Developing the e-commerce for the Seafood Industry: What Business are we Really in?

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Abstract

1. Introduction

The global production of fish increased to 177 million tons in 2016 while the per capita fish consumption has doubled since 1961 reaching 20.3 kg in 2016 (FAO, 2016). The fishery sector plays a great role in national economies as it contributes to economic growth. It is a source of nutritionally valuable foods for humans and it generates a significant amount of revenue. For instance, the export value of fish was 54 billion US dollars in 2016 while the estimated total first sale value was 362 billion in 2016 (FAO, 2016).

The increase in fish consumption is partly driven by the overall perception that consuming fish is healthy although consumers are not aware of the specific types of nutrients in fish (Verbeke et al., 2005). In the midst of the rise of non-communicable disease including cancer, diabetes and heart disease (WHO, 2013), an increasing number of health conscious consumers emerge mainly in emerging and developed countries (Chen, 2009; Jay-Russel, 2010). Evidence indicates that health conscious consumers change their consumption patterns to improve their health status (Lockie et al., 2002; Mai and Hoffmann, 2015). In light of this, there is a steady demand for fish and fish products, which will continue to grow in the coming decades (Kearney, 2010; FAO, 2016).

In Europe, total consumer expenditure on seafood amounts more than 50 billion euros with per capita consumption being 25.5 kg in 2015 (EU, 2017). Norway and Iceland are the largest producers of fishery in Europe and they constitute the major seafood exporting countries in the world. Fish consists of an important part of the diet of consumers in these two countries (islandsbanki, 2013; Norwegian Ministry of Fisheries and Coastal Affairs, 2013). The high level of consumption in essence is a reflection of the presence of a great deal of fish marketing activities in these countries.

These activities mostly take place in the traditional physical stores (personal observation). Nevertheless, in line with the increasing trend in digital marketing (Mulhern, 2009; Brynjolfsson, Hu and Rahman, 2013), there is a tendency that fish marketers use the internet as their marketing platform. In Iceland, a pre-survey market assessment indicated that fish products are sold online mainly by general online vendors such as www.nammi.is. In Norway, there are fish marketing firm selling fish online and some of them have social media presence while others have their own website where consumers can order fish products.

Reports shows that online grocery is increasing in several countries. For instance, in the US, around half of the consumers purchased goods and services online according to a research conducted by Food Marketing Institute (FMI) and Nielsen. Many European countries are also experiencing increasing activities of online grocery (Seitz et al., 2017). A notable example is the UK online grocery industry, which increased to 7.3% in 2016 from 6.9 in 2015 (McKevitt, 2017). In connection with this, the digital marketing is also thriving in the food sector as increasing number of companies operate online (Ignatius, 2011; Perrin, 2015). Evidence exists showing the majority of the foods sold online are not healthy (Freeman et al., 2014; Bragg, et al., 2017) leading to serious health problems including non-communicable diseases (WHO, 2016). Tackling this problem may require aggressive marketing of healthy foods such as fish online given that consumers spend a great deal of their time online (Perrin, 2015).

In the fish industry, online marketing can be instrumental to increase consumers' access to fish. However, this industry is lagging behind other food industries such as beef, chicken and pork because it lacks marketing strategies to win over consumers (Birkner, 2015). This is reflected by the high level of per capita consumption of beef, chicken and pork globally. Marketing firms can exploit the fish industry by devising new marketing strategies and increasing their marketing efforts to attract consumers and boost demand. This includes creating mechanisms that increase access to fish, providing clear information about the fish products including their health benefits and methods of cooking of fish meals.

This lends itself to the question: why do firms exist? This question has attracted the attention of researchers in the last several decades. The neoclassical economic theory contends that firms play a minor role as market forces determine the distribution of output and income. With perfect information and well function pricing system, allocation of resources is efficient according to this theory (Demsetz, 1997). A firm that produces and sells its products to others at a market price qualifies as a firm although it is one person's firm. In a perfectly competitive

market, this firm can increase its production efficiency by increasing total factor productivity assisted by technological progress (Davidson et al., 2018).

