly landed seafood in Oman, where temperatures can reach 45 degrees during several hours, leads to accelerating deterioration of the seafood.

5.2.4 Wholesale markets

The recently established regulation regarding seafood markets in Oman, in which the control of the markets was shifted from the municipalities to the Ministry of Agriculture and Fisheries, also involved the establishment of three wholesale markets, whereof two local and one central. The central wholesale market is managed and operated by the Muscat municipality and the Ministry of Fisheries and Agriculture (Qatan, 2010) and has full modern services including, for example, equipment for seafood quality and temperature control, ice machines, potable water, hygienic containers and display areas. Controls on the transports to the wholesale markets are weak (Al-Busaidi et al., 2015) and the Ministry is planning to extend quality controls to involve transports in the future. The central wholesale market accommodates an electronic auctioning system and there is an intention by the Ministry to connect all three wholesale markets electronically to better support buyers and sellers. In addition, there are plans on allowing the system to accommodate remote offers and bids from the Sultanate and from other countries (Qatan, 2010). Figure 11 is a photograph of a trader at the wholesale market in the old town of Muscat.

Figure 11 Trader at the wholesale market in the old town of Muscat

There are many objectives behind the implementation of the wholesale markets. The main objective of the markets is to provide better transaction opportunities for fishermen, truckers, processors and retailers. Another objective is to have everything go through the same channel. Before the implementation of the wholesale markets the truckers were exporting large shares of the total catch, leaving domestic consumers without certain species of seafood and furthermore with the result of low quality export. For certain species no export can be conducted to the EU and US markets without having passed through the wholesale market. The species of seafood that have to go through the wholesale market before they are exported will henceforth

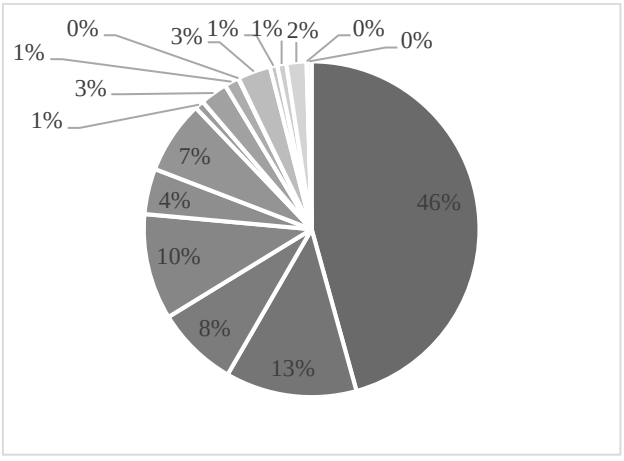
be referred to as *monitored species*, and the remainder as *non-monitored* species. Note that seafood aimed for domestic consumption do not apply to these rules.

The sellers in the wholesale markets are mostly truckers, that is the first type: *trader* and the third type: *middlemen* acting on behalf of other middlemen, traders or exporters. At the wholesale markets all sellers have designated places for display. The suppliers of seafood are present at the markets at different times during the day and several designated spaces are often empty. Sales are conducted at different times during the day if there is no organized auction. The processors are the main buyers at the market, but also domestic retailers and shops procure their seafood at the wholesale market.

5.2.5 Processors

The processors serve domestic, neighboring and large international markets but focus primarily on export to non-neighboring countries, and more specifically high-value markets. The products distributed are mainly fresh and frozen, but some value-added products such as canned, salted and dried, are also included. In 2015 there were 47 processing companies in Oman (Al-Busaidi et al., 2015). Table 14 presents the shares of total turnover for the 16 largest processing companies in Oman in 2013, compiled by data from Al-Belushi et al. (2015). The table illustrates that there is one company representing a large share of the Omani seafood market, a few medium sized and many small companies. See details of Table 14 in Appendix E.

Table 14 Shares of total turnover for the 16 largest processing companies in Oman in 2013



There are two types of processors, the ones that have Quality Assurance Certificates, and the ones that do not. The Quality Assurance (QA) certificate includes the HACCP standards (see chapter 2.3.1) and pre-requisite programs coupled. The certificate is granted by Fishery Quality Control Center (FQCC), which is a part of the Ministry of Agriculture and Fisheries, to businesses, fishing vessels and seafood transporters that fulfil the standards for export to the major international markets. In 2015, 21 out of the 47 seafood processors operating in Oman had a national certification for export (Al-Busaidi et al., 2015).

The processors can be classified into different categories depending on the species distributed and on the designated destination for the seafood. The different categories have different means for procuring the seafood raw material and different regulations that apply for the processing of the seafood. As mentioned in 5.2.4 monitored species aimed for export can only be sourced

from the wholesale market whereas other non-monitored species can be sourced directly from any other actor in the network. If the seafood is designated to be exported to high-value markets additional demands are placed on the processor. Firstly, it is required that the processor has a QA-certification. In addition, when it comes to non-monitored species that is destined for export to high-value markets the processor must also assure that the seafood is sourced from QA-certified fishermen, as well as ensure that transportation of the seafood is carried out in controlled transport with automatic cooling systems.

One of the interviewed processors only handled monitored species of seafood aimed for export both to commodity and high-value markets. The processor has company representatives at the wholesale markets that select, source and transport the seafood from the market to the factory. Different suppliers are used at different occasions depending on prevailing seafood quality, estimated by touching and looking at the seafood and talking to the supplier, and price on that day. The seafood is, regardless of destination, transported to the factory in refrigerated trucks owned by the processor. The processing company has no contact with additional actors in the network and when asked about this one of the interviewees states: "*It is a pretty small process for the fresh seafood in Oman*".

The other interviewed processing company mainly export non-monitored species of seafood to primarily high-value markets, 90% of total export from the processor goes to the EU. The processing company assures the quality from the landing site and transport the seafood aimed for high-value markets in refrigerated trucks in so called controlled transport, see section 5.2.3. The well-developed road network in Oman guarantees rapid transportation of seafood (FAO, 2015), but the transport to the factory from the landing site takes generally eight to nine hours. When the seafood reaches the factory a quality control is conducted in which the seafood is sorted and the seafood which is not sellable is removed. The company has no information regarding the share of seafood that is discarded as waste. If the biochemical degradation has been initiated, but the seafood is still sellable, it is frozen. According to the interviewee, selling the seafood in a frozen condition, compared to fresh, results in revenues being cut in half. The processing company has several factories, where some factories are QA-certified, and it is only from these factories that the company conduct export to high-value markets. The other factories process seafood to be distributed domestically or to commodity markets.

By regulation, export to high-value markets require processors in Oman to provide all necessary documentation regarding for example hygiene and contamination levels to the customer. The packing and handling is also regulated. In addition, to conduct export processors must receive an export permit by the Ministry. The labelling procedures seem to vary between different processors, but all processors share some information regarding traceability based on information on the location of the landing sites or the wholesale markets. One interviewee describes this information as "*Pretty reliable*".

All fresh seafood export to non-neighboring countries are transported by air. All interviewees at processing companies experience the airport's cargo section as a major bottleneck and the seafood is sometimes stranded at the airport for hours before being loaded. In addition, according to representatives at the Ministry, it is significantly more expensive to ship seafood to high-value markets due to the long distance. The large processors conduct export directly to

wholesalers in the importing country or though import agents. The procedure of choice is, as described by one processing company, highly dependent on the specific importing country. The smaller processors often use export agents that in their turn have contact with import agents. In some cases, the processing companies have managed to bypass the export agent and established direct contact with the import agent. The smaller processing company interviewed in this study means that they aspire to establish long-term relationship with these agents.

Both interviewed processing companies experience one common challenge when it comes to export, which is also confirmed as a challenge by the Ministry of Agriculture and Fisheries, namely the shortage of raw material, especially for some species. Both companies express that the shortage hinder new market entries and their possibility to satisfy the high demand of certain species on certain markets. The export destination of Omani seafood is highly dependent on the species traded and their seasonal availability (FAO, 2015). For example, export to USA is mainly high-value species such as lobster and jumbo shimps, which all have seasonal catch regulations. The USA market demands a steady supply of these species in a fresh condition, which creates a challenge for exporters in Oman (FAO, 2015). Hence, the export is completely dependent on what season it is and one interviewed processing company experience that the unstable supply is their main competitive weakness. It is further expressed that the supply of seafood often declines significantly when around half the season has elapsed.

According to a study conducted by Boughanmi et al. (2007), there are certain factors that affect the export performance of processing firms in Oman. The authors found that there is a strong correlation between management experience and knowledge, implying that companies benefit from investing in training and education of their employees in export procedures and legal requirements regarding quality, safety and labelling. Secondly the authors found a positive correlation to the amount of information available about the export market, in which more information leads to better export performance. The authors found that firms adopting a market strategy in which they rely on an overseas commissioner have a lower export performance than firms that adopt a different market strategy. The authors conclude by stating that the most important factor for export performance of a processing firm is the quality of the seafood.

5.2.6 Ministry of Agriculture and Fisheries

During past decades the governmental effort in developing the fisheries sector in Oman has been focused on establishing infrastructure and providing soft loans for small-scale fishermen, traders and other investors in the sector. This section describes the Ministry of Agriculture and Fisheries' role in the network for fresh seafood export from Oman. The Ministry of Agriculture and Fisheries has developed several strategic approaches to make the management of the seafood supply chain more effective, reduce post-harvest losses and enhance the quality and safety of seafood. The objective is to make seafood exports meet the legal requirements and high standards on international markets and increase the contribution of seafood to the country's GDP. Many efforts have already been mentioned throughout chapter 5.2, such as the infrastructural development regarding construction of ports and wholesale markets. The following sections describe further action taken by the Ministry and is divided into three parts, each with a specific focus area: food quality and safety, sustainability and marketing.

Food quality and safety

The fishery quality control system in place in Oman aims to ensure the safety of any fishery product throughout the entire value chain from harvest to consumption. The system is developed side by side with requirements regarding food quality and safety from the EU and USA. The development of the system is the outcome of the threat from EU arising in 1998 to ban Omani seafood export, which is considered one of the biggest challenges that the Omani fisheries sector has faced (Zaibet, 2000). During the 1990s exports to the EU amounted for 23% of total seafood export from Oman but following the banning threat, the export share decreased to one percent. Although the ban was lifted one year after it was imposed (Zaibet, 2000) this figure remains the same today (Table 12, pp 27).

Oman further have specific limits for the amount of contamination and standards for hygiene, landing, storage, inspections, duties and handling routines. There is also a hazard control system, previously mentioned, as well as a structure for consequences in the case of system violations. The regulatory system for food quality and safety in Oman and the implementation of HACCP has had substantial impact on the internationalization of Omani seafood, especially regarding seafood export to highly regulated markets such as EU and USA (Qatan et al., 2015). Strengthened legislative and governmental support, including subsidies, has encouraged businesses to implement HACCP (Al-Busaidi et al., 2015). The government has further established training and education programs for establishments and processing companies with regards to seafood quality and safety.

The Fishery Quality Control Center (FQCC) monitors the enforcement and implementation of quality and safety procedures and routines in the value chain and also approve for example plant layout and give out QA-certificates. According to the interviewees at the Ministry of Agriculture and Fisheries, there is no problem in updating and adapting to comply with regulations imposed from EU. New systems are currently being developed to be integrated and implemented.

Nevertheless, it is mentioned by several representatives at the Ministry of Agriculture and Fisheries that remaining a high quality post-harvest of the seafood remains to be one of the largest challenges for fresh seafood export from Oman. Qatan (2010) argues that the main issue in the seafood supply chain concerns the enforcement of the established regulations regarding the quality standards. It would require considerable effort to keep close inspection and monitoring throughout the coastline (Qatan, 2010). The author further argues that even though standards for high-value markets are currently being met, new concepts such as ecolabelling and organic food requirements will be a challenge in Oman in the future with the current standards in harvesting, handling and transporting the seafood throughout the value chain.

Sustainability

In the legal aspect, Oman complies with the directions regarding sustainable fisheries from EU. The Ministry of Agriculture and Fisheries is, according to the interviewees, working intensively in this aspect and regulations have been transformed into laws by Royal decree. The Ministry aims to make all activities in the value chain fulfill the need of sustainable fisheries. There is also a lot of research conducted regarding sustainability and there is one department solely focused in assuring biological components of the sustainability, such as the preservation of

ecosystems and seafood stocks. Measures taken in this area are limited to specific seasonal restrictions for different species and there is no quota system for the fisheries.

Waste reduction and waste management is one of the Ministry of Agriculture and Fisheries' current focus areas. It is stated that by improving the quality and reducing the mishandling of seafood, waste can be substantially reduced from the harvest to the consumer. Another hypothesis for reducing the waste includes improving marketing and processing of seafood. There are further efforts being placed in finding usages for the bi-products of seafood, both seafood that is no longer suitable for human consumption, but also residues from filleted seafood. The Ministry of Agriculture and Fisheries is currently executing a project to reduce waste. Since there currently is no data available regarding the waste in the network the first step in this project is to determine how to collect data regarding the waste, and this is now on-going.

The interviewed processing companies did not take any action surpassing the requirements from the Ministry in the respect of sustainability and one interviewee stated, "*The sustainability is controlled by the Ministry*".

Marketing

The Ministry is currently not placing any efforts in marketing Omani seafood. All interviewed representatives agree on that such an approach would be feasible and desirable. The country has, according to the interviewees, the capacity and pre-requisites to perform such a marketing effort. The seafood raw material from Oman is of high quality coming from non-polluted waters. The high quality of the raw material, and the specific properties that follow for certain species, is further stated by one processing companies as their main competitive advantage.

6 Three case countries within seafood export

In this chapter follows a description of three industrial networks for fresh seafood in countries with distinguished seafood export. The three countries are: Norway, Iceland and New Zealand, see the three nations on the world map in Figure 12. The countries selected all have a long tradition of fisheries and seafaring. The countries are dependent on seafood as a source of foreign income and in 2013 the export share of total production was around 85% in Norway and New Zealand, and 65% in Iceland. All data presented in this introductory chapter to the three countries have been gathered from several Fishery and Aquaculture Statistics Yearbooks (years 2007, 2009, 2012 and 2014), compiled by the Food and Agriculture Organization (FAO) of the United Nations. Furthermore, data has been collected from the FAO Statistical Query Website (FAO, 2017b).

Figure 12 Norway, Iceland and New Zealand on the world map

The countries are outstanding with regards to seafood capture production. The capture production of seafood for the three countries respectively is illustrated in Table 15. Norway stand out and has during the years 2003 to 2014 been ranked around the tenth largest capture producer in the world. It should also be mentioned that Norway has a large aquaculture production of seafood which in 2014 represented one third of total seafood production in the country, see Table 16. Iceland has been ranked around 20th place and New Zealand around 30th place with regards to capture production during this period of time. Both Iceland's and New Zealand's aquaculture productions are relatively small and can thus be disregarded.

Table 15 Capture production volume, Norway, Iceland, New Zealand 2003–2014

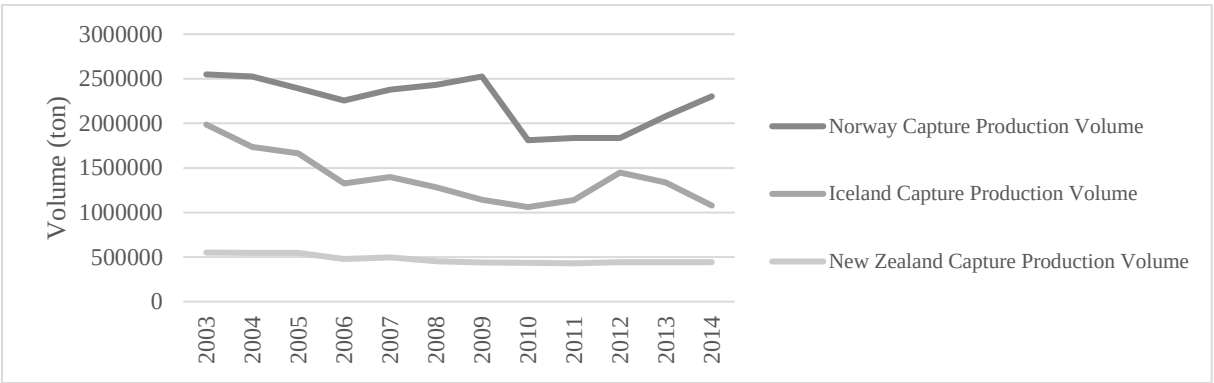
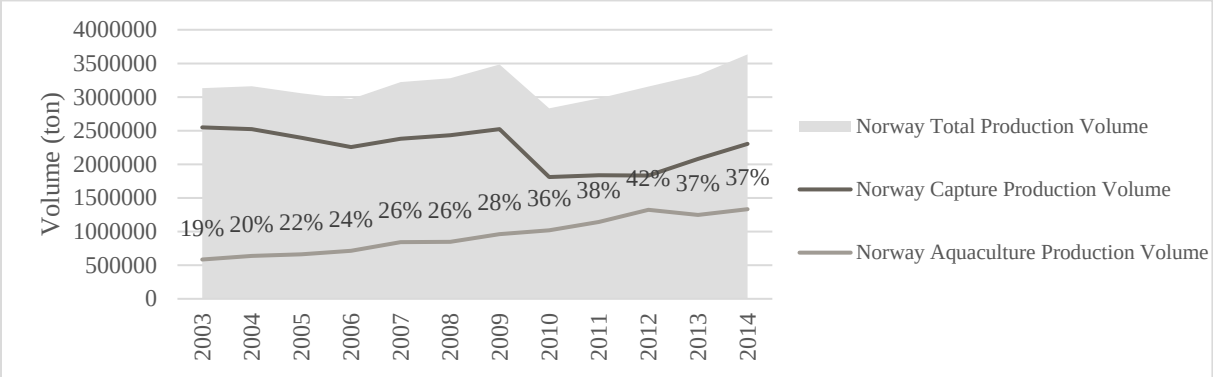
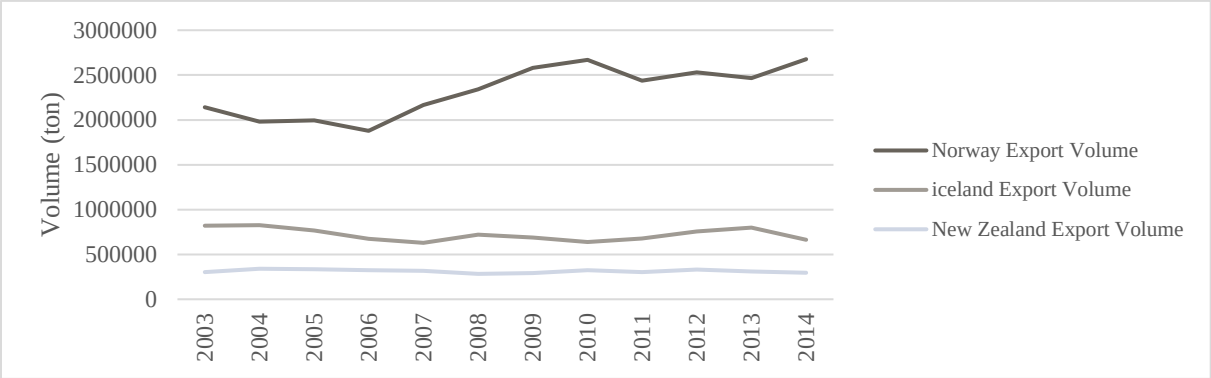


Table 16 Norway's capture and aquaculture production of seafood 2003-2014



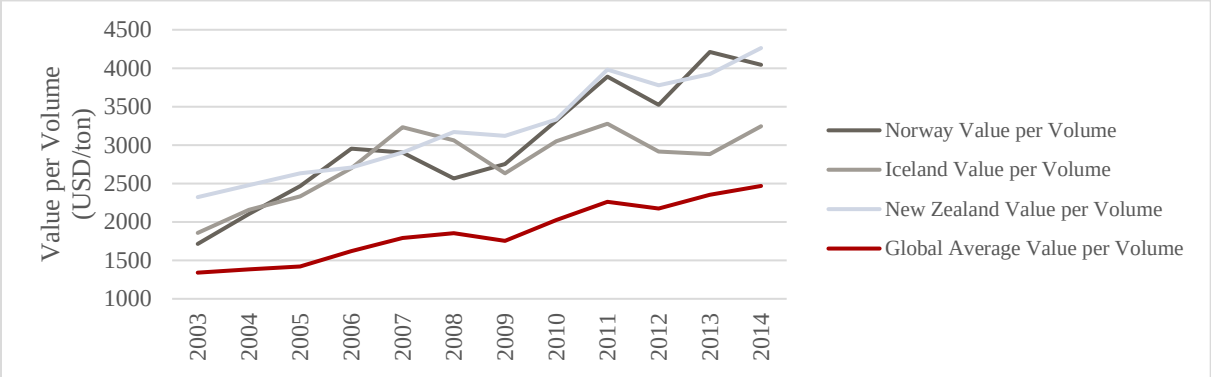
Similarly, with regards to volume in export Norway distinguishes itself from the other two countries. The nation is, and has been for many years, the second largest exporter of seafood in the world. Table 17 presents the export volume for the three countries over the years 2003 to 2014. Note that this volume includes both capture fisheries and aquaculture, since specific export data over the two production categories is not available.

Table 17 Export volume, Norway, Iceland, New Zealand 2003-2014



All case countries all have experienced growth with regards to value per volume over the past ten years, as can be seen in Table 18. By comparing the value per unit of volume (USD/ton) it is also demonstrated that all three country cases are well above the global average. (A comparison between the global average and Oman can also be found in section 5.1.1). It should be noted that also Table 17 includes data from both capture fisheries and aquaculture for the same reasons as described previously. Since aquaculture is a production that enables a higher value of the seafood, see section 1.4, this should be accounted for when considering the value per volume for Norway.

Table 18 Value per volume, Norway, Iceland, New Zealand and Global average 2003–2014



The sections below describe the three case countries respectively more in detail. Each section begins with an introduction to the countries, followed by a description of the fisheries management system in the countries respectively. In addition, for both Norway and Iceland their respective industrial networks for fresh seafood export are described. The New Zealand industrial network for seafood is not described due to the scarcity of data and information on this subject.

6.1 Norway

Norway has a long coastline with rich fishing grounds, a seafaring heritage that dates back thousands of years (Cantillon, 2010) and is one of the world's leading nations regarding production from capture fisheries and aquaculture (FAO, 2011). The fisheries sector has played a key role in the economic and social development in Norway and has contributed to settlement and employment throughout the entire coastline (FAO, 2011). Alongside hydrocarbon products seafood is an important and around 80% of seafood is annually being exported (FAO, 2014). Norway is the second largest exporter, in terms of value, in the world, after China which is unprecedented in seafood export, both in terms of volume and value (FAO; 2014). Norway export to around 150 countries (Trondsen, 2012) and the main export markets for Norwegian seafood include the European Union, mainly Denmark and France, Japan, China, USA and Russia (FAO, 2011).

6.1.1 Fisheries management in Norway

Norwegian fisheries management is based on the principle of sustainable harvesting, meaning keeping stocks in a viable condition. The Food and Aquaculture Organization describes the aim of the Norwegian government in the following way: "…*to have an ecosystem-based approach to fisheries management in order to secure a sustainable harvest of marine living resources.*" (FAO, 2011). During the past decades the Norwegian fishery sector has been vastly regulated with individual quotas (see section 2.4.2) and comprehensive licensing requirements (FAO, 2011). Quotas are designated yearly firstly through international allocation, and later on domestic level. Allocation is determined by the government in which the technical regulations for how the fishing should be performed are also decided upon. In Norway quota transfers are mainly linked to the transfer of vessels between firms (FAO, 2011). According to Norwegian legislation, vertical integration beyond 49% (i.e. processors/ exporters owning more than 49% of a vessel company) is prohibited (Abrahamsen & Håkansson, 2015).

The Norwegian government has established a generic marketing organization called the Norwegian Seafood Export Council (NSEC). The organization was introduced in 1991 and its main task is to support the selling activities of Norwegian seafood exporters by promoting the positive attributes of Norwegian seafood through raising awareness. All exporters provide to the organization by allowing a share of all revenues from exports to common marketing performed by the organization. Through marketing efforts, the seafood is being transformed from a commodity into a product with a specific distinguishable feature, namely its origin: Norwegian seafood. This means that Norwegian seafood can be seen as different or even *better* than seafood from other countries and allows Norwegian exporters to maintain and increase the demand of seafood (Cantillon, 2010).

6.1.2 Industrial network for seafood in Norway

The fishing fleet in Norway is diversified and technology advanced ranging from small one-man inshore fishing vessels to large trawlers (FAO, 2011). The fisheries sector in Norway has experienced a transformation over the past decades. The changes include a reduction of the number of vessels (50% between 2000 and 2009) with the largest reduction among small vessels and a reduction of the number of fishermen (90% between 1940 and 2010) (ibid). The end-result of the transformation is increased fishing efficiency (ibid) and further concentration currently happening (Abrahamsen & Håkansson, 2015). The industrial network for fresh seafood export in Norway is illustrated in Figure 13.

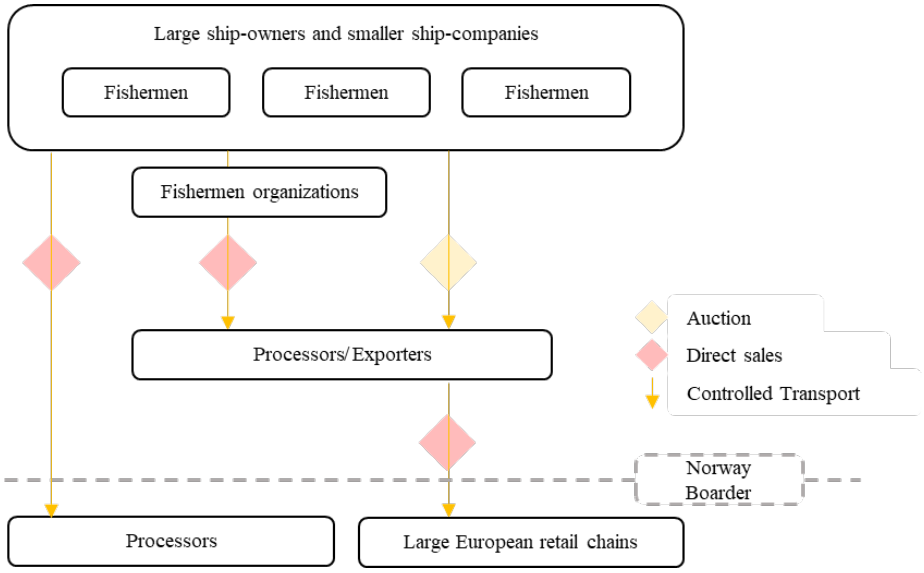


Figure 13 Industrial network for fresh seafood export in Norway

The fishing vessels in Norway are mainly owned by large ship-owners and smaller shipping-companies (Abrahamsen & Håkansson, 2015). The quotas are largely controlled be fishermen that have no investment in on-land production facilities. This has enables specialization where the fishermen have invested in high-technology equipment, such as on-board freezing facilities for processing in low-wage countries, rather than investing in value-adding, market-oriented land based production facilities. (Trondsen, 2012)

The port structure in Norway is highly decentralized and landing sites for seafood are dispersed along the coast. The landing sites range from small seafood landing sites to large industrial

ports (FAO, 2011). When the fishermen reach the shore fishermen's sales organizations manage and coordinate the sale of the catch (FAO, 2011). There are currently six independent fishermen cooperative organizations in Norway (FAO, 2011). As an example, all pelagic fish caught is sold through the Norwegian Fishermen's Sales organization for pelagic fish (NSS) which is a cooperative owned and operated by the fishermen aimed at securing the interests of the fishermen (Abrahamsen & Håkansson, 2015).

Herring is the largest landing with regards to volume, however, cod is the most important species in marine capture fisheries with regards to value. The marketing of the two species are different and presented below. Marketing of cod is in Norway is characterized by highly regulated primary markets, including a price system in which the fishermen get a minimum price for their catch and restrictions on vertical integration. First hand buyers are not required to buy anything, but if they do they have to buy the total catch at a minimum price decided by fisher-controlled organizations in Norway. The rationale behind the system is to protect the fishers to variation prices due to the long distance between landing sites and consumption areas (Trondsen, 2012).

The herring, on the other hand, is traded and marketed through a closed blind auction. The fishermen report details of their catches, including vessel position, species, quantities, sizes and catching areas. The prices are made public at the end of the auction (Abrahamsen & Håkansson, 2015). The rationale behind this system is to create an effective marketplace, enabling a fair price, security and protection for the fishermen at the same time as it manages seafood quotas and stock. The auction is self-regulatory in the way that it regulates supply and demand through market mechanisms as herring has natural variation in population and quotas (ibid)

The processing industry in Norway has during the past years been characterized by increased concentration through numerous mergers and restarting and today a few actors dominate the market (Abrahamsen & Håkansson, 2015). Many producers in Norway base their activities on large volumes and require a steady supply of raw materials (ibid). The customers to the processing companies (i.e. the importers) are manly large European retailers with annual contracts on price, quality and quantity.

6.2 Iceland

Iceland is one of the world's most prominent fishing nations, despite the country's small size and population. The productivity in the Icelandic capture fisheries sector is one of the highest in the world (Jónsdóttir, 2010). In addition, Icelandic products are known for their high quality and have a strong tradition in the market (ibid). Iceland has always been highly dependent on its marine resources, in terms of employment. as a source of the foreign currency and as a source of nutrition and food for the population (FAO, 2010).

6.2.1 Fisheries management in Iceland

The Icelandic government has implemented an effective management system to ensure responsible and sustainable fisheries. The measures implemented include, among other things, Individual Transferrable Quotas (ITQs) (see section 2.4.2) and area restrictions that aim to preserve the vulnerable habitats in the oceans (Qatan, 2010). The Ministry of Fisheries and Agriculture of Iceland is responsible for the management of the Icelandic fisheries and the

implementation of relevant laws and regulations (FAO, 2010). The ministry is also responsible for regulating the commercial fishing and for the allocation between quota holders (FAO, 2010).

The majority of all pelagic species in Icelandic waters have been managed with individual quotas for decades, which have later developed ITQs (Saevaldsson & Gunnlaugsson, 2015). In Iceland the quota system encompasses five pelagic species, and for two of these a quota-ceiling, that is a maximum quota share, has been established as to reduce the ongoing concentration of the quotas and seafood companies (ibid). A vessel can transfer its individual between fishing years, but the quota is lost if the total catch fall below 50% over two subsequent years (FAO, 2010). There are two governmental organizations that perform control and enforcement of the food quality and safety of seafood by monitoring fisheries closely both during harvest, but also post-harvest. This includes port-control, weighing of all catches, handling in seafood markets and processing. (Qatan, 2010)

6.2.2 Industrial network for seafood in Iceland

The Icelandic fishing fleet consists of three categories of vessels: trawlers, boats (>15t) and small boats (<15t) (FAO, 2010). Both small-scale fishermen and the larger vessels deliver the harvested seafood directly to the landing centers, in which they also provide the primary market with all the information regarding the catch. The fishermen also call before reaching the shore providing the information, which allows for the catch – up to 75% (RSF, 2011) – to be sold before the fishermen reach the shore. When the catch arrives the primary markets it is weighed, quality checked, sorted, iced and stored and information regarding species, weight, quality, size, vessel number, fishing grounds and what type of processing that has been performed is recorded (Qatan, 2010). The industrial network for fresh seafood export in Iceland is illustrated in Figure 14.

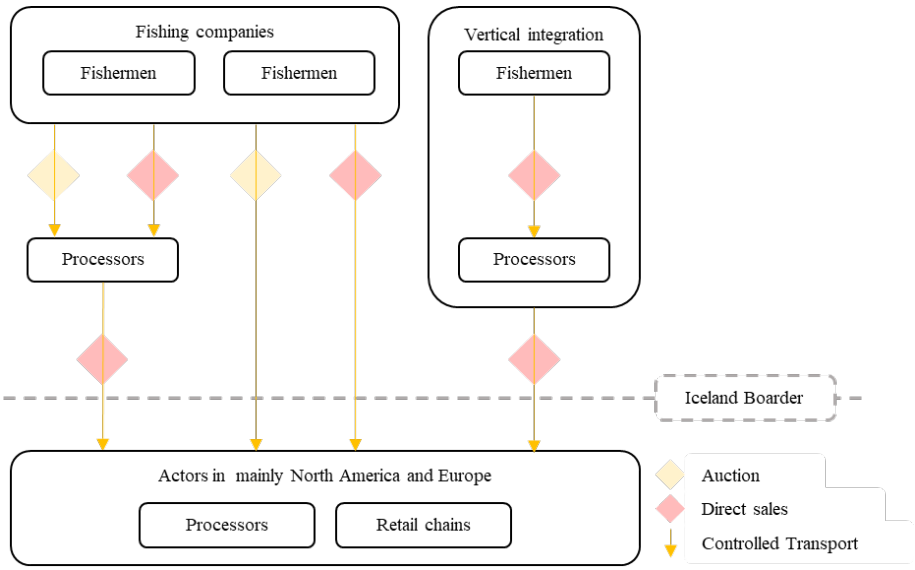


Figure 14 Industrial network for fresh seafood export in Iceland

The primary markets on Iceland are free and trade from harvest occurs through a variety of means, including seafood auctions, contracts with regular partners or within vertically integrated processing companies (Knútsson et al., 2016). When the seafood is traded through

auction the information provided by the fishermen is stored in a database connected to an electronic auctioning system managed by The Central Auction System Company (Qatan, 2010). The electronic auction connects 15 fish auction companies, in 30 locations with 200-300 buyers per day from across the globe that purchase fresh seafood in real-time (FAO, 2010). All buyers and sellers on in the system have to be registered (Qatan, 2010). The *physical* auction markets are privately owned and operated under the Fish Auction Market Law and hence the Icelandic government is not providing auction markets facilities (FAO, 2010). Auction is the one of the main marketing systems used to transfer the seafood from the fishermen to the firsthand buyers. The auction system also includes a minimum starting price set by the government (Trondsen, 2012).

After the auction the primary markets stored in iced fish tubs, or containers for export, and labelled for traceability. The buyers transport the seafood from the primary markets their own trucks or through contracted transport companies (Qatan, 2010). Export of fresh seafood from Iceland is increasing by the means of modern transport and logistics enabling transport of whole fish by boat and fresh fillets by air to major fish markets (FAO, 2010). The major importers of fresh seafood from Iceland are the retail sector and service operators in Europe and North America (ibid).

There are principally two companies performing transportation of seafood in Iceland (Qatan, 2010). The trucks have a capacity from 5 to 26 tons and comprise an automatic refrigerator system. The transport companies have contractual agreements with seafood buyers, industrial fleets, processors (Qatan, 2010).

In Iceland the ITQs can be traded flexibly between actors in the network. In Iceland the quotas are mainly owned by vertically integrated businesses with investments in both vessels and processing plants (Trondsen, 2012). Over the past years the Icelandic fishing companies have been aiming for increased efficiency and benefits raising from economies of scale and in 2008 the ten largest companies represented over 50% of the quota holdings (Jónsdóttir, 2010). The increased consolidation of quotas has altered and concentrated the structure of the Icelandic pelagic industry, the number of companies, vessels and factories have decreased, and their respective productivity increased (Saevaldsson & Gunnlaugsson, 2015). The quota system coupled with technological development and changes on both domestic and international markets have decreased employment in the industry resulting in closed factories and scrapped ships, especially in small fishing villages (ibid).

6.3 New Zealand

New Zealand encompasses the tenth longest coastline in the world and has access to many natural resources for capture fisheries with more than 130 species captured (MBIE, 2017). The nation conducts export to over 100 countries where. The Western markets account for around half of total exports and the Asian markets the remainder (MBIE, 2017). Several researchers suggest that New Zealand fisheries is one of the most sustainable fisheries in the world and New Zealand has an efficient and modern seafood industry.

6.3.1 Fisheries management in New Zealand

New Zealand was the first country to implement ITQs as a national policy comprising all significantly important commercial species. The system was implemented in the response to excess resource capacity in the value chain and seafood stocks being near depletion (Bess, 2006). The Quota Management System (QMS) has been of importance in improving the biological status of the fisheries resource and commercial returns to the fishers (Bess, 2006). Since the implementation three decades ago, the sector has experienced growth in volume and value of exports mainly attributable to seafood firms having a security in their tenure of access rights (Bess, 2006). With the ITQ the individual fisher can catch a certain amount of seafood per year and thereby plan their own fishing operation without consideration to other fishers and the fisher is hence guaranteed a certain catch level (Bess, 2006). Since the ITQ is transferrable each fisher can adjust their quota to achieve efficiency in their operations (ibid). Firms have expanded their holdings and made strategic investments in specialized (with regards to for example species) fishing vessels and equipment which have reduced operating costs and the same time improved the quality and value for their customers (Bess, 2006).

7 Case country analysis

This chapter contains an analysis of the three case countries presented in chapter 6. The three countries are compared and contrasted to each other and with other sources of information. The theoretical framework presented in chapter 3 is used for decomposing the data and analyzing throughout the chapter.

The structure of the chapter is based on a general structure of the industrial networks for fresh seafood export in the three country cases. The analysis works downstream in the industrial network, starting with an analysis of the fishermen's activities and resources, to be followed by the next section encompassing the interaction between the fishermen and the processors. The same procedure is carried out for the processors, their resources, activities and finally their interaction with importing customers. Following this, there are two sections about the two main resources in the network respectively, namely seafood and the controlled access to this resource, and information. Each section is divided into sections covering specific features. The chapter is finalized with a synthesis of the analysis in section 7.7, answering the second research question for this master thesis by describing the key success factors for value creation in sustainable fresh seafood export.

7.1 Fishermen

In all three country cases described above the fishing fleet is diverse in size and capacity, ranging from small boats to large vessels. However, common for the three countries is that the fishermen are rarely acting on behalf of themselves, but are owned by fishing companies, ship owners or processors. In addition, there is an increasing concentration of companies on all three countries, much related to quota management systems (see section 2.4.2) and the maturing concentration on the import markets (see section 7.4), while maintaining or even increasing the quantity of landings. This means that the three countries have managed to commercialize the same amount, or more, resources from the sea by the means of less resources and as stated by many, for example Knútsson et al. (2016) and Bess (2006), the efficiency has steadily increased in the fisheries sector in all three countries.