This is against the view of put forward in an early work by Coase, (1937). He introduced the importance of management-based resource allocation in situations where there are considerable transaction costs in the price-based market system. In his view, firms exist to accomplish such team-oriented tasks themselves without transacting with others. This is referred in the literature as *internalizing operations* or more formally as *vertical integration* (Coase, 1937; Demsetz, 1997). Managerial authority play a determinant role in planning and coordinating tasks that can lead to cost-effective resource allocation. Williamson (1975) dig deeper to show the importance of the transaction cost analysis for internalizing of operations. He noted that bounded rationality and opportunism behavior provides a compelling reason for internalizing operations in situations where the frequency of transactions is sufficiently high and the outcomes of the transactions themselves are uncertain. More importantly, he underscored that *asset specificity*, i.e. asset used for specialized purpose, is likely to cultivate opportunism behavior, thus internalizing operations is useful to control over such asset. Other economists echoed Coase's view. For example, Alchian and Demsetz, (1972), argued that team production as well as team organization could increase production efficiency by reducing the problem of shirking. This is related to the contemporary microeconomic theory which suggests that the role of management is to correct for agency problems including shirking, opportunism and reputation as discussed deeply in Demsetz, (1997). Furthermore, Teece, (1982) accentuate the importance internal organization to enhance organizational knowledge to tackle the problems of associated with information acquisition in the market. These include high transaction costs and organizational as well strategic obstacles when using the market system to oversight the process.

The theory of the transaction cost and the related contemporary microeconomic theory provide important initial assessment of the rationales for the existence of firms. Nevertheless, these theories focus exclusively on firms' production maximization in a cost-effective manner. They amplify the role of production integration within the firm to avoid contracting with others. The market system is ineffective in mediating contracts according to these theories. In so doing, they ignored to apprehend the role of marketing when discussing factors underpinning the existence of firms. This is partly related to the fact that at the time when these theories were at the forefront, mass-production was the main strategy of firms to capitalize on little competition (Levitt, 1960). While this strategy paid off for some time, the ultimate fate of several firms were closure. Why? Because they ignored the issue of *marketing.*

In modern economies, firms face fierce competition for selling their products and services. Today, mass-production is less likely to be a major issue as firms have the ability to meet supply. The level of consumers' income has increased over the last several decades. This coupled with consumers being informed about the different types of products available in the market calls for a change in firms' strategy. In other words, firms should exert efforts to focus on winning over consumers through marketing to ensure their long-term existence. This consideration has led to the analysis of the existence of firms from the marketing point of view using the theory of the marketing firm (TMF) (Foxall, 1999). The TMF provides an in-depth theoretical assessment to answer the question: why do firms exist? The main difference between the TMF and Coase's theory of transaction cost of the firm is that the former places a strong emphasis on marketing without ruling production at a firm level.

Marketing involves recognizing that consumers are the most important determinants of firms' existence. This naturally means that firms must satisfy their customers in the most profitable way by adopting customer-oriented marketing management (Foxall, 1999). Firms should devise strategies to create long-term sustained relationships with their customers while at the same time being able to attract news ones. This compels the understanding of consumers' behavior in order to meet their demands in the best possible ways that can lead to profitability as well as customer satisfaction. Consumers' behavior can be referred from their responses to what is offered by firms. More succinctly, firms create and offer marketing mixes (price, product, place and promotion) in the market place, and consumers respond to these. This implies that firms' behavior determine consumers' behavior and vice versa. The marketing mixes generated by firms serve as discriminative stimuli for consumers, which may cause rewarding or discouraging responses (Foxall, 2018). These in turn serve as discriminative stimuli for firms based on which they can create as well as modify the marketing mixes that can maximize their business interests and meet consumers' needs. Such interactions give rise to interlocking relationships (Glenn, 2004; Biglan and Glenn, 2013), which can be explained in operant behavioral contingencies of reinforcements in a contextual system (Foxall, 1999). Foxall, (1999) termed such relationships as *Bilateral contingency*. The existence of the marketing firm is thus subject to maintaining this bilateral contingency where the marketing firm is able to retain its customers and attract new ones by identifying suitable marketing mixes.

While the TMF is a useful theoretical exposition of the existence of firms, only few empirical studies investigated its relevance are (Foxall, 2015a, b; Vella 2015; Vella and Foxall, 2011). In this study, we aim to contribute to the literature by investigating the relevance of the TMF in the context of the fishery industry. The per capita consumption of fish is increasing

and it is expected that the industry will contribute thriving. It is likely that consumers seek more access to fish as an increasing number of consumers are becoming healthy conscious (ref). We utilize a unique data set that is composed of quantitative and qualitative data collected from consumers and managers of firms selling fish, respectively. As to the authors' knowledge, we are the first to investigate the TMF integrating primary data from marketing firms and consumers. While the qualitative data is collected using semi-structure interview technique, quantitative data is collected using discrete choice experiment method. The DCE is increasing used to assess consumer preference for food products (ref). In our case, the DCE is used to gather data on consumer preferences for fish products sold online, which is then explained using qualitative information from the sellers. While it is a common practice to analyze data from DCEs based on the random utility theory (McFadden, 1986), the consumer behavioral analysis model which is neatly described in Foxall, (2015b) and Foxall, (2016) is used as an overall theoretical foundation in this study.