7.1.1 Equipment and technology in capture fisheries

The efficiency development of the fisheries sector is related to the investment in high-technology equipment (Bess, 2006) and, according to Trondsen (2012), the investment in shelf-life extension and quality assurance technology is vital in successful marketing of fresh, high-quality seafood. Jónsdóttir (2010) means that all actors in the network have to consider many choices throughout the chain from harvest to consumer, such as transportation methods, processing methods, packaging and cooling methods on-board. However, states Jónsdóttir (2010), the most important factor throughout the network is to keep the seafood in a given temperature range to prolong the shelf-life and ensure the quality and safety of the fresh seafood. Specifically, Jónsdóttir (2010) states that cooling shortly after catch is the most important factor in the pro-longing the shelf-life and thus enhancing quality of seafood throughout the supply chain. If the seafood is not handled correctly immediately after harvest, other quality-enhancing methods in the subsequent steps of the supply chain will have a decreased effectiveness. According to an economic analysis performed by Jónsdóttir (2010),

the operational and investment cost is only a small share of the revenues and benefits of using ice and cooling technology for cooling seafood on-board the vessels.

Technical advances have, according to Valdimarsson (2007), allowed for smaller vessels to increase the effectiveness of loading and catching seafood and can thus also be engaged in fisheries that aim for international marketing. The author further states that there is a pressure to professionalize the small-scale fisheries sector to make fishing effort equal to the productive capacity of resources. From this section it can be concluded that investment in adequate equipment and technology, result in pro-longing shelf-life, increasing food quality and safety and increasing the fishing efficiency, see Figure 15.

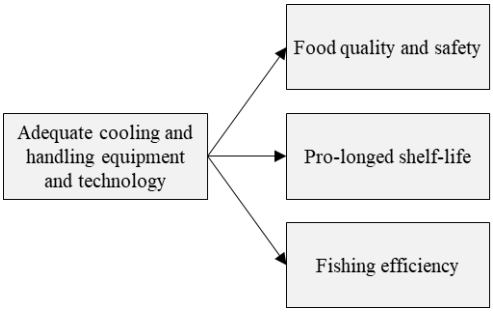


Figure 15 The impact of adequate cooling and handling equipment and technology

7.1.2 Fishermen cooperation

One distinguishing feature in the Norwegian network for seafood export is the independent fishermen organizations managing. and coordinating sales, as well as securing the interests of the fishermen. Similar organizations also exist in other countries, for example in Mexico and in Brazil where several fisher and fish worker cooperative organizations have been developed in an attempt to empower small-scale fisheries (FAO, 2014b). The organizations can engage with, and challenge, government authorities on fisheries management issues as well as strengthen the bargaining power of small-scale operators along the value chain enabling the fishermen to structure new deals with buyers (ibid).

FAO (2013) describes that in Mexico, there are two cooperatives that manage sustainable lobster fishing, in which all members are involved in resource management decisions. The organizations have established a responsible and just use of lobsters through capacity building to improve technology and practices among the fishers. The consequences are positive for both the fishers, in terms of a higher income without having to harvest more lobster, but also for the lobster population and ecosystem through the reduction of illegal fishing. FAO (2013) also describes a cooperative organization for oyster producers in Brazil that was founded in 1990. The cooperative has established new rules and practices to reconcile oyster harvesting. Prior to the establishment of the cooperative intermediaries dominated the oyster value chain and little attention was paid to environmental as well as food quality and safety regulations. According to FAO (2013), "*Strengthening organizations and collective action in small-scale fisheries (SSFs) is crucial to empowering the sector's operators to secure their livelihoods and to contribute to food security, nutrition and rural poverty reduction.*" (pp. 99).

Fishermen organizations established in Norway, but also other countries can bring security to, and empower fishermen as well as increase the capacity building of the fishermen. The factors ultimately have an impact fishermen livelihoods and communities, as well as increased value of the seafood and ecological sustainability, see Figure 16.

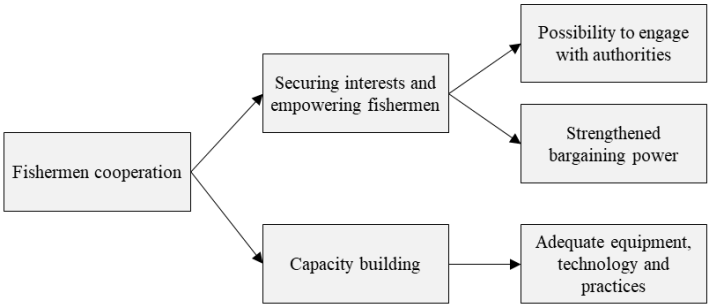


Figure 16 The impact of fishermen cooperation

7.2 Interaction between fishermen and first-hand buyers

The interaction between fishermen and first-hand buyers are described as important factor for the value creation of seafood by various researchers, see for example Abrahamsen and Håkansson (2015), Knútsson et al. (2016) and Trondsen (2012). From the country case descriptions, it can be observed that the primary market of fresh seafood, in all three cases, comprises the fishermen and mainly domestic or international processors. However, the means for interaction on the primary market are different in the three countries. In Iceland the primary market is liberated, and fishermen have the possibility to either market their seafood on the auction, directly to a processing company or transfer it through vertical integration with a processing company. In Norway, however, the primary markets are highly regulated. Industry experts in Iceland acknowledge the free markets in Iceland as the main factor in creating a market driven fishing industry that adapts to changes, identifies new markets and operates in a manner that aim to satisfy customer demand (Knútsson et al., 2016). The experts mean that this has improved profitability in the sector both through specialization and through alteration of the product range towards more profitable products (ibid).

This variation between the countries' primary markets is evident when studying the distribution of cod in Iceland and in Norway, which is the same fish, harvested from the same ocean. In Norway the transfer to the first hand-buyer is based on a minimum price decided by the fishermen organizations, whereas in Iceland an open auction is used to transfer a large share of the harvested the cod from fishermen to first-hand buyers. The outcome is that the cod raw material prices in Norway are less fluctuating, but significantly higher than in Iceland, and the rest of the European Union (Trondsen, 2012). Despite this, Iceland receives a higher average value per volume for exported cod, while having logistical disadvantages and poorer weather conditions compared to Norway (ibid). The following sections investigates how the different primary market systems affect the value of the seafood.

7.2.1 The auction system

The explanation for the higher value per volume of cod in Iceland is, according to Trondsen (2012), that the Icelandic auctioning system creates incentives for the fishermen to be concerned about following market conventions to obtain the highest prices for their landings. The auction system also provides the fishermen with information of their performance through the sales prices for each seafood quality and species. This results in incentives for investing in facility resources, such as handling and cooling equipment, and business unit resources, such as competence and knowledge, to be utilized and combined in a way that creates a higher quality and thus a value of the product resource, fresh seafood, which ultimately result in a higher profit, see also section 7.1.1 for the value creation from adequate equipment and technology. This is summarized in Figure 17.

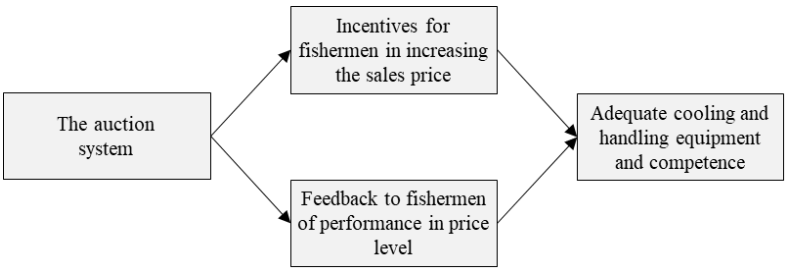


Figure 17 The impact of the auction system

Trondsen (2012) further describes that the auction enables the entire industrial network for cod export in Iceland to become consumer market-oriented, as the first-hand buyers have the possibility to always purchase seafood at the auction which satisfies the end-consumers quality requirements.

Abrahamsen and Håkansson (2015) discuss the auction system for herring in Norway and state that the system favors arms-length relationships, not just because of the natural instability and seasonality in the supply of herring, but also because of the interaction on the seafood auction. The auction system interaction is routine, short-term and limited only to the transfer of the raw material resource, namely seafood, and the related information. According to Abrahamsen and Håkansson (2015), the absence of relationships, as is the case on the Icelandic cod auction and the Norwegian herring auction, can be problematic for the processers whose customers are large retailers and wholesalers requesting close relationships and coordination. The reason for this is mainly related to the inability to create a stable supply in an auction system without always paying a premium price for the seafood.

7.2.2 The minimum price system

The Norwegian primary market for cod, with a minimum price and trade through the fishermen organizations, provides the fishermen with a security of always receiving a fair price for their catch, but do not influence the activities performed, nor the resources utilized, for catching and handling the cod in a way that promotes quality of the cod, as with the auction system in Iceland. According to Trondsen (2012), the Norwegian cod quality differentiation is according to catch and landing regulations by the Norwegian government. However, the activities and performed and resources utilized are affected by the desire to minimize costs in order to improve profit. Trondsen (2012) states that Norway has adapted a cost-efficient, production focus in which

low value products aimed for processing downstream in the value chain with a lower capacity of taking advantage of the increasing demand for highly valued, fresh, good quality seafood products (Trondsen, 2012). The Norwegian fishermen have invested in high-technology for e.g. freezing seafood on-board and processing in low-wage countries, which enables stable and high-volume exports. The Norwegian cod industry is hence based on pooled interdependence of activities with the aim to create economies of scale and efficiency. This type of interdependence is, as stated in chapter 3.2, highly dependent on the standardization of resources which is satisfied by the means of the minimum price level transactions. The impact of a minimum price system is illustrated in Figure 18.

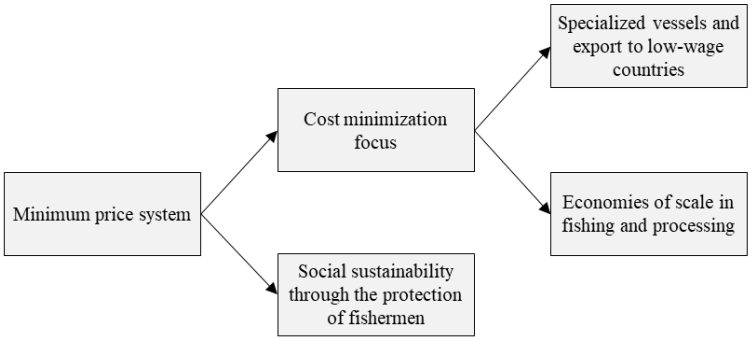


Figure 18 The impact of a minimum price system

Several researchers, such as Knútsson et al. (2016) and Trondsen (2012), criticize the minimum price system because of the limited incentives to positively affect the attributes of the seafood as in the case with auctions. Furthermore, since the cost focus is likely to increase the seasonal catch patterns, as fishers mainly harvest during the time when it is cheapest, with regards to for example season and weather. Seasonality, as in all other industries and sectors, creates problems with regards to capacity utilization and predictability, all of which according to (Knútsson et al., 2016), result in a lower quality of the seafood. Knútsson et al. (2016) conclude by stating: "*…the market mechanism in Norway weakens the ability of the entire fishing industry to optimize long run profits.*" (pp. 174).

7.2.3 Vertical integration of fishermen and processors

When comparing the industrial networks in the country cases there is a noticeable difference with regards to vertical integration between the fishermen and the processors. In Norway, the regulated primary markets as well as the regulation prohibiting a production company from owning more than 49% of a harvesting company result in a lower degree of vertical integration compared to both Iceland and New Zealand (Trondsen, 2012). The allocation of seafood quotas is also affected by this, as in Norway, fishing companies hold the quota, whereas in Iceland and New Zealand, vertically integrated processing companies hold large shares of the quota. The quota reassures a certain supply of seafood per year, and when transferrable also generates a flexibility in operations. Hence, the vertical integration in combination with the quota management system result in a guaranteed stable supply of seafood for the processors in Iceland and New Zealand, see more about quota allocation in section 7.5.

In an interview with Docent Morten H. Abrahamsen for this master thesis project, the importance of a stable supply was stressed. Abrahamsen argued that a stable supply of seafood is the explanation behind the success of Norway's salmon aquaculture. The stable supply is achieved through vertical integration in which large Norwegian seafood companies control the entire supply chain. As salmon is an industrial product it is also to control harvest occasion, volume and quality. Abrahamsen and Håkansson (2015) argue that even though vertical integration allows for processors to receive a stable supply of seafood, there still exist natural variations for seafood species in capture fisheries. The authors argue that the Icelandic system is better at adopting to changes in customer demand, whereas supply variation in natural variation is more difficult to handle because the suppliers and buyers are tied to each other. The Norwegian system is, on the other hand, better at absorbing the natural variation differences, but lacks efficiency in adapting to market demand.

In both Iceland and New Zealand, the markets have become more vertically integrated and concentrated since the quota management systems were implemented (Bess, 2006; Trondsen, 2012). The New Zealand quota system was implemented as to manage excess capacity of in-shore fisheries, that caused depletion of several seafood stocks, and it was viewed as the best option to improve efficiency in an over-capitalized sector (Bess, 2006). With fewer actors, the allocation is larger to each actor, allowing for pooled interdependence of activities and economies of scale.

Knútsson et al. (2016) argue that integration of the value chain in Iceland has enabled companies to increase control over both harvesting and processing, in accordance with both information on price and marketing demand. The authors also found that Icelandic companies regard control in seafood fishing, processing and marketing as "*…the single most important factor in ensuring maximum quality and thus value creation.*" (pp. 176). The control means that the processing company can assure food control and safety from harvest until the product is sold to the consumer and, through that, decrease the amount of seafood waste in the entire value chain. This control also includes transport from landing sites to the processing facility, in which all three country cases utilize solely controlled transport with automatic cooling systems.

The network control has further effects on the possibility for the processing firms to engage with customers downstream in the network and Bess (2006) argue that a successful vertical integration strategy for a seafood firm is highly dependent on the creation of enduring customer relationships. Hence it can be said that the involved actors through integration economize by combining their resources as to create a better resource utilization and generate a higher value.

Vertical integration in the network also result in fewer transactions stages between actors. In a study by Jónsdóttir (2010) it is investigated whether the value of raw material in export of fresh whitefish can be increased by choosing more economic and/or value adding methods in different links of the chain from catch to retailer. The author argues that each step in the chain from catch to retailer is connected to a cost, and that each node in the chain has a specific impact on the quality of the product, related to time and more specifically shelf-life. Because of seafood's perishable nature, the distribution of fresh seafood, is not only about keeping the cost at a minimum level, as is the case with many other types of distribution. The lead time from catch to consumer is also a great success factor (Jónsdóttir, 2010). Another factor of importance is to process the seafood as soon as possible after catch and by decreasing the lead time from

catch to processing the equal amount of time, or even more, is made available for transport to the consumer (Jónsdóttir, 2010). This becomes of extra importance when the seafood is to be exported and is subject to longer distances between catch and harvest (ibid). The impact of vertical integration is illustrated in Figure 19.

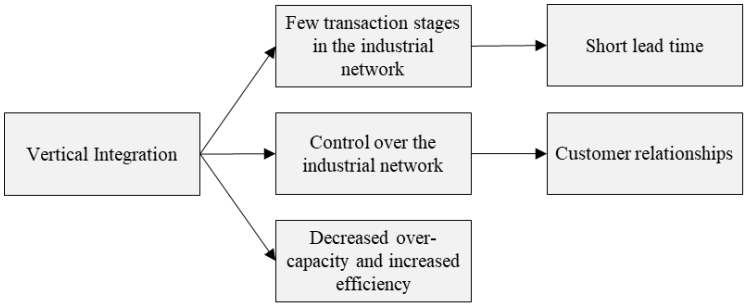


Figure 19 The impact of vertical integration

7.3 Processors

With regards to processors in the three country cases there are two features that can be analyzed, namely seafood quality and safety assurance and processing inter-firm cooperation.

7.3.1 Seafood quality and safety assurance in the processing industry

All the presented case countries in chapter 6 export to high-value markets that have high food quality and safety standards and regulations for import. The requirements place demands on the entire industrial network for fresh seafood export in these countries, and a direct pressure is placed on the processors that interact with the importing companies and conduct the export. All three countries have extensive governmental regulations for processing and handling of seafood and all processors oblige to the HACCP regulations and more. Compliance to food quality and safety standards can hence be said to give access to high-value markets, see Figure 20.

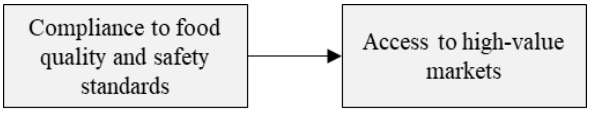


Figure 20 The impact of food quality and safety standard compliance

Valdimarsson (2007) argues that the processing sector of the seafood industry has changed its way of responding to more demanding product quality and safety directions and that "*…the successful approach has been to move away from centralized government controls towards making the industry responsible for implementing "self-control" systems that are verified and audited by governments*." (pp. 24). The author further mean that this type of system requires clear objectives and extensive record keeping. The same approach can also be applied with new environmental demands (Valdimarsson, 2007).

7.3.2 Processing inter-firm cooperation

According to Bess (2006), New Zealand seafood processing firms have increasingly begun to explore interfirm cooperative efforts as to further reduce costs and enhance product value and delivery. Bess (2006) also argues that inter-firm cooperation leads to the boosting of creative and entrepreneurial efforts that enhance individual and collective competitiveness in export markets. Hoholm and Håkansson (2012) agree and argue that development and innovation is to

a high degree about trying out new combinations of resources, which is possible when two actors in a network interact.

Also processing firms in Norway have during the past couple of years experienced increasing interfirm cooperation, mainly in the form on mergers and acquisitions between processing firms through horizontal integration. Like vertical integration, described in section 7.2.3, horizontal integration leads to increased efficiency and economies of scale in production of seafood, see Figure 21.

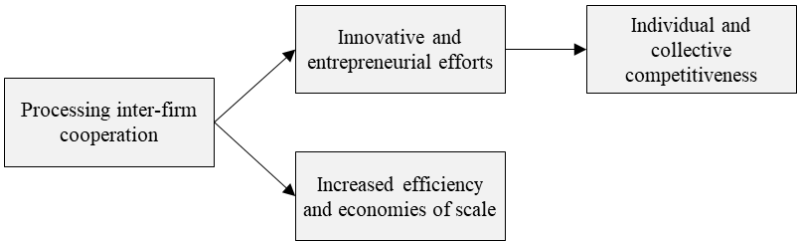


Figure 21 The impact of processing inter-firm cooperation

7.4 Interaction between processors and importers

All processors in the three country-cases export to high-value markets such as EU, USA and Japan and they mainly have a direct contact with the importing company which in many instances are large retail-chains and processors. The interaction between processors and their importing customers in the network was a central theme in two interviews conducted in this master thesis project with Håkan Håkansson and Morten H. Abrahamsen, both having studied the industrial network for seafood export over many years. According to the interviewees, there has been a significant change over the past years in which classical distribution structures, with producers, wholesales, retailers etc., have been challenged with direct distribution, forcing the entire upstream network to adapt. The network is now highly vertically and horizontally integrated and there are a few companies extorting control over the entire chain. For example, Håkansson states that there are three companies in Sweden, four in Norway and five in Great Britain that control the network. and the smaller actors are forced to adjust their operations.

Håkansson and Abrahamsen argue that this shift is not due to any governmental regulation, rather it is the market that is the driver of this transformation. According to Abrahamsen, the demand side of the network in which small retailers have conglomerated and created large retail chains. "*With a more concentrated import market, follows a more concentrated export market.*" says Abrahamsen and concludes that this is what has happened in the major fishing export nations, such as Norway. In a study by Cantillon and Håkansson (2009) one national and one local market in the UK, and more specifically the interaction between these markets and Norwegian seafood exporters, are investigated. The case study finds that the market is dominated by a few large retailers and processors and that these high-interaction structures have emerged because of the actors urge to improve efficiency in activities and increase the utilization of resources.

7.4.1 Direct contact between exporter and importer

The importance of establishing a direct contact between the producer and the importing retailer is stressed in the interview with Håkansson, who means that without a direct contact the seafood

is subject to price competition and the quality might suffer. Håkansson also highlights the disadvantage of using export and import agents and state that "*Characteristic for import and export agents are to have a volume focus and buy from anyone, anywhere – which impairs both quality and value of the seafood.*" Håkansson describes a network situation for a certain type of seafood called Bacalao, which is popular in catholic countries. *One* of the major producers in Norway has a direct contact with *one* importer in Portugal, representing a large share of the Portuguese market. The importer distributes the seafood as a quality product, at a premium price. The competing companies have a large focus on volume, and do not manage to create a high value of the seafood. Håkansson states that "*If producers manage to create close and long-term relationships on the market it is possible to reach a high quality and create value, it is about bypassing the middlemen and reach directly to the retailers."*

Trondsen (2012) argues that seafood can be characterized according to many heterogonous product qualities, including for example species, size, freshness and processing and preservation methods. The author means that the commercialization of seafood is about matching the heterogenous product qualities to heterogenous markets to create a homogenous demand from specific consumer groups. Trondsen (2012) further states that the process of transforming a heterogenous raw material to a homogenous and standardized demanded product requires coordination of production and distribution stages. This coordination can be established by close contact between actors and the formation of close relationships, which is what processing actors in Iceland, Norway and New Zealand have managed to do.

The large retailers on the large, high-value markets have a great deal of power in the network. Consumers do not buy the seafood from a certain fishery rather they select seafood based on retailer brand, Håkansson state that "*Consumers buy ICA's fish, Coop's shrimps, and so on.*" (ICA and Coop are two of three large retail-chains in Sweden[1]). Abrahamsen argues that this type of retail power is also visible in other distribution chains and both interviewees both mean that this enables retailers to affect the activities and resources of the exporters. "*Some retailers demand a certain level of innovation from their suppliers, for example a new packing, a new type of product on a regular basis.*" says Håkansson. Hence, this type of retail power requires close cooperation, long-term relationships and mutual adaptations between the retailer and the exporting processor.

Direct interaction between actors and the establishment of close business relationships also have a distinct impact on the value of sharing information. Abrahamsen and Håkansson (2015) state "*…information about product quality is of great importance, but it is difficult to assess quality when relying on several suppliers at arms-length relationships*." (pp. 12). The authors further describe that the issue is usually solved by inspections, pictures and product samples- However, problems arise when the consignments have a lower quality than reported when arriving at the customer. Another, more effective, solution is to establish closer cooperation and adaptation of processes, however since resource adaptation is a complex and issue, it is not possible to conduct this with an unlimited number of suppliers.

[1] Livsmedelsaffär (2017) Wikipedia. https://sv.wikipedia.org/wiki/Livsmedelsaff%C3%A4r (2017-11-27)

In the interview with Abrahamsen, managing the evolution and development from the traditional distribution channels to the evolving direct distribution networks was described as the major challenge in seafood export currently. Abrahamsen and Håkansson (2015) investigates this issue in a study by examining the export network of Norwegian herring. Herring is, as stated previously, by law transferred from fishermen to processers through a blind auction. However, the Norwegian herring processors have large European retail-chains and processors as their consumers which desire long-term relationships and close cooperation. The processors must hence manage both market type interactions on one side, and relationships on the other side.

Stability in volume is a key issue for both Norwegian processors' facilities and the importing processors and retailers since it is related to the utilization of resources. Abrahamsen and Håkansson (2015) argue that one way of achieving volume stability is through this is having several suppliers with arms-length relationships and market-type transactions. However, as previously stated, in an auction system volume stability can only be achieved by paying a premium price. In such a situation, says Abrahamsen and Håkansson (2015), processors and importing companies must find ways to cooperate to create joint efficiency, favoring close relationships. In addition, there exist interdependencies between the two actors in which the seafood and processing equipment need to be adapted to each other, which favors mutual investment, close interaction and long-term relationships.

The summary of the impact of direct contact and business relationships in seafood export is illustrated in Figure 22.

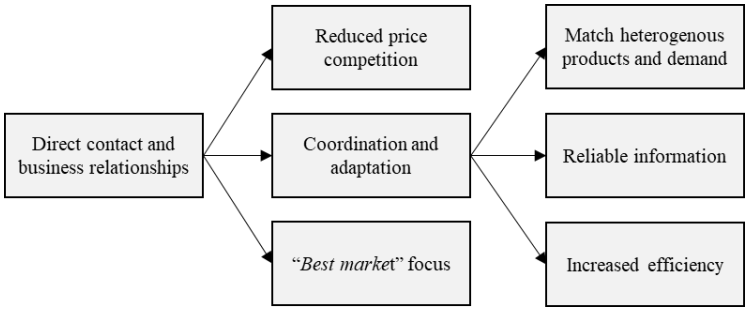


Figure 22 The impact of direct contact and business relationships

In Iceland, the processors are not restricted to the monopolistic auction system, direct cooperative relationships have been established with importers and the is described by Knútsson et al. (2016) as one of the main advantages of the Icelandic liberated market system. This has also altered the strategy of the exporting firms in which focus has shifted from finding new markets to establishing long-term relationships on the "*best markets*" as the number of actors in these markets are limited.

Cantillon and Håkansson (2009) state that the development towards high-interaction between few actors is expected to continue for the foreseeable future. In the interview with Abrahamsen it is also expressed that the future will imply more actors establishing closer interactions. However, says Abrahamsen, it is important to recognize that seafood is a natural resource that has a natural limitation both in terms of quotas and population size. "*There is a currently a balance between a market with auctions and sales based on price versus vertically integrated,*

direct channels with close relationships between large actors. The latter state will most likely increase in the future." concludes Abrahamsen.

7.4.2 Marketing and promotion of seafood

Marketing and promotion is one form of interaction between the processors that have implications for the value of the seafood. In this section two types of marketing are discussed; ecolabelling and nation specific marketing.

Several fisheries in the three case countries are certified by the Marine Stewardship Company (MSC, 2017b) which is an ecolabel certification (see section 2.4.1) and the countries are all acknowledged for their sustainable fisheries sectors (Bess, 2005; Qatan, 2010; Barton, 2006 and Trondsen, 2012). As stated in section 2.4.1, it seems that the retailers and processors are creating the market for ecolabelled productions by producing and distributing sustainable products to the consumers. Many leading food retailers in the large export markets have decided to sell only products that are sustainably harvested (Valdimarsson, 2007).

Roheim (2007) states: "*The goal of ecolabelling is to harness the power of the market to achieve environmental goals, and, in the case of seafood ecolabelling, to promote sustainable fisheries*." (pp. 85). But the benefits of ecolabelling reach beyond just environmental and sustainable benefits. Ecolabelling result in price premiums and furthermore access to high-value markets in general, and certain retailers and processors in particular (Roheim, 2007).

Another marketing feature is distinguishable for seafood from Norway in the form of "*Norwegian seafood*" This brand is, as described in section 6.1, marketed through the Norwegian Seafood Export Council (NSEC) with the main task of supporting the selling activities of Norwegian seafood exporters by promoting the positive attributes of Norwegian seafood. The effort has been successful and in restaurants and retailers all over the world the origin of the seafood is often displayed if it comes from Norway. Even though the seafood might not be different than the seafood from Iceland or any country the NSEC have managed to increase the demand and the value of the product resource, seafood, without activities performed or resources consumed that alter physical attributes of the seafood. The impact of marketing and promotion of seafood is summarized in Figure 23.

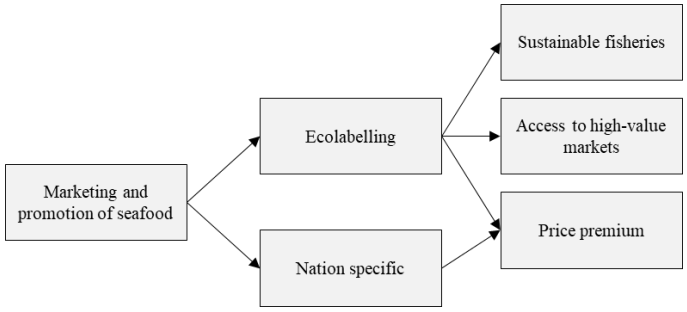


Figure 23 The impact of marketing and promotion of seafood

7.5 Controlled access to seafood

A feature distinguishing the Icelandic and New Zealand networks from the Norwegian network is the management of seafood quotas. All country cases presented have adopted some sort of quota system regulating the utilization of the natural resource seafood. However, what

differentiates the countries is whether the quotas, hence the access to resources, are transferrable in between the actors in the network. In Iceland and New Zealand, the quotas can be flexibly interchanged between the actors, whereas in Norway quota transfers mainly linked to the transfer of vessels between firms. In addition, the actors that hold the quotas diverge between the countries. In a study performed by Trondsen (2012) one of the findings highlighted that governmental regulation of seafood in the harvesting sector, has an impact on the market adaptation downstream, and could hence also be deemed to affect the value creation of seafood. In this section three such regulations are presented in relation to the value creation of seafood. It should be noted that each presented regulation builds on the previous, and hence the benefits apparent in the first, are also present in the second and the third.

7.5.1 Total Allowable Catches (TAC) system

The Total Allowable Catches (TAC) system (see section 2.4.2) adopted throughout the entire Europe Union and other regions in the world regulate the total amount of seafood that can be caught by several nations in a specific region. The system reduces the risk for depletion of seafood stocks, which is related to ecological sustainability, and hence preserves the one common resource for all actors and all activities in the industrial network for seafood, see Figure 24.

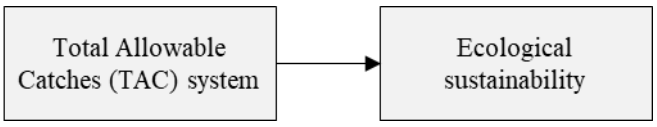


Figure 24 The impact of a Total Allowable Catches (TAC) system

7.5.2 Individual Quotas (IQ) system

Individual Quotas (IQ), the fisheries management approach adopted in all three country-cases, further mean that one actor is guaranteed a certain catch level each year without consideration to other actors in the network. Knútsson et al. (2016) argue that the introduction of quota management systems has improved profitability in many fisheries in the world. The IQ system enables a stable supply of resources to all actors and the activities that they perform which ultimately reduces the financial risks in long-term investments and commitments that drives performance.

These investments can include resources from all four resource categories presented in section 3.3. In New Zealand the secure access to raw material has allowed for vertical integration where firms have expanded their holdings and made strategic investments in specialized fishing vessels and equipment. This has reduced operating costs and improved the quality and value for their customers (Bess, 2006). Jónsdóttir (2010) argues that the productivity in fishing in Iceland has constantly increased trough innovation in equipment and product development, something that is made possible by the quota management system. With regards to the business relationship resource category, Bess (2006) states that the individual quota system presents the opportunity to build long-term customer relationships, in which the customers' demand can be understood and surpassed and a prospect to differentiate the seafood. Moving away from commodity markets and low prices to high quality and higher-valued product markets (Bess, 2006). According to Knútsson et al. (2016), several Icelandic actors discussed the ability to

secure a stable supply as very important in marketing fresh seafood, as it enables the development and retainment of long-term business relationships and contracts with large customers in high-value markets. This is especially true in vertically integrated seafood sectors such as New Zealand and Iceland (Knútsson et al., 2016). See summary of impacts from an IQ-system in Figure 25.

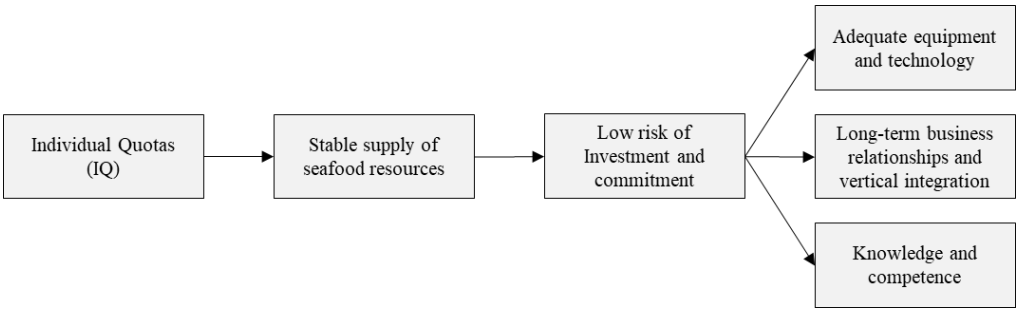


Figure 25 The impact of Individual Quota (IQ) management system

7.5.3 Individual Transferrable Quotas (ITQ), system

With Individual Transferrable Quotas (ITQ), which is the management system in Iceland and New Zealand, there is the opportunity to adjust quota holdings and thus the access to resources on a yearly basis, both in terms of quantity and species. One advantage of such a system is the possibility to optimize resource utilization and through pooled interdependence of activities achieve operational efficiency and economies of scale. The actors can hence adjust the quantity of raw material to fit the capacity of their operations, as well as they can adjust quotas for distinct species of seafood, enabling specialization within a certain species. In addition, the ITQ system presents an opportunity to adjust to the resources of downstream actors. If, for example, customer demand increases or declines, the exporting company has the possibility to adapt to the market. By being able to adjust to customers it is expected that the creation and development of business relationships is facilitated.

In a study performed by Knútsson et al. (2016) with the purpose of explaining the success of Icelandic fisheries it was revealed that Icelandic actors in the fishing and fish processing industry "*…believe the current [ITQ] system to be very effective, and specifically point out how the free transfer and allocation of catch quotas are essential tools for achieving both specialization and flexibility*." (pp. 176). Knútsson et al. (2016) further state that specialization in fishing and processing in Iceland has placed emphasis on increased value creation, since the actors are motivated by increasing the value of each kilo of caught seafood. Saevaldsson & Gunnlaugsson (2015) state that "*The ITQ system encourages the quota holders to maximize profit instead of catch quantity…*" (pp. 211). The ITQ impact is summarized in Figure 26.

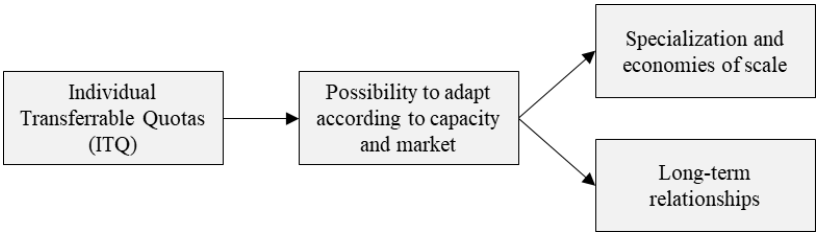


Figure 26 The impact of Individual Transferrable Quota (ITQ) management system

In an article by Barton (2006) a comparative analysis is made between the development of seafood export over the past decades in New Zealand and Chile. The author argues that despite many similarities, such as long coastlines, extensive fisheries traditions and major opportunities in globalization, the development of public and private policies and management strategies for globalization of seafood have been very different. In New Zealand, sustainable development has become the guiding principle based on the ITQ management system, vertical integration and the promotion of healthy and sustainable seafood. Competitiveness is achieved through comprehensive management of the natural resource. In Chile focus has been on creating a competitive advantage though maximizing profit margins by keeping costs at a minimum and maximizing output. This means of competitiveness requires careful evaluation of the natural resource (seafood), and according to Barton, this evaluation has not been careful enough in Chile. The Chilean fisheries are moving in a more sustainable direction, but Barton (2006) argues that Chile is dependent on private sector decision-making and lacks a solid public-sector orientation in this area. The author concludes by stating that the two contrasts reveal that multiple options exist for countries in exploiting a natural resource but capitalizing on assets should only be done within the context of a sustainable strategy that promotes and enforces responsibility.

7.6 Information exchange

One feature that distinguishes the industrial network for seafood export in Iceland is the abundance of information exchanged between different actors. Firstly, information about seafood origin, handling processes and so on enables traceability, which is a resource in itself. This, since traceability gives seafood exporters access to high-value markets where traceability is an increasing demand, as stated in section 2.3. Secondly, Knútsson et al. (2016) state that information flows in value chains or networks allow the necessary coordination of fishing, processing and marketing of fresh seafood. Information exchange enable coordination of plans ex-ante which is essential with sequential interdependence in supply chains according to Dubois et al. (2004), see section 3.2.1. An example of this is the information provided by the fishermen to the landing centers before reaching the shore enabling a large part of the seafood to be sold before landing the catch. The information thus exchange result in fast transactions promoting short-lead times followed by a high quality and low waste of the seafood. The information that is exchanged between the actors thus enables the actors to exploit resource heterogeneity when the information combined with the seafood raw material resource result in a higher value of the seafood, see Figure 27.

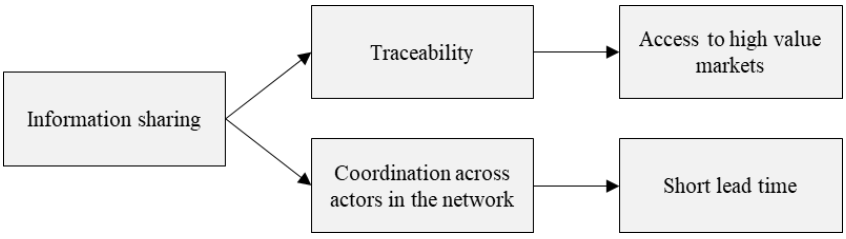


Figure 27 The impact of information sharing between actors

7.6.1 Information technology

In the interviews conducted with Håkansson and Abrahamsen the importance of information technology was stressed. According to the interviewees, information technology does not only enable the possibility to track and register transports and quality aspects (i.e. traceability) but furthermore it enables an increased interaction within the network leading to cooperation, coordination and a more concentrated network structure.

The electronic auctioning system in Iceland is based on the sharing of information between actors and enables fishermen distributed over the coast to connect with buyers from across the globe in real-time. The market is not restricted to one single physical location. The system creates transparency and correct market information as it is possible to determine the total daily supply and demand. According to Qatan (2010), the electronic auctioning system also allows for the fishermen to dispose of their catch quickly. A similar auction system also exists in Australia and Qatan (2010) states that "*There are many benefits for the buyers to use the auction market including a wide range of fish species from Australia and overseas, high quality fish, quantity, speed of auction system and good loading facilities to load the product.*" (pp. 22).