1.2 Theoretical frameworks

1.2.1 The theory of marketing firm

Economic theory posits that firms emerge to maximize production and to reduce transaction costs (Coase, 1937). This theory has faced increasing criticism from several authors (e.g. Hudgson, 1998, 1999; Nelson and Winter, 1982; Foss and Klein, 2008). Levitt (1960) noted that those firms, which focused on mass-production with reduced cost of operation, had been exposed to failure because they ignored the essential element of their existence: *marketing*. Building upon the assessment of the Coase's (1937) *'The Nature of the Firm'*, Foxall (1999) proposed the *theory of marketing firm* (TMF) where the focus is on marketing rather than exclusively on cost effective production. The TMF does not exclude the issue of production in its entirety but it underlines that in business environments characterized by increased competition among firms and changing level of consumer demand, the existence of firms is conditional upon creating a sustained relationship with their consumers. This gives rise to customer-oriented marketing management whose ultimate goal is to realize consumer satisfaction as well as firm profitability. Customer-orientation in marketing maybe simply defined as creating conducive business environment for consumers and firms. In broad sense, this involves marketing operations that strengthen the ability of firms to retain existing consumers and attract new ones (Foxall, 1999; 2018).

From the marketing firm perspective, customer-oriented marketing management entails understanding of the behavior of customers in order to serve them in the best possible ways.

This can be analyzed using consumer behavioral analysis (CBA) (Foxall, 2018) within the framework of the Behavioral Perspective Model (BPM) (Foxall, 199072004, 2001, 2002; 2018). According to Foxall, (2018), the BPM can be illustrated using the *"three-term contingency"* which involves discriminative stimuli (S^D), response to S^D (R) which can be either a reinforcing stimulus (S^r) or a punishing stimulus (S^p). Previous experience of consumers determine their learning history, which in combination with their behavioral setting informed by S^D, form the consumer situation. This in turn determines their behavior, which can have either a rewarding or a punishing consequence in terms of utilitarian and informational reinforcements (Foxall, 2018). While utilitarian reinforcement refers to the functional benefits of the product, informational reinforcement involves indications of social status as a result of using the product.

The CBA in BPM suggests the presence of important relationships between the marketing firm and its customers: the consumers. The role of the marketing firms is to manage the consumer behavioral setting by creating and refining the marketing mixes including price, product, promotional activities as well as place of operation and distributional systems. Consumers respond to this action in a manner that rewards (reinforces) or discourages (punishes) the behavior of the marketing firms. In other terms, managerial behavior is reinforced or punished by the consumers while consumer behavior is reinforced or punished by the activities of the marketing firms. Such interactions give rise to interlocking relationships (Glenn, 2004; Biglan and Glenn, 2013), which can be explained in operant behavioral contingencies of reinforcement in a contextual system (Foxall, 1999). Foxall, (1999) termed such relationships as *Bilateral contingency*. The existence of the marketing firm is thus subject to maintaining this bilateral contingency where the marketing firm is able to retain its customers and attract new ones by identifying suitable marketing mixes. Continued literal exchange of money for obtaining the outputs of the marketing firm is an indicator of the profitable existence of the firm.

The bilateral contingency is such an indispensable element of customer-oriented marketing management that it requires extended marketing operations. In addition to identifying and managing the marketing mixes, this involves devising appropriate marketing strategies as well as gathering vital marketing intelligence. The latter is important to understand and predict consumer choices and their changing preferences. Using this information, marketing firms identify marketing mixes presented as discriminate stimuli for consumers that will initiate consumer responses. If the responses are such that they encourage purchase of the products or services, managerial behavior is rewarded with utilitarian (revenue and profits) and

informational (performance feedback, reputation) reinforcements. The purchase responses serve as stimuli for the marketing firm which will determine the evolution of the marketing mixes in the future. Generally speaking, bilateral