7.6.2 Trust between actors

Qatan (2010) describes that the effective Icelandic information system is built on trust between all actors in the network. If one actor provides inaccurate information the purchase can be rejected, and future sales are affected. The trust between actors in Iceland is developed based on the information shared between actors over a long time and is often secured with bank guarantees (Qatan, 2010). Trondsen (2012) agree and argue that since seafood is highly perishable, it is difficult to maintain control by relying on product guarantees. Control throughout the transactions in the supply chain of fresh seafood is dependent on trust that built up over time and common product-quality definitions between the suppliers and the buyers (Trondsen, 2012).

In a study by Hammervoll and Toften (2013) the drivers of interorganizational trust between Norwegian seafood exporters and importers is investigated by the gathering data from a sample of 181 buyer-seller relationships in the Norwegian seafood industry. The authors found that successfully developing and implementing interorganizational trust, significantly enhances the organizational performance, and directly affects the bottom line, of the exporting firm. The trust between seafood exporters and importers is a vehicle that can be used for increasing value creation in complex buyer-seller interactions, however not in situations with repetitive pure transactions. The authors also found that the main drivers of interorganizational trust in the industry were the nurturing of long-term relationship, investing time and resources in the relationship and sharing strategic information, such as such as future investments and plans. Though, international experience and sharing of logistical and operational information between the seafood exporters and importers do not have a correlation to interorganizational trust.

The two largest exporters in Iceland do not see a direct correlation between the investment in new methods and equipment to profit. Improving equipment and methods is rather perceived as a confirmation that the buyers can trust in product quality and shelf-life (Jónsdóttir, 2010). Furthermore, buyers are willing to pay more for a product with a history of uniform and reliable

quality (ibid). According to exporters in Iceland, the prices of seafood are dependent on the supply and demand, but also on the reputation of the seller: "*A seller with a highly respected reputation is more likely to be chosen than a less respected seller.*" (Jónsdóttir, 2010: pp. 4)

Trust, which is a resource created between two actors through close interaction in resource and information sharing and activity coordination can hence not only increase the performance of the involved actors and increase the value of the seafood, but also decrease the importance of other resources, see Figure 28.

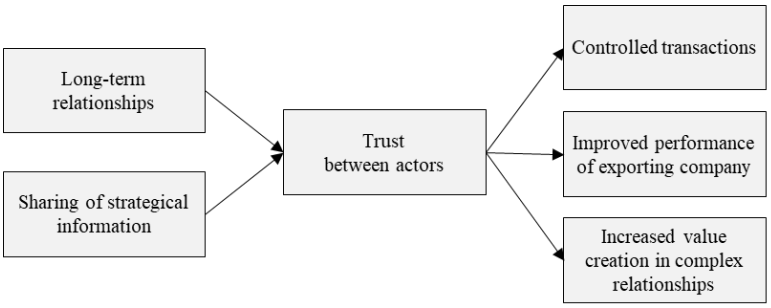


Figure 28 The impact of trust between actors

7.7 Key success factors in sustainable fresh seafood export

This section is a synthesis of the previous case country analysis in sections 7.1-7.6. This section has the purpose of answering the second research question for this master thesis by describing the key success factors for value creation in sustainable fresh seafood export. Through the analysis the following key success factors have be distinguished:

1. An effective catch share management system
2. Structures for efficient information distribution
3. Decentralized incentive structures for food quality and safety
4. Cooperation among actors in the industrial network
5. Direct and close relationships between exporters and importers
6. Compliance to food quality and safety regulations, traceability and labelling
7. Few transaction stages from harvest to consumption

Due to the complexity of value creation through actor interaction, the key success factors are not mutually exclusive, and one factor can induce another factor. However, even though the success factors are connected one does not necessarily lead to the other and vice versa. The key success factors and their impact on value creation are further described in the sections 7.1.1-7.7.7

7.7.1 An effective catch share management system

A catch share management system governs the one resource common for all actors in the industrial network for seafood export, namely seafood. The main rationale behind implementing any catch share management system is to ensure the long-term preservation of seafood stocks and ecosystems in the ocean. If capture fisheries contribute to depletion of seafood, the activity is not sustainable in a long-term perspective and all actors will be negatively affected, since ultimately there will be no product resource obtainable. A catch share management system thus enhances sustainability and ensure long-term continuation and development of the industrial network for seafood export. A critical feature of an effective catch share management system is that it is constructed as to provide stable and secure access of seafood to the actors catching the seafood. By guaranteeing each actor a certain amount of product resources for a certain time period, there is a decreased risk of investment and commitment and an increased possibility to plan and organize activities.

The reduced risk of investment and commitment regards both physical and organizational resources that can ultimately increase the value of the seafood. With nominal risk, actors, small and large, can acquire equipment and technology as well as knowledge and competence, that result in adequate handling and cooling of the seafood. The ultimate result is pro-longed shelf-life, high food quality and safety and thus a low degree of seafood waste. Adequate resources also result in effective activities performed by the actors and ensures a fair return for the effort. As a consequence of the reduced risk, actors can also commit to other actors and form business relationships. Business relationships give access to other actors' resources and can result in resource combinations that have the possibility to exploit the resource heterogeneity and thus enhance the value of the seafood. Also, more permanent forms of commitment through vertical integration is motivated by a stable and secure supply of resources. Both business relationships

and vertical integration increase the control of the seafood flow in the industrial network, ensuring adequate handling and cooling and thus food quality and safety. The close actor interaction created though a stable and secure supply of seafood is furthermore a driver of other key success factors, namely Structures for efficient *information distribution* (see section 7.7.2), *Cooperation among actors in the industrial network* (section 7.7.4), and D*irect and close relationships between exporters and importers* (see section 7.7.5). Vertical integration likewise leads to the success factor in section 7.7.6: *Few transaction stages from harvest to consumption*.

With a stable, guaranteed supply the actors that catch seafood can increase their ability to plan and organize activities performed without considering other actors and an optimal resource utilization and activity coordination can be achieved. This creates the possibility to satisfy market demand without the risk of over-supply from forced, rushed harvesting or under-supply from foregone, delayed harvest.

An additional imperative feature of an effective catch share management system is that it should enable the actors who catch the seafood to flexibly adapt their catch share, in terms of volume and species, according to the market demand and operational capacity. The flexibility encompasses the possibility to smoothly optimize resource utilization and through specialization achieve pooled interdependence of activities and economies of scale. The adjustment to market demand further increases the possibility to create long-term business relationships, especially with regards to export-import relationships.

With a catch management system, the access to seafood, i.e. the volume, for each actor is appointed and the actors are hence motivated to increase the value of each allocated resource. Hence, a catch share management system also leads to the key success factor: *Decentralized incentives for food quality* and safety (see section 7.7.3).

7.7.2 Structures for efficient information distribution

Information is a resource that is always existing and exchanged between actors in any network, in different degrees. Structures for efficient information distribution imply that the information exchange is quick, and that the information exchanged is accurate. This type of information exchange can enhance value creation of the seafood and is further closely related to many other success factors.

The seafood network and chain of distribution from harvest to consumption is characterized by sequential interdependencies in which activities need to be performed in a certain order and the output of one activity is the input for the subsequent activity. This type of interdependence requires a high level of coordination between actors handling the seafood in the industrial network and matching of plans ex ante. The need for coordination is further amplified with regards to the requirements on short lead-time to preserve the quality and safety of the fresh seafood. In addition, a high interdependence among activities result in a high integration of resources in the network. Efficient information distribution between actors enable efficient coordination of activities and integration of resource that enhance the value of the seafood.

Structures for efficient information distribution also include actors deciding on what other actors to exchange information with. Any information about the seafood is of great importance, however, the accuracy of the information provided is difficult to assess when receiving

information from several actors with arm's length relationships. By establishing closer cooperation and adaptation of processes between actors the value of the information, and hence the value creation of seafood, can be increased. But since resource adaptation is a complex issue, it is not possible to conduct this with an unlimited number of actors. Accurate information is hence achieved though interaction with selected actors.

The exchange of information is closely related to trust as the exchange of correct information is a driver of trust that is often developed from information exchanged over a long time. Trust is also a mechanism for normative control in the network. Normative control is based on shared visions and objectives and implies a cooperative interaction atmosphere in which actors coordinate activities and combine resources. Fresh seafood is highly perishable, and control is difficult to maintain only by relaying on product guarantees and other forms of contractual control. Control is related to directing other actors' activities and resources throughout the network and impact seafood quality, safety and ultimately seafood waste in the network.

Information technology is an important resource for efficient, and more specifically quick, information distribution, as it allows for rapid diffusion of information to many actors. Information technology enable both coordination and control, especially with regards to operational and logistical information. Information technology does not only enable the possibility to track and trace transports and quality aspects (i.e. traceability) but furthermore it enables increased interaction within the network leading to cooperation, coordination and a more concentrated network structure.

7.7.3 Decentralized incentive structures for food quality and safety

Decentralized incentive structures for food quality and safety comprise the systems and network features that motivates the actors to improve the quality and safety of the seafood. The term *decentralized* imply that a high quality and safety of the seafood is not only the result of rigorous regulations, standards and policies from centralized official organs – but also the result of actors' self-interest in generating seafood with a high quality and safety. Essentially, the incentive structures generate rewards, in the form of a higher price and higher profit, for the actors providing seafood with a great quality and safety. With quality and safety regulations, standards and policies actors are motivated to fulfil minimum requirements at a low cost, since there is no reward for surpassing the obligations. However, with decentralized incentive structures the better the quality and safety generated by the actors, the higher the compensation for performed activities and consumed resources. Vital for this type of system is direct and quick access to information about actor performance, see more about *Structures for efficient information distribution* in section 7.7.2.

Ultimately, seafood quality and safety are achieved though correct handling, keeping the cold chain and a short lead-time from harvest to end-consumer. Especially important is to ensure quick cooling shortly after catch to pro-long shelf-life and thus enhance quality and safety of seafood throughout the supply chain. If the seafood is not handled correctly directly after harvest, other quality-enhancing methods in the subsequent steps of the supply chain will have a decreased effectiveness. Hence, the incentive structures for fishermen is deemed to be of utmost importance.

Besides the direct value in generating high-quality seafood, additional outcomes of decentralized incentive structures include decreasing waste in the entire distribution chain. This has a positive impact on sustainability, and getting access to high-value markets. By establishing quality and safety incentive structures, the actors in the network utilize their existing resources and invest in additional resources that enable them to achieve a high quality and safety and thus a higher value of the seafood. In addition, the structure makes the actors less prone to use and invest in resources that result in high-volume, commodity seafood with a lower value that often have a negative impact on seafood stocks and sustainability at large.

Resource development resulting in higher quality and safety can be established by either new resource acquisition, or through new resource combinations both independently or in interaction with other actors. This hence concerns facility resources, such as handling and cooling equipment, and business unit resources, such as competence and knowledge, to be utilized and combined in a way that creates a higher seafood quality and safety, and ultimately a higher value of the product resource, fresh seafood. Moreover, it should be noted that this type of resource development many times result in increased efficiency of operations through the improved resource utilization among actors in the network.

7.7.4 Cooperation among actors in the industrial network

Cooperation among the actors in the industrial network includes both the cooperation and collaboration among actors within one actor category e.g. among independent fishermen – referred to as horizontal cooperation, and cooperation and collaboration between different actor categories e.g. among fishermen and processors – referred to as vertical cooperation. The interaction between exporters and importers is examined in section 7.7.5 *Direct and close relationships between exporters and importers*.

Seafood can be characterized according to many heterogonous product qualities, including for example species, size, freshness and processing and preservation methods. The commercialization of seafood is about matching the heterogenous product qualities to heterogenous markets in order to create a homogenous demand from specific consumer groups. The transformation of heterogenous raw material to a homogenous and standardized demanded product requires coordination between the actors in the network.

Cooperation among the actors in the same actor category – horizontal cooperation – lead to securing interests and empowering the actors, particularly with regards to small-scale actors. This is related to a shift with regards to power and dependence in the network. For example, if the fishermen catching a certain species cooperate, the first-buyer actor category becomes more dependent on the cooperative, and thus the fishermen increase their power. This enables an increased bargaining position towards other actor groups in the network and the ability to influence governmental- and other authorities. The ultimate outcome is often improved working conditions for the cooperative actors, especially small-scale actors, in the industrial network for seafood. This can be seen as a factor of increasing importance with the present concentration on the large export markets, in which large actors extort power over smaller actors.

Cooperation and collaboration among actors involves the creation of business relationships and in extension, horizontal and vertical integration. The interaction between the actors in the

network does not necessarily mean that the product resource is exchanged between the two actors. However, the interface implies some resource interaction, such as the exchange of knowledge, competence and information which consequently increases the value creation of the seafood for involved actors. To achieve a long-term constructive and creative interaction, the involved actors need to accept the other actors' conflicting objectives and simultaneously place demands on the other actors. Through a high level of interaction conflicts can have a constructive effect.

Collaboration and cooperation, both horizontal and vertical, can be capacity building in which the actors can share and combine existing physical resources as well as obtain new resources that exploit resource heterogeneity and increase the value of the seafood. Through new combinations of resources, the resources evolve, and innovation and entrepreneurial efforts are boosted, resulting in innovative processes and market offerings as well as productivity. Furthermore, trough business relationships actors can both use common resources and achieve economies of scale through pooled interdependence in the network, and in addition relationships allow for actor specialization resulting in cost-efficient operations throughout the network. This type of interaction and integration tends to decrease an often-prevailing overcapacity in the network, through a network comprising fewer actors with access to more resources.

The activities performed in a fresh seafood supply chain are highly sequentially independent which requires coordination between different actors that can be achieved though cooperation and collaboration. More on this issue in section 7.7.2 *Structures for efficient information distribution*.

7.7.5 Direct and close relationship between exporter and importer

During the past years increasing concentration, through vertical and horizontal integration, has occurred in large, high-value export markets. In the EU, the USA and Japan the market is dominated by a few large retailers and processors driven by the desire for economies of scale and efficient utilization of resources. The development of more concentrated markets is expected to continue on the large, high-value markets and furthermore spread to other markets across the globe.

To enable export of high-value seafood a direct and close relationship between the exporting actor and the importing actor is required. Firstly, this type of actor interaction signifies a direct distribution of the seafood that bypasses middlemen, such as export and import agents. Agents, and other types of middlemen, often have a volume focus and do not promote quality features of the seafood with the result of a low value of the seafood. In addition, without a direct contact the seafood is subject to price competition which creates a cost focus and might impair the quality. Hence, a direct interaction between an exporter and an importer promotes increased value creation of seafood. Direct interaction between actors and the establishment of close business relationships also have a distinct impact on the value of sharing information. Also, the advantages stated in section 7.7.4 with regards to cooperation and collaboration among actors in the industrial network apply to this relationship.

The concentration allows for large actors in the importing markets to exploit power in the network because of the suppliers' dependence on them to access the market. These actors can hence influence the activities performed and resources utilized by the other actors in the network. The first demand from these actors regards *Compliance to food quality and safety regulations, traceability and labelling* (see section 7.7.6) in which the seafood must have a certain standard to even be considered. Furthermore, large retail-chains also demand a certain level of innovation from their suppliers. Hence, this type of retail power requires close cooperation, long-term relationships and mutual adaptations between the retailer and the exporting processor. To conclude, a business relationship creates prospect for specialized actors to coordinate interdependent activities and achieve efficiency and to combine heterogenous resources to enhance the value creation

A stable supply of seafood is a facilitator for both exporting and importing companies in order to achieve a high resource utilization and cost-efficiency. In this respect having several suppliers with arms-length relationships and market-type transactions is preferable in which the importing company can source from many exporting actors and through this assure that demand is always satisfied. However, having multiple suppliers often comes at a high price with regards to price competition. The actors must find ways to cooperate to create joint efficiency, favoring close relationships. Through vertical integration the exporting actor can ensure a stable supply in their own facilities and to their customers. Through this exporting actors can shift focus from finding new markets to establishing long-term relationships on the *best markets* as the number of actors in these markets are limited.

7.7.6 Compliance to food quality and safety regulations, traceability and labelling

The quality and safety of seafood products has received attention from governments, policy makers, food businesses and supply chain players on a global basis. There are many different types of quality control and assurance systems in the food sector but they all have the intention to influence to safe food production and reduction of seafood-born deceases. The implementation of quality control and assurance systems is a requirement to conduct seafood export to the large markets, and the requirements are expected to increase in girth and diffuse to other markets. Hence, a rigorous quality and safety assurance system as a part of fisheries management system is a necessity to enhance the value creation of seafood in long-term perspective. However, it is not necessary to have a system in place, it must also be implemented and enforced in an effective manner that do not require exhaustive controls and testing but still pledge compliance. The system must also be implemented and enforced in all stages of the network from harvest to consumption.

Besides the quality and safety assurance systems that assure that activities are performed, and resources utilized in an accurate way other features are also increasing in importance, namely the ability to trace the seafood from its origin as well as the guarantee that the seafood was caught and handled in a sustainable manner. Traceability and ecolabelling have increased in importance over the past decades and both accreditations give exporters access to high-value markets. Both traceability and ecolabelling result in reliability between the actors in the networks and many leading food retailers in the large export markets have decided to sell only products that are sustainably harvested. Through the traceability and ecolabelling the end

customer is guaranteed a certain procedure from harvest to purchase and in many cases both traceability and ecolabelling is related with a price premium. In addition, traceability can also be utilized for nation specific marketing. The information that the seafood has a certain origin leads to a higher value of the seafood on consumer markets and in restaurants without additional product resource development.

In addition, by complying to the standards, enabling traceability and ecolabelling, sustainability is boosted. Both social sustainability with regards to the decreased risk of diseases from contaminated seafood, and ecological sustainability with regards to decreased seafood waste depriving the depletion of seafood stocks and increasing the utilization, i.e. human consumption of the natural resource seafood. Traceability and ecolabelling utilizes the power of the market to promote sustainable activities form harvest to final purchase. A holistic system that incorporates the possibility to couple the legislative, traceability and ecolabelling systems can generate synergies by performing the same activities and utilizing the same resources and achieving all three measures.

7.7.7 Few transaction stages from harvest to consumption

The number of actors from harvest to consumption determine how many physical transactions that the product resource, seafood, is exposed to. Each step in the chain from catch to retailer is connected to a cost, and each node in the chain has a specific impact on the quality of the product, related to time and more specifically lead-time. Because of seafood's perishable nature, the distribution of fresh seafood, is not only about keeping the cost at a minimum level, as is the case with many other types of distribution. The lead time from catch to consumer is also of importance. Hence, by keeping a short physical network from harvest to consumption a short lead time is made possible which have a positive effect on available shelf-life, quality and safety. In addition, it is especially important to process the seafood as soon as possible after catch. By decreasing the lead time from catch to processing the equal amount of time, or even more, is made available for transport to the consumer. Hence assuring few physical transaction stages between harvest and processing is especially important.

In addition, through having few physical transaction stages the control and coordination and coordination of activities in the network is simplified which is described in detail in section 7.7.2 *Structures for efficient information distribution*. This success factor is furthermore, unquestionably related to the factor *Cooperation among actors in the industrial network* (see section 7.7.4) and *Direct and close relationships between exporters and importers* (see section 7.7.5).

8 Discussion

This discussion is divided into two subchapters. The first section comprehends a discussion regarding the industrial network for fresh seafood export in Oman and the seven key success factors for value creation in sustainable fresh seafood export identified in section 7.7. The second section encompasses possible measures and the way forward for enhanced value creation in the industrial network for sustainable fresh seafood export in Oman.

8.1 Omani seafood export and the seven key success factors

This section is structured around the seven identified key success factors for value creation in sustainable fresh seafood export from chapter 7.7 and discusses the industrial network fresh seafood export in Oman considering these factors.

An effective catch share management system: Seafood harvest is regulated in Oman by the means of seasonal restrictions, fishing permits and restrictions concerning exposed species – with regards to seafood stocks and ecosystems in threat of depletion. The seafood catch management system in place is designed as to preserve the ecological sustainability by systematic controls and examination of seafood stocks and ecosystems. Through the absence of quotas and limits, the system also provides the individual fisherman with flexibility in how much and what species they can catch. However, the system fails to fulfil the criteria of creating a stable and secure supply of seafood to the actors in the industrial network. The unstable supply, the scarcity of seafood and the effects of this is explained by processors interviewed in this study as the main competitive disadvantage compared to processors in other countries, especially in high-value market export. Furthermore, it has been shown that only two thirds of all fishermen have the fishing permits required. It can hence be questioned whether the regulation in place is enforced and adopted by the actors in the industrial network.

*Strucures for efficient information distribution***:** The most common form of information exchange in the industrial network in Oman is actors talking to each other, face to face, and exchanging information about seafood quality, handling methods, origin and price. From the wholesale markets, processors are also provided with documentation of certain information required for export to high-value markets. Information is generally transferred between many actors before the seafood reaches the end-consumer. The use of information technology is limited throughout the network which hinders the quick diffusion of information and the possibility to coordinate activities accordingly. The information distributed is not always complete and accurate. This is especially true with regards to information about total supply. Seafood is landed throughout the long coastline of Oman, it is sold at numerous landing sites and in the three wholesale markets during different times of the day. There is no information exchanged between these markets and hence no accuracy with regards to total supply or demand. In addition, because the limited interaction between different actors in the network, the arm's length based relationships and the large number of actors in each actor category, the quality and accuracy of information is also difficult to assess when it comes to seafood quality, handling methods and origin.

Decentralized incentive structures for food quality and safety: The fishermen and the truckers in the industrial network in Oman are motivated by selling large volumes of seafood quickly to neighboring commodity markets, in contrast to selling seafood with a high level of food quality and safety to high-value markets. In the example with the cool box provided to the fishermen by the government it is illustrated that the fishermen receive no monetary benefit in filling the

cool box with ice, and it is therefore not surprising that ice is disregarded. The auctions conduced at the Omani wholesale markets, and at certain primary markets, yield higher prices for higher food quality and safety. However, it is uncommon that the fishermen are the ones providing seafood to the auction, it is rather truckers, traders or other middlemen. The fishermen are hence not connected to the incentive structures accommodated by the auctions. The current incentives for volume and speed are not only the result of inferior rewards for quality and safety, but also the low degree of professionalization in the harvesting activity. Fishing is described as a way of life, rather than a profession, and incentives for acquiring new and modern equipment as well as competence and knowledge for achieving food quality and safety is thus low.

Cooperation among actors in the industrial network: The level of interaction and cooperation in the industrial network for fresh seafood export is limited with regards to both horizontal and vertical cooperation. Generally, the interaction between actors, vertically in the network, is short-term and includes the exchange of seafood and some related information for a monetary compensation. There is slight vertical cooperation between fishermen and truckers as well as between fishermen, truckers and the largest processing companies. In the latter cooperation, the processing companies have contractual control over the other actors. Most medium sized and small-scale processors have numerous suppliers and base their selection on daily quality and price negotiations. With regards to horizontal cooperation, the only form of this – demonstrated in this study – is the cooperation among fishermen, in which one third of all fishermen are involved in some form of partnership.

Direct and close relationships between exporters and importers: There is limited interaction, and direct and close business relationships, between the exporters and the importers in the industrial network for fresh seafood in Oman. The main part of exported seafood is distributed to neighboring countries through the truckers in a fresh condition. These truckers sell the seafood at wholesale markets in the importing countries. The tuckers can sell large volumes of seafood to these markets, however, the quality often suffers through incorrect handling and cooing during transport. The interaction is short-term and limited to the exchange of seafood and some related information for a monetary compensation. The majority of processors are small- and medium- sized and are dependent on import and export agents to get access to export markets. Hence, there are no direct or close relationships between the exporters and the actual importing companies. The larger processing companies have a direct contact to large retail chains in high-value markets, however this represents a small share of total export.

Compliance to food quality and safety regulations, traceability and labelling: The Omani Government and the Ministry of Agriculture and Fisheries have established a well-developed and up-to-date regulatory system comprising HACCP and other high-value market requirements with regards to food quality and control. Actors in the network have legislative and governmental support as well as subsidies to implement food quality and safety systems. However, the system is binary, in which a Quality Assurance (QA) certificate is only required for export to high-value markets, and not for export to commodity markets or distribution on the local Omani market. In addition, the enforcement of the regulation is expressed as an issue by Ministry representatives. Attempts of increasing control over this has been performed in Oman, for example by bringing all markets under the Ministry umbrella, yet there are still discrepancies in quality control on both primary and wholesale markets. The Ministry has initiated training and education in quality and safety procedures for processing companies. Nevertheless, there are no education or training for fishermen or other actors in the network.

There is no system for traceability and labelling in Oman. The highest level of detail in traceability is from where the seafood is landed. Sustainable harvesting, handling and ecolabelling is not something considered a priority among the actors in the network, excluding the Ministry.

*Few transaction stages from harvest to consumption***:** The overall structure of the industrial network for fresh seafood export in Oman is highly complex as it involves many actors and many transactions of the seafood. There is a low degree of standardization in the physical distribution of seafood from sea to plate resulting in long-lead times and a higher risk of mishandling with the ultimate outcome of low quality, high waste and inefficiencies.

8.2 Proposed measures for enhanced value creation of fresh seafood export in Oman

From the discussion in the previous section it is demonstrated that the industrial network for fresh seafood export in Oman is not realizing all the criteria for the identified key success factors for value creation. The lack of attainment results in difficulties in achieving a satisfactory food quality and safety of the seafood, extensive waste in the post-harvest supply chain and limited access to high-value markets. The outcome is an inferior value creation of the seafood and non-sustainable effects economically, ecologically and socially. There is a need to enhance the value creation in the industrial network for fresh seafood in Oman. However, developing the industrial network in the direction of the key success factors and enhancing the value creation is a great endeavor that requires a restructuring of the industrial network, revised interaction patterns and novel governmental policies and regulations.

8.2.1 Proposed measures for developing the industrial network for seafood export in Oman

The inability to realize the key success factors and the deficit in value creation in seafood export is believed to principally be the result of the abundance of actors in the network. The industrial network for fresh seafood export is not only elongated with many transaction stages from harvest to consumption, it is likewise wide with many individual actors in each actor category. With around 50 000 fishermen, 3 000 truckers, 43 processing companies and other middlemen, traders and agents, the common seafood resource is shared between many actors unable to specialize, achieve economies of scale, exploit resource heterogeneity and value creation in seafood export. Thus, in order to enhance the value creation, the network structure needs to become more concentrated. The concentration of actors can be increased on different actor levels, and have diverse effects on each level. However, altering the features on one actor level have propagating effects in other elements throughout the industrial network. Fishermen is the actor category in which the greatest opportunities of improvement can be found. If the seafood is not handled correctly from the start, additional measures downstream in the network will not be as effective.

The small-scale artisanal fishermen in Oman have a great responsibility in the value creation of seafood, as cooling and accurate handling immediately after catch is described as the most important factor for seafood quality, safety and shelf-life elongation. The current activities performed, and resources utilized by the fishermen in Oman are, in general, not adequate to fulfil this undertaking. One way to improve the situation would be to simply substitute the existing resources and alter the activities with new and modern solutions, through private investment or public programs. However, this option is not considered neither feasible nor

sustainable, as the individual fishermen in Oman do not have the financial capacity or the incentives to invest in new resources and since the current resources would most likely be scrapped in an unsustainable manner.

As described, attempts have been made by the Omani Government and the Ministry of Agriculture and Fisheries to improve the harvesting and handling methods of the fishermen, with for example provision of cool boxes. Similarly, modern and high-technology resources for private acquisition are available in Oman. However, without sufficient incentive structures, the available resources are not exploited in a manner that enhances value creation. Incidentally, it can be questioned whether other types of ongoing investments, such as port infrastructure developments or soft loans to fishermen and other actors in the network, will increase the value of the seafood if the incentives for food quality and safety remains low. Nevertheless, if incentives for food quality and safety increase, the providers of infrastructure, equipment and technology must be prepared to facilitate the value creation performed by fishermen and other actors.

A conceivable way to increase the value creation of seafood and to professionalize the fishing activity is to establish fishing companies and organizations encompassing fishermen cooperation. Previous attempts of organizing fishermen have failed and it is therefore vital to create tangible incentives for the fishermen to be involved in a cooperating unit. Furthermore, the cooperation should be constructed with regards to the *casual culture* of Omani fishermen encompassing flexibility and a quick disposal of catch.

Flexibility, encompassing the opportunity to go fishing at any time, is identified as a central requirement from the fishermen in Oman. However, the flexibility can in the current state only be regarded as beneficial for the fishermen themselves. For the other actors in the network, this flexibility results in an uneven supply of seafood, with the risk of low resource utilization and poor market adaptation. This hinders the creation of close actor interactions and formation of long-term business relationships in the entire network. Through creating fishing companies or organizations, in which several fishermen cooperate, the daily catch could collectively be fairly constant, and the desired flexibility could simultaneously be preserved. Furthermore, the prospect of a stable supply increases with fishing companies with establishments over several landing sites and could be regarded as spreading the supply risk with regards to local weather conditions and other uncontrollable factors.

The Omani fishermen are also keen on receiving quick payment for their catch. Currently, this is fulfilled by allowing for large portions of the seafood to be distributed by truckers directly from the landing sites. A fishermen cooperation that manages the seafood when it is landed, and still act on behalf of the fishermen in the interaction with other actors, could fulfil the request of quick transactions of seafood to first hand buyers without compromising the income for the fishermen. The fishing organizations moreover have the possibility to give fishermen access to the wholesale markets through the increased consolidated volume and a more robust position in the network. In the wholesale markets the auction rewards seafood quality with a higher return. This could be expected to create increased incentives for quality among the fishermen. Incentives are further discussed below with regards to business relationships with processors.

The core advantage of fishermen cooperation in Oman is the capacity building in which resources can be combined to enhance value creation and in addition, increase resource

utilization and create economies of scale. Cooperation further decreases the barrier for investments in new and modern shelf-life extension and quality assurance equipment and technology. Through collaboration the fishermen's knowledge and competence can similarly be increased, and the fishermen can be educated in seafood harvesting and handling. The current low degree of knowledge and competence of fishermen is probably a factor in the mishandling and non-compliance to food quality and safety standards. When you do not know what standards to apply, it is difficult to conform. Through the benefits provided to the fishermen by the cooperation, the cooperating units can place pressure on the fishermen with regards to accurate harvesting and handling procedures that generate increased value of the seafood.

Establishing fishermen cooperation is expected to improve the conditions for cooperation with other actors in the industrial network. This because of the possibility for the fishermen to collectively supply a larger consolidated volume and a stable supply. In forming business relationships with other actors, the fishermen get a guaranteed outlet for the seafood harvested, with the result of a secure income. In addition, through the fishermen cooperation the fishermen have a better bargaining and negotiating position in which they can secure their interests and receive higher prices for their seafood.

As described, the truckers currently have diverse roles in the network. The role as a *trader* is the most common, and results in large amounts of seafood being distributed by truck to neighboring countries with poor handling and quality control. These traders do not only generate a low value of the exported seafood, they impede other actors to perform activities and use resources that increase the value creation of seafood export by contributing to the experienced scarcity of seafood. To decrease the amount of transaction stages and to shorten the critical lead-time, it would hence be advantageous, in terms of value creation, to transfer seafood directly from fishermen and/ or seafood companies to processors. There is hence a need to shift volumes from truckers to processors. However, changing the role of the truckers in the network, from selling seafood to selling transportation services, is not something that can happen instantaneous. It is a process in which seafood processors in Oman need to engage truckers on contractual basis and guarantee a stable supply of seafood as well as a stable income. It is likely to be desired by truckers to receive an equally great monetary compensation for transporting seafood over a shorter distance. The guaranteed supply of seafood and stable income for the truckers result in a decreased risk of investment, and in combination with demands from processors it is prospective that the truckers will invest in new modern technology and resources, such as automatic cooling systems. Keeping the cold chain is identified as vital for food quality and safety, as well as shelf-life and such investments would thus have a great effect on value creation in the network.

As previously discussed, shifting seafood volume from export to neighboring countries by truckers to processors will mitigate the issue of seafood scarcity, described as the main competitive disadvantage by processors. In addition, decreasing levels of waste through new resource combinations ensuring accurate handling and cooling in the post-harvest supply chain would result in increased volumes provided to the processors. Hence, total seafood volume can be increased – not by increased harvesting and pressure on seafood stocks – but thought the efforts to increase seafood value.

The establishment of business relationships between fishermen, truckers and processors enables actor specialization in which the fishermen can specialize in the harvesting activity, the truckers

can specialize in the transport activity and the processors can specialize in the processing and export marketing activity. In addition, business relationships allow the processors to better control and coordinate the activities performed and resources used in the chain from harvest to the processing. With increased control and coordination, an increased quality and shorter lead time can be expected. The issue in which processors are forced to market the seafood a frozen instead of fresh at half the price due to initiated biodegradation, could hence be avoided.

Through business relationships among actors, the accuracy and reliability of information is increased, as trust is created between the actors. Amplified exchange of accurate information between the actors simplifies traceability and labelling of seafood. It is expressed that the raw material quality of seafood in Oman is the main competitive advantage, by a processor interviewed in this study. The reason is the low pollution in the ocean and other beneficial environmental factors. Hence, processing companies could utilize the information about seafood origin as a resource for marketing purposes. For example, *Omani Tuna* could be as widespread as *Norwegian Salmon*. Hence, traceability needs not to be considered a necessarily evil, but could enhance the value of the seafood in export. Furthermore, the increased coordination and control of activities enables ecolabelling of seafood. Ecolabelling is furthermore expected to become increasingly important, as developing the network involves access to high-value markets with requirements on sustainable harvesting and handling processes.

Horizontal cooperation and increased concentration through mergers among processors could also have a positive effect on value creation in the Omani seafood export. Through conglomeration, processors can, similar to fishermen cooperation, increase their influence on other actors in the network. Through increased power and the possibility to distribute a stable volume, negotiations could, for example, be held with airlines to facilitate a smoother air transportation – which is described as a major problem today. This would ensure quality control also in the last step of the supply chain. In addition, horizontal integration also increases innovative and creative capabilities as well as enables economies of scale in operations.

Through the benefits described above from increasing interaction in the network follows the possibility for processors to gain access to high-value markets in a greater extent and to form direct and close business relationships with large retail chains and other large importers in these markets. In conducting export to some markets, it is expressed by interviewees in this study that the export agents are the only option. However, many processors in Oman are deemed to not have sufficient resources to conduct direct export, and are forced to use export and import agents to other markets as well. With an altered network structure, processors would have the possibility to not be active on as many markets as possible, but to select a few high-value markets and create long-term business relationships with actors on these markets. In the market selection consideration should be taken to the value per volume of exported seafood. According to the value analysis performed in chapter 5, export from Oman to EU and USA result in a notably higher value for each volume unit of seafood compared to the primary current export markets. A concern that could be raised in converting from the current export markets to high-value markets, is the resulting decreased supply to neighboring markets, as well as other commodity markets. In addition, the increased value of export could amplify the ambition to export instead of selling seafood on the local Omani market. However, it is deemed that with the decreasing seafood waste in the value chain the ultimate volume is deemed to satisfy a larger

total demand. Furthermore, with regards to high-value species, a system for assuring supply to local markets already exists with the recent implementation of wholesale markets.

The Ministry of Agriculture and Fisheries has an aspiration to implement an electronic auctioning system connecting all three wholesale markets. Such a system would increase the supply and demand transparency in the network, which can lead to improved coordination among the different actors and create incentives for food quality and safety. The system could also be expanded and include seafood at the primary markets and developed as to not require a physical presence at the markets, through information technology. This would also allow for foreign customers to enter the markets and purchase seafood directly from the fishing companies or processors in Oman. This ultimate result of a holistic electronic auctioning system are fast transactions at a low cost and the possibility to achieve a short lead time and a higher price to the end-customer.

It is vital that the increased consolidation and concentration in the network do not result in reduced job opportunities, but preferably in job creation. The proposed network structure does not solely promote the replacement of current resources into highly efficient resources that reduces the need for man-power, rather it endorses an efficient utilization of current resources and the exploitation of resource heterogeneity. The development could reduce the need for man-power in some areas of the industrial network from harvest to plate, but new tasks and job opportunities are also created, as for example with regards to coordinating actors and relationship development.

8.2.2 Proposed measures for developing regulations and policies in Oman

Currently, the requirement of quality assurance (QA) is only needed for export conducted to high-value markets. However, these systems encompassing for example HACCP should be a requirement for all types of seafood distribution. This to ensure sustainable operation, human health and environmental protection. Implementing such regulation would result in actors either adopting and complying to the new standards, or ceasing operations. It might be severe, but actors not complying to perform activities and use resources that secure food quality and safety cannot be considered as value creating. The ultimate result is that the *best* actors remain and are allowed a larger share of the limited seafood.

Developing the industrial network structure and interactions as discussed above will most likely have an impact on the one common resource in the network, namely seafood. As the discussed transformation involves an industrialization and professionalization of the fishery sector, the methods for harvesting and handling seafood is likely to be improved. This type of development might lead to increased demand for seafood which in a long-term perspective, might endanger the viability of seafood stocks. Hence, the network structure development is not as effective without the implementation of an effective catch share management system.

However, the implementation of an effective catch share management system is a great endeavor that not only requires efforts by the Omani Government, but furthermore international cooperation. Oman has maritime boarders to four other nations, which comprise some level of shared marine resources. Even though many countries in the region are currently highly dependent on fossil resources and experience a future need to diversify the economy, it can be predicted that implementation of such a system would involve a great deal of politics and require a lot of time and resources. However, it is possible as a first step to implement a catch

share system within the maritime boarder of Oman and to regard the international cooperation as a long-term solution.

The enforcement of an effective catch share management system is reliable on accurate harvest information from the actors in the network. Assuring accurate information from fishermen could be an issue in the current industrial network for fresh seafood in Oman. Issues with reporting and compliance to regulation has been identified in the current system, with regards to for example having a valid fishing permit and reporting catch to labor unions. This issue is expected to be partially solved through the establishment of fishermen organizations and vertical cooperation, previously discussed. Since the seafood supplied by fishermen to the cooperation yields a higher return for the fishermen, than not supplying the seafood it can be expected that all seafood caught is supplied and thus reported. However, it is unlikely that all fishermen will conglomerate into fishing companies, so controls need to be conducted in which rules should be clear and the penalty for non-compliance should be distinct.

It is important to overcome the identified barriers in creating and enforcing an effective catch management system in Oman. An adequate system ensures a stable, secure and flexible supply of seafood to the actors in the network and in a larger, long-term perspective a sustainable fisheries industry. When each actor has access to share of the seafood, each actor is more inclined to increase the value of the allocated seafood. Hence, this creates incentives for seafood quality and safety. It is also expected that the implementation of an effective catch management system retains a developed, more concentrated industrial network structure.

8.2.3 A recommended way forward

The presented proposed measures include altering the resources, activities and actor interactions in the industrial network for fresh seafood export in Oman, as well as new governmental policies and regulations. Some measures are more difficult to implement than others. As discussed, implementing a catch share management system is a great endeavor that require large public resources and time, in addition to international cooperation. However, it is vital to initiate efforts in this area forthwith to ensure a sustainable development of the fisheries sector. The proposed network development discussed will most likely not occur instantaneously. Oppositely, the development requires action from many actors in different stages in the industrial network.

The suggested network structure does not necessarily require high volumes of seafood, rather it is based on the premise of a stable supply of seafood. Hence, one way to initiate a development towards value creation in the entire network is to set up the recommended network structure in small scale through a pilot project. The described network structure is dependent on changed interaction patterns among all actor categories in the network. Furthermore, all actors are responsible for the increased value creation of seafood. If one actor does not fulfill the requirements of adequate handling or cooling the value of the seafood is depreciated and the efforts by other actors diminished. Hence, all actor categories need to be involved in a pilot project. A proposed pilot-project network structure is illustrated in Figure 29.

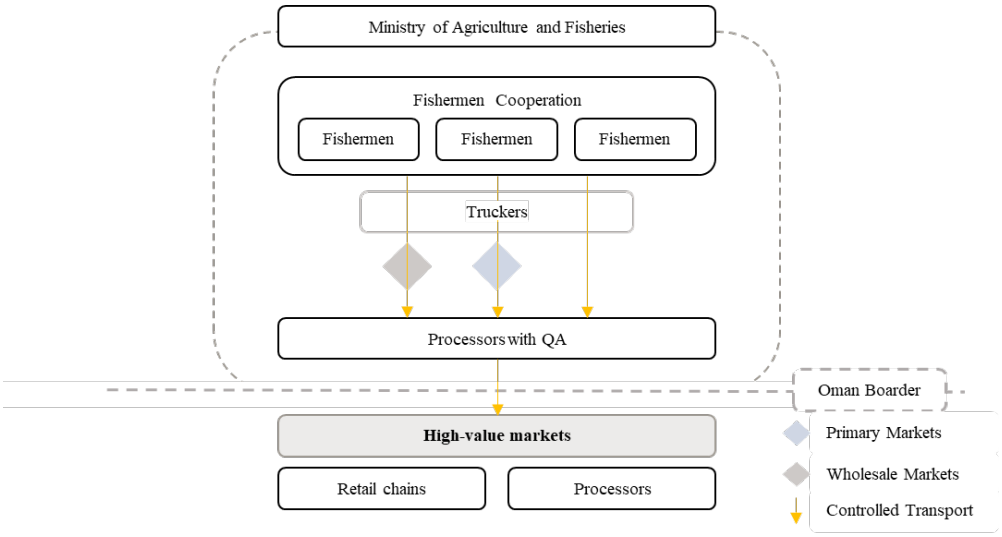


Figure 29 Proposed pilot project network structure

The pilot project could initially be established in one landing site, and later be scaled to include additional landing sites, as to increase supply security with regards to weather and other factors. It is recommended to primarily consider a port in the Muscat area, since this region is highly developed with regards to both port and transportation network infrastructure. Initially, such a pilot project would not require large investments, it is more about connecting and coordinating actors and utilizing the existing resources in a more effective manner. For example, for the fishermen this would include *actually* filling the cool box with ice and keeping the cold chain directly from harvest and being rewarded by higher prices for their catch.

The scale of the pilot project, i.e. how many fishermen, truckers, processors to include and how much seafood that should be distributed through the network, needs to be investigated further in cooperation with the public and private sector Oman. However, an important feature of a pilot project is that it is based on a scalable business model for the entire industrial network. It can be expected that scaling will happen more or less naturally as the benefits are demonstrated and through increasing competition among actors. However, it should also be mentioned that the proposed network structure does not have to cover all actors in the fishery sector in Oman. Domestic demand could still be satisfied through quick sales directly from fishermen at the landing sites, if the seafood is consumed shortly after catch.

In starting with a small-scale pilot project, the proposed network structure from this master thesis can be validated and fine-tuned to achieve the highest possible value creation in seafood export in a sustainable manner.

9 Conclusion

Seafood is increasingly highly valued as food and is considered to have many nutritional benefits. The global production of seafood has increased over the past decades and it is estimated that around half of world seafood production is traded internationally. Seafood is one of the most important foodstuffs for humans, due to its nutritional benefits and mild taste. However, it is also one of the most sensitive and perishable food groups and require suitable handling throughout the industrial network to keep a high food quality and safety.

The Sultanate of Oman has a long coast with a rich marine life and seafood is regarded as an important natural resource to diversify the Omani economy. The production and export of seafood in Oman has steadily increased over the past 50 years and Oman is the largest seafood producer in the geographical region. Currently around 55% of all produced seafood is exported. Oman conducts export to around 50 countries, and the main part is distributed to neighboring countries and only a small share is exported to the markets in which a higher value for the seafood can be obtained, namely EU and the USA. A value analysis performed demonstrated that the value per volume of exported seafood over the past decade is significantly lower (52%) than the global average.

The industrial network for fresh seafood export in Oman encompasses an abundance of small individual actors and numerous transaction stages from harvest and plate. The actors often have low technology equipment, inadequate handling and cooling procedures as well as low competence and investment capabilities. The interaction between the actors in the network is modest and is mainly restricted to the exchange of seafood and limited, related information. Standards and policies have been established by the Ministry of Fisheries and Agriculture in Oman, but is not sufficiently adopted by the actors in the industrial network. The result is seafood with a short-shelf life and poor food quality and safety, that either is distributed to commodity markets, or discarded as waste. The ultimate result is low value creation in fresh seafood export and unsustainable development.

From the examination of three case countries namely Norway, Iceland and New Zealand seven key success factors for value creation in fresh seafood export was identified. The key success factors are related to effective catch share management, efficient information distribution, incentive structures for food quality and safety, cooperation among the actors in the network and especially the creation of business relationship between exporters importers, compliance to food quality and safety regulations as well as assuring few transaction steps from harvest to plate.

The industrial network for fresh seafood export in Oman is not realizing all the criteria for the identified key success factors for value creation and there are several areas of opportunity in increasing value creation. In order to enhance the value creation for sustainable fresh seafood export in Oman the network needs to be developed as to increase the concentration and interaction between the actors in the industrial network, both horizontally and vertically, to enable resource combinations that enhance the value and increase efficiencies in seafood export in a sustainable manner. The development of the new network structure is recommended to be initiated thought a scalable pilot project. In addition, new regulations regarding quality and safety control and catch share management needs to be established as to assure a long-term sustainable development of the fisheries sector.

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Appendix A: Global production and consumption of seafood

Table A1 Global consumption patterns of total seafood production (FAO, 2014)

Category	**Volume (1000 ton)**	**Percentage**
Total seafood production	*167 229*	*100%*
For human consumption	146 279	87%
For other purposes	20 950	13%

Table A2 Global applications of seafood for human consumption (FAO, 2014)

Category	**Volume (1000 ton)**	**Percentage**
For human consumption	*146 279*	*100%*
Marketing Fresh	66 741	46%
Freezing	43 621	30%
Curing	16 928	12%
Canning	18 990	13%

Table A3 Export and domestic use of total seafood production (FAO, 2014)

Category	**Volume (1000 ton)**	**Percentage**
Total fishery production	*167 229*	*100%*
Export	60 020	36%
Domestic use	107 209	64%

Appendix B: Oman production and export volume

Table B1 Seafood capture production and export volume in Oman 1965-2015 (FAO, 2017b)

Year	Capture production volume (ton)	Export volume (ton)	Percentage
1965	65 000	0	0%
1970	92 000	0	0%
1975	198 850	0	0%
1980	106 000	8 132	8%
1985	101 180	20 874	21%
1990	119 783	38 845	32%
1995	139 861	69 092	49%
2000	120 421	58 37	48%
2005	157 544	83 267	53%
2010	164 054	86 933	53%
2015	257 172	132 01	51%

Table B2 Seafood capture production and export volume in Oman 2005-2015 (FAO, 2017b)

Year	Capture production volume (ton)	Export volume (ton)	Percentage
2005	157 544	83 267	53%
2006	147 782	75 953	51%
2007	151 840	74 535	49%
2008	152 031	74 202	49%
2009	158 669	80 975	51%
2010	164 054	86 933	53%
2011	158 723	93 928	59%
2012	191 700	117 080	61%
2013	206 169	125 690	61%
2014	211 037	132 450	63%
2015	257 172	132 010	51%

Appendix C: Export value per volume

Table C1 Seafood capture production, export volume and value for export from Oman 2003-2014 (FAO, 2007; 2009; 2012; 2014)

Year	Capture production volume (ton)	Export volume (ton)	Export value (USD)	Export value per volume (USD/ton)
2003	138 833	64 018	81 808 000	1278
2004	165 531	104 696	106 071 000	1013
2005	157 544	83 267	102 798 000	1235
2006	147 782	75 953	101 528 000	1337
2007	151 840	74 535	93 384 000	1253
2008	152 031	74 202	82 730 000	1115
2009	158 669	80 975	87 088 000	1075
2010	164 054	86 933	118 406 000	1362
2011	158 723	93 928	158 592 000	1688
2012	191 700	117 083	159 496 000	1362
2013	206 169	125 690	144 576 000	1150
2014	211 037	132 448	141 576 000	1069

Table C2 Seafood capture production, export volume and value for export globally 2003-2014 (FAO, 2007; 2009; 2012; 2014)

Year	Capture production volume (ton)	Export volume (ton)	Export value (USD)	Export value per volume (USD/ton)
2003	127 202 000	47 567 000	63 768 734 000	1341
2004	134 669 000	51 790 000	71 687 886 000	1384
2005	136 771 000	55 373 000	78 630,105 000	1420
2006	137 539 000	53 051 000	86 017 822 000	1621
2007	140 734 000	52 141 000	93 499 925 000	1793
2008	143 106 000	54 934 000	101 896 995 000	1855
2009	145 886 000	54 982 000	96 473 364 000	1755
2010	148 103 000	54 665 000	110 674 019 000	2025
2011	155 492 000	57 261 000	129 614 454 000	2264
2012	157 777 000	59 970 000	130 318 680 000	2173
2013	162 930 000	59 161 000	139 223 299 000	2353
2014	167 229 000	60 020 000	148 147 376 000	2468

Table C3 Comparison of export value per volume between Oman and the global average

Year	OMAN: Export value per volume (USD/ton)	GLOBAL AVERAGE: Export value per volume (USD/ton)	Difference
2003	1278	1341	5%
2004	1013	1384	37%
2005	1235	1420	15%
2006	1337	1621	21%
2007	1253	1793	43%
2008	1115	1855	66%
2009	1075	1755	63%
2010	1362	2025	49%
2011	1688	2264	34%
2012	1362	2173	60%
2013	1150	2353	105%
2014	1069	2468	131%
AVERAGE			**52%**

Table C4 Comparison of export value per volume between 2013 Top 50 countries in terms of value of exports. The countries represent 94,3% of global total export value. Sorted on descending export value per volume (FAO, 2014)

Country	Export value (USD)	Export volume (ton)	Export value per volume (USD/ton)
Australia	997 882 000	53 586	18 622
Honduras	358 584 000	28 335	12 655
Mexico	1 088 002 000	156 154	6 967
Bangladesh	572 211 000	85 624	6 683
Ecuador	3 835 940 000	611 779	6 270
Greece	737 867 000	141 075	5 230
France	1 820 876 000	364 008	5 002
India	4 664 309 000	955 437	4 882
Sweden	3 571 007 000	781 439	4 570
Canada	3 613 558 000	801 021	4 511
Mauritius	491 901 000	114 888	4 282
Peru	2 658 474 000	628 545	4 230
Turkey	567 949 000	140 221	4 050
Belgium	1 096 447 000	277 116	3 957
Netherlands	4 364 195 000	1 173 627	3 719
Seychelles	379 209 000	103 579	3 661
Poland	1 769 727 000	499 116	3 546
Morocco	1 817 852 000	537 377	3 383
Lithuania	454 522 000	134 422	3 381
Chile	4 601 717 000	1 392 229	3 305
South Africa	517 873 000	160 480	3 227
Spain	3 574 752 000	1 108 074	3 226
Denmark	3 461 681 000	1 095 662	3 159
Portugal	1 075 736 000	348 066	3 091

Indonesia	3 946 949 000	1 348 747	2 926
Hong Kong	1 174 078 000	412 073	2 849
Italy	474 015 000	166 944	2 839
Mauritania	353 003 000	125 936	2 803
Vietnam	7 057 194 000	2 543 987	2 774
Japan	1 982 048 000	728 181	2 722
UK	2 284 780 000	855 575	2 670
New Zealand	1 207 055 000	453 743	2 660
Korea	1 778 765 000	669 908	2 655
Germany	2 737 366 000	1 041 688	2 628
China	19 539 377 000	7 446 679	2 624
Ireland	674 401 000	264 728	2 548
Taiwan	1 969 857 000	782 322	2 518
Philippines	1 143 961 000	460 341	2 485
Faroe Islands	1 020 375000	411 488	2 480
Norway	10 367 544 000	2 786 788	3 720
Thailand	5 963 088 000	2 510 773	2 375
Argentina	1 494 538 000	642 156	2 327
USA	4 985 211 000	2 146 044	2 323
Malaysia	793 426 000	349 733	2 269
Pakistan	361 306 000	163 183	2 214
Iceland	1 769 727 000	876 304	2 020
Zambia	784 565 000	403 915	1 942
Greenland	446 046 000	251 228	1 775
Myanmar	652 755 000	466 585	1 399
Russia	2 905 438 000	2 102 240	1 382

Appendix D: Oman export markets

Table D1 Oman export countries and export volume
(Ministry of Agriculture and Fisheries Oman, 2009; 2013; 2016)

	Volume (ton)				
Country Group	**Year**			**Calculations**	
	2010	**2013**	**2016**	**Average Volume (ton)**	**Percentage**
GCC Countries					
Bahrain	13	42	317	124	
Kuwait	564	868	476	636	
Qatar	2114	2976	4195	3095	
Saudi	14246	22856	19224	18775	
UAE	49559	59857	66646	58687	
Total	*66496*	*86599*	*90858*	81318	67,1%
Other Asian Countries					
Bangladesh	0	17805	15245	11017	
China	1487	130	4372	1996	
Fiji Islands	0	54	381	145	
Hong Kong	79	31	29	46	
India	361	27	4386	1591	
Indonesia	186	539	2246	990	
Iran	0	986	0	329	
Iraq	0	336	40	125	
Japan	14	47	0	20	
Jordan	224	496	86	269	
Lebanon	766	719	35	507	
Malaysia	596	414	320	443	
Maldives	0	0	1	0	
Marshall Islands	0	0	200	67	
Pakistan	0	126	0	42	
Philippines	0	0	188	63	
Singapore	27	0	132	53	

South Korea	111	78	59	83	
Sri Lanka	411	371	218	333	
Syria	863	75	52	330	
Taiwan	203	0	875	359	
Thailand	2117	1462	6915	3498	
Vietnam	941	376	1427	915	
Yemen	268	99	0	122	
Total	*8654*	*24171*	*37207*	23344	19,3%
European Union					
Cyprus	44	8	0	17	
France	169	96	188	151	
Germany	8	21	1	10	
Greece	536	106	129	257	
Italy	1399	532	540	824	
Malta	0	0	12	4	
Netherlands	25	0	0	8	
Portugal	21	0	0	7	
Spain	160	15	18	64	
United Kingdom	0	1	55	19	
Total	*2362*	*779*	*943*	1361	1,1%
Africa					
Angola	27	0	0	9	
Egypt	3219	6762	4131	4704	
Ghana	639	1737	27	801	
Kenya	270	243	135	216	
Libya	462	419	269	383	
Mauritius	0	119	61	60	
Mauritania	0	0	25	8	
Nigeria	0	0	57	19	
South Africa	0	0	54	18	
Tanzania	0	0	376	125	
Tunisia	222	232	81	178	
Zaire	0	482	0	161	
Total	*4839*	*9994*	*5216*	*6683*	5,5%

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North America					
USA	0	11	166	59	
Total	*0*	*11*	*166*	*59*	0,0%
South America					
Brazil	0	1182	15613	5598	
Total	*0*	*1182*	*15613*	*5598*	4,6%
Others					
Australia	0	0	7	2	
Papua New Guinea	0	0	54	18	
Bulgaria	0	0	308	103	
Hungary	0	0	1	0	
Others	4582	1954	1458	2665	
Total	*4582*	*1954*	*1828*	*2788*	2,3%

Table D2 Oman export countries and export value
(Ministry of Agriculture and Fisheries Oman, 2009; 2013; 2016)

	Value (OMR)				
Country Group	**Year**			**Calculations**	
	2010	**2013**	**2016**	**Average Value (OMR)**	**Percentage**
GCC Countries					
Bahrain	15	66	98	60	
Kuwait	301	456	161	306	
Qatar	921	2003	1738	1554	
Saudi	9053	15621	11799	12158	
UAE	31960	40906	37462	36776	
Total	*42250*	*59052*	*51258*	50853	65,5%
Other Asian Countries					
Bangladesh	0	16424	4120	6848	
China	1311	92	2050	1151	
Fiji Islands	0	54	90	48	
Hong Kong	363	903	476	581	
India	448	16	941	468	

Indonesia	186	350	483	340	
Iran	0	1100	0	367	
Iraq	0	0	30	10	
Japan	18	47	0	22	
Jordan	286	461	44	264	
Lebanon	766	703	34	501	
Malaysia	441	379	197	339	
Maldives	0	0	9	3	
Marshall Islands	0	0	42	14	
Pakistan	0	72	0	24	
Philippines	0	0	39	13	
Singapore	33	12	190	78	
South Korea	73	47	21	47	
Sri Lanka	381	291	147	273	
Syria	940	54	0	331	
Taiwan	228	0	430	219	
Thailand	1884	1490	2056	1810	
Vietnam	1226	429	1245	967	
Yemen	364	191	1439	665	
Total	*8948*	*23115*	*14083*	15382	19,8%
European Union					
Cyprus	107	26	1	45	
France	275	149	650	358	
Germany	18	60	5	28	
Greece	1019	339	156	505	
Italy	2945	1522	1152	1873	
Malta	0	0	47	16	
Netherlands	18	0	1	6	
Portugal	26	0	0	9	
Spain	210	50	39	100	
United Kingdom	0	3	146	50	
Total	*4618*	*2149*	*2197*	2988	3,8%
Africa					
Angola	18	0	0	6	

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Egypt	2967	6733	96	3265	
Ghana	576	1394	15	662	
Kenya	176	195	38	136	
Libya	613	784	15	471	
Mauritius	0	104	67	57	
Mauritania	0	0	32	11	
Nigeria	0	0	61	20	
South Africa	0	0	11	4	
Tanzania	0	0	194	65	
Tunisia	261	394	66	240	
Zaire	0	270	0	90	
Total	*4611*	*9874*	*595*	*5027*	6,5%
North America					
USA	0	28	305	111	
Total	*0*	*28*	*305*	*111*	0,1%
South America					
Brazil	0	725	3591	1439	
Total	*0*	*725*	*3591*	*1439*	1,9%
Others					
Australia	0	0	4	1	
Papua New Guinea	0	0	11	4	
Bulgaria	0	0	63	21	
Hungary	0	0	4	1	
Others	3108	1775	565	1816	
Total	*3108*	*1775*	*647*	*1843*	2,4%

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In comparing the export value per volume for different regions some markets are regarded as heterogenous – with a large deviation from the average and the median of the respective market. The Asian market is regarded especially heterogenous.

Table D3 Oman export countries and export value per volume

	Value per volume (OMR/ton)					
Country Group	**Year**			**Calculations**		
	2010	**2013**	**2016**	**Average value per volume (OMR/ton)**	***Deviation from average***	***Deviation from median***
GCC Countries						
Bahrain	1154	1571	309	*1011*	*55%*	61%
Kuwait	534	525	338	*466*	*-29%*	-26%
Qatar	436	673	414	*508*	*-22%*	-19%
Saudi	635	683	614	*644*	*-1%*	2%
UAE	645	683	562	*630*	*-3%*	0%
Total	*3404*	*4137*	*2238*	***652***		**630**
Other Asian Countries						
Bangladesh		922	270	*596*	*-67%*	-20%
China	882	708	469	*686*	*-61%*	-8%
Fiji Islands		1000	236	*618*	*-65%*	-17%
Hong Kong	4595	29129	16414	*16713*	*838%*	2140%
India	1241	593	215	*683*	*-62%*	-9%
Indonesia	1000	649	215	*621*	*-65%*	-17%
Iran		1116		*1116*	*-37%*	49%
Iraq		0	750	*375*	*-79%*	-50%
Japan	1286	1000		*1143*	*-36%*	53%
Jordan	1277	929	512	*906*	*-49%*	21%
Lebanon	1000	978	971	*983*	*-45%*	32%
Malaysia	740	915	616	*757*	*-57%*	1%
Maldives			9000	*9000*	*405%*	1106%
Marshall Islands			210	*210*	*-88%*	-72%
Pakistan		571		*571*	*-68%*	-23%
Philippines			207	*207*	*-88%*	-72%
Singapore	1222		1439	*1331*	*-25%*	78%

South Korea	658	603	356	*539*	*-70%*	-28%
Sri Lanka	927	784	674	*795*	*-55%*	7%
Syria	1089	720	0	*603*	*-66%*	-19%
Taiwan	1123		491	*807*	*-55%*	8%
Thailand	890	1019	297	*735*	*-59%*	-1%
Vietnam	1303	1141	872	*1105*	*-38%*	48%
Yemen	1358	1929		*1644*	*-8%*	120%
Total	*20590*	*44707*	*34216*	***1781***		**746**
European Union						
Cyprus	2432	3250		*2841*	*19%*	23%
France	1627	1552	3457	*2212*	*-7%*	-5%
Germany	2250	2857	5000	*3369*	*41%*	45%
Greece	1901	3198	1209	*2103*	*-12%*	-9%
Italy	2105	2861	2133	*2366*	*-1%*	2%
Malta			3917	*3917*	*64%*	69%
Netherlands	720			*720*	*-70%*	-69%
Portugal	1238			*1238*	*-48%*	-47%
Spain	1313	3333	2167	*2271*	*-5%*	-2%
United Kingdom		3000	2655	*2827*	*18%*	22%
Total	*13586*	*20052*	*20538*	***2386***		**2319**
Africa						
Angola	667			*667*	*-19%*	-6%
Egypt	922	996	23	*647*	*-21%*	-9%
Ghana	901	803	556	*753*	*-8%*	6%
Kenya	652	802	281	*579*	*-29%*	-18%
Libya	1327	1871	56	*1085*	*32%*	53%
Mauritius		874	1098	*986*	*20%*	39%
Mauritania			1280	*1280*	*56%*	80%
Nigeria			1070	*1070*	*31%*	51%
South Africa			204	*204*	*-75%*	-71%
Tanzania			516	*516*	*-37%*	-27%
Tunisia	1176	1698	815	*1230*	*50%*	73%
Zaire		560		*560*	*-32%*	-21%
Total	*5644*	*7604*	*5899*	***820***		**710**

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North America						
USA		2545	1837	*2191*	*0%*	0%
Total	*0*	*2545*	*1837*	***2191***		**2191**
South America						
Brazil		613	230	*422*	*0%*	0%
Total	*0*	*613*	*230*	***422***		**422**
Others						
Australia			571	*571*		
Papua New Guinea			204	*204*		
Bulgaria			205	*205*		
Hungary			4000	*4000*		
Others	678	908	388	*658*		
Total	*678*	*908*	*5367*	*1128*		

The Asian market was divided in three segments in according to the export value per volume. The limits were chosen as to decrease the average deviation from an average.

Table D4 Segmentation of heterogenous Asian export market

		Value per volume (OMR/ton)				
Segment	**Country**	**2010**	**2013**	**2016**	**Average value per volume (OMR/ton)** ***per country***	**Average value per volume (OMR/ton)** ***per segment***
Low end <900 RO/ton	Philippines			207	207	
	Marshall Islands			210	210	
	Iraq			750	375	
	South Korea	658	603	356	539	
	Pakistan		571		571	
	Bangladesh		922	270	596	
	Syria	1089	720		603	
	Fiji Islands		1000	236	618	
	Indonesia	1000	649	215	621	
	India	1241	593	215	683	
	China	882	708	469	686	
	Thailand	890	1019	297	735	
	Malaysia	740	915	616	757	
	Sri Lanka	927	784	674	795	**587**
	Taiwan	1123		491	807	
	Jordan	1277	929	512	906	
	Lebanon	1000	978	971	983	

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Middle-end 900-1700 RO/ton	Vietnam	1303	1141	872	1105	
	Iran		1116		1116	
	Japan	1286	1000		1143	
	Singapore	1222		1439	1331	
	Yemen	1358	1929		1644	**1175**
High-End >9000 RO/ton	Maldives			9000	9000	
	Hong Kong	4595	29129	16414	16713	**12856**

The High-end Asian market was excluded from the analysis since it represents a small share of export and is non-comparable to the other markets. It is deemed that the value is high because of reasons related to certain species or processing methods.

Table D5 Value per volume for different export markets from Oman

Market	**Value per volume (OMR/ton)**	**Percentage (%)**
Asia: High-End	12 856	Excluded
European Union	2 386	100%
North America	2 191	92%
Asia: Middle-End	1 175	49%
Africa	820	34%
GCC Countries	652	27%
Asia: Low-End	587	25%
South America	422	18%

Appendix E: Seafood processors in Oman

Table E1 The largest 16 processing companies in Oman in 2013, their turnover and the share that this represents. (Al-Belushi et al., 2015)

	Sales turnover 2013 (OMR)	**Share of total turnover for the 16 companies (%)**
Oman Fisheries Co.	26 000 000	46%
Dhofar Fisheries Industries Co	7 200 000	13%
AlJarjoor Establishment	4 500 000	8%
Sea Pride	5 800 000	10%
Al-Ainkawi Enterprises Fisheries Division	2 500 000	4%
Al-Marsa Fisheries	4 000 000	7%
Bentout Seafood Products	500 000	1%
Al-Hamadi Fisheries Co.	1 500 000	3%
Five Oceans Co.	800 000	1%
Majan Import & Export Co. LLC	25 000	0%
Al-Moqala Establishment	1 800 000	3%
Rwad Al-Ibtikar	400 000	1%
Pelagic Fisheries Trading	500 000	1%
Al-Bahihi Fisheries Co.	1 100 000	2%
Asmak Al-Sharqyia	28 000	0%
Abu-Alawi Trading	249 219	0%
SUM	56 902 219	100%

Appendix F: Norway, Iceland and New Zealand

Table F1 Capture and Aquaculture seafood production in Norway (FAO, 2017b)

Year	Capture Production (ton)	Aquaculture Production (ton)	Total Production Volume (ton)	Aquaculture Share (%)
2003	2 548 975	584 423	3 133 398	19%
2004	2 524 464	636 802	3 161 266	20%
2005	2 392 970	661 877	3 054 847	22%
2006	2 256 413	712 373	2 968 786	24%
2007	2 378 950	841 560	3 220 510	26%
2008	2 431 371	848 359	3 279 730	26%
2009	2 524 437	961 840	3 486 277	28%
2010	1 810 620	1 019 802	2 830 422	36%
2011	1 835 126	1 143 893	2 979 019	38%
2012	1 834 573	1 321 119	3 155 692	42%
2013	2 079 938	1 247 865	3 327 803	37%
2014	2 301 609	1 332 497	3 634 106	37%

Table F2: Seafood capture production, export volume and value in Norway (FAO, 2017b)

Year	Capture Production (ton)	Export Volume (ton)	Export Value (1000 USD)	Export value per volume (USD/ton)
2003	2 548 975	2 140 081	3 669 067	1 714
2004	2 524 464	1 981 239	4 170 996	2 105
2005	2 392 970	1 996 268	4 921 788	2 465
2006	2 256 413	1 878 115	5 543 705	2 952
2007	2 378 950	2 166 849	6 290 039	2 903
2008	2 431 371	2 340 718	6 003 982	2 565
2009	2 524 437	2 581 145	7 107 237	2 754
2010	1 810 620	2 670 319	8 852 961	3 315
2011	1 835 126	2 438 246	9 484 237	3 890
2012	1 834 573	2 530 809	8 921 085	3 525
2013	2 079 938	2 467 667	10 392 246	4 211
2014	2 301 609	2 676 762	10 830 773	4 046

Table F3: Seafood capture production, export volume and value in Iceland (FAO, 2017b)

Year	Capture Production (ton)	Export Volume (ton)	Export Value (1000 USD)	Export value per volume (USD/ton)
2003	1 986 539	818 880	1 521 163	1 858
2004	1 733 702	826 267	1 782 756	2 158
2005	1 664 657	768 288	1 793 579	2 335
2006	1 327 097	675 553	1 822 671	2 698
2007	1 399 267	629 156	2 034 862	3 234
2008	1 284 034	721 023	2 207 660	3 062
2009	1 141 869	689 467	1 815 800	2 634
2010	1 060 641	639 015	1 949 340	3 051
2011	1 138 462	676 538	2 217 437	3 278
2012	1 449 587	756 151	2 204 471	2 915
2013	1 336 675	797 528	2 300 147	2 884
2014	1 076 769	664 802	2 156 878	3 244

Table F4: Seafood capture production, export volume and value in New Zealand (FAO, 2017b)

Year	Capture Production (ton)	Export Volume (ton)	Export Value (1000 USD)	Export value per volume (USD/ton)
2003	550 943	303 698	705 476	2 323
2004	545 943	340 391	843 125	2 477
2005	545 118	336 464	885 787	2 633
2006	476 884	323 467	875 883	2 708
2007	494 500	318 056	923 351	2 903
2008	453 325	283 139	896 966	3 168
2009	437 916	290 544	906 018	3 118
2010	436 172	323 649	1 078 938	3 334
2011	429 836	304 581	1 213 396	3 984
2012	440 683	330 999	1 249 990	3 776
2013	442 738	309 233	1 213 473	3 924
2014	442 097	293 940	1 252 928	4 263

Appendix G: Interview form, private sector Oman

The following questions are divided into six main areas:

1. General
2. Export
3. Company X's role in the industrial network
4. Seafood quality and safety
5. Sustainability
6. Identified challenges and opportunities

General

- General description of company
- Description of *your* role at the company

Export

- What type of seafood do you export and why?
- What do you do with the **fresh** seafood aimed for export?
- How much fresh seafood do you export?
- What countries do you export fresh seafood to and why?
- Are there any differences between the different export countries/ regions?
- Are there any countries that you have the aspiration to initiate export to?

Company X's role in the industrial network

- Who are your **suppliers**?
    - How many suppliers do you have?
    - What kind of business relationship do you pursue?
    - How much of the value chain upstream do you have control over?
- Who are your **customers**?
    - How many customers do you have?
    - What kind of business relationship do you pursue?
    - How much of the value chain upstream do you have control over?
    - When is the customer order point for fresh seafood export?
- **Other actors** in the network of which you are in contact with?
    - What kind of business relationship do you pursue?

Seafood quality and safety

- Do you perform quality and safety controls?
- Is the exported seafood subject to traceability?
- Do you place pressure/ demands on suppliers/ customers/ transporters etc. in these areas?

Sustainability

- Do you actively work with enhancing the sustainability of your operations?
    - How is this done?

Identified challenges and opportunities

This section covers the identified challenges and opportunities regarding fresh seafood export from Oman. These questions are of broad character and each interviewee will have the opportunity to answer according to their own perspectives.

- Identified challenges in fresh seafood export from Oman
- Identified opportunities in fresh seafood export from Oman

Appendix H: Interview form, public sector Oman

The following questions are divided into four main areas:

1. Statistics
2. Industrial network structure
3. Efforts taken by the Ministry of Fisheries
4. Identified challenges and opportunities of fresh seafood export from Oman

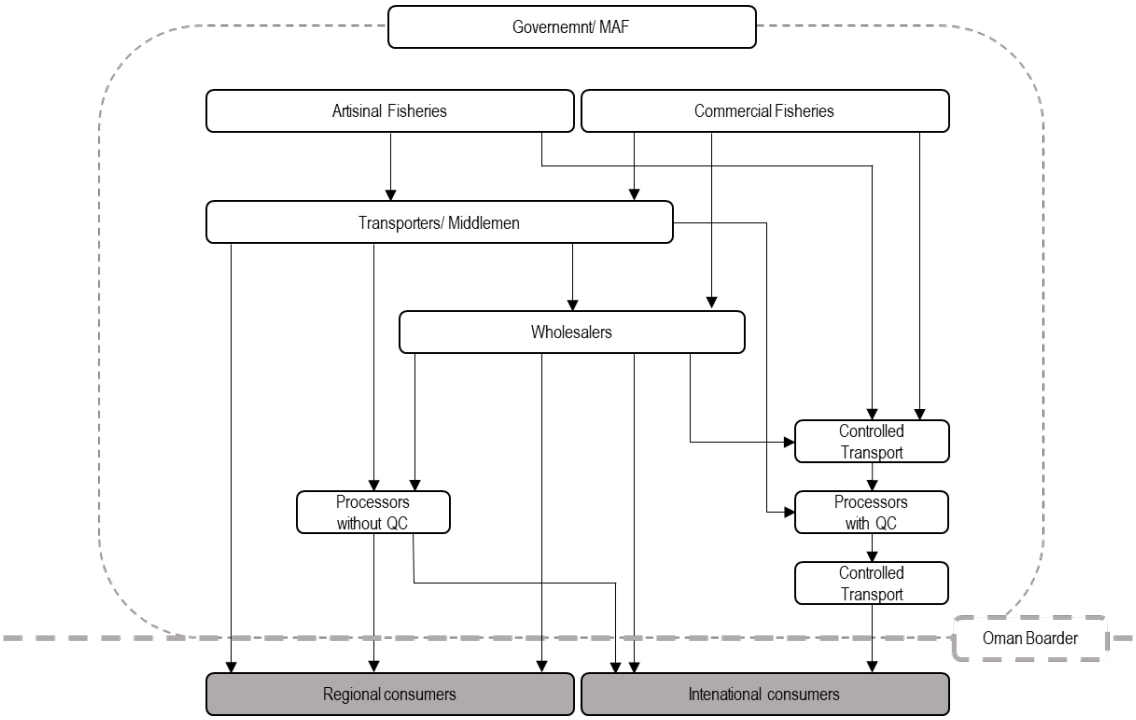
Statistics

- Production volume of seafood
  - Total production volume
  - Production volume by sector: artisanal, commercial, aquaculture
- Export of seafood in export volume (ton) and export value (USD)
  - Total seafood export
  - Export per geographical area
  - Fresh seafood share of export
- Amount of seafood that is not possible to sell to consumers, i.e. waste in the value chain

Industrial network structure for fresh seafood export

A hypothesis has been created regarding the industrial network structure for fresh seafood export by reading several articles, see below: Industrial Network Structure Hypothesis. Initially it would be of great help to get comments and confirmation on this hypothesis. This answers the question:

- What actors are present in the industrial network for fresh seafood export?



Furthermore, it would be interesting to know more about each actor in the network.

- What resources do they control and combine?
- What activities do they perform and coordinate?
- How do the actors interact in the network?

I am especially interested in three actors in the network:

- The "truckers" that transport the seafood from primary markets
- The central wholesale markets
- The government and ministry of agriculture and fisheries role in controlling the network

Efforts taken by the ministry of fisheries and agriculture's and other governmental organs

I have an interest in understanding the efforts taken by the ministry of fisheries and other governmental organs. This section is divided into four subsections; food quality and safety, marketing, training and education and sustainability.

Food quality and safety for fresh seafood to be exported

- What legislation is in place regarding seafood quality and safety?
- How is this legislation being enforced?
- Why is this approach chosen?

Marketing of Omani (fresh) seafood

- How is Omani (fresh) seafood being marketed to export markets?
- Is there any difference between different markets?

Training and education

- How are the actors in the industrial network being trained and educated?

Sustainable fisheries sector

- Is the ministry of agriculture and fisheries actively working for a more sustainable fisheries sector?
- If yes, how is this done? What approaches/areas are the most vital?
    - Depletion of seafood stocks
    - Controlling waste in the value chain
    - Improving life quality and income of fishermen
    - Etc.

Identified challenges and opportunities

This section covers the identified challenges and opportunities regarding fresh seafood export from Oman. These questions are of broad character and each interviewee will have the opportunity to answer according to their own perspective.

- Identified challenges in fresh seafood export from Oman
- Identified opportunities in fresh seafood export from Oman
- Efforts taken in further developing fresh seafood export from Oman
- What would you like to see changing?
- What is your proposal to increase the value of fresh seafood export from Oman?

Appendix I: Interview form, international experts

Background

- What are you currently working with?
- What are your previous experience from the seafood industry?

Open-ended questions

- What do you consider unique for the industrial network for export of fresh seafood?
- What is the largest difference compared to other networks?
- What challenges have you identified within the industrial network for export of fresh seafood?
- Is there any specific segment of the industrial network for export of fresh seafood that is particularly challenging?
- What approaches to the challenges have you identified in different countries?
- In your opinion: What are the success factors for fresh seafood export?
- What countries stand out? Why?
- How have these successful countries managed to exploit resource heterogeneity?
- There is a shift towards a more centralized network structure – what do you believe drives this change?
- Does technology and IT have a large impact on success rate in the industrial network for export of fresh seafood?
- What do you believe will happen in the future in the industrial network for export of fresh seafood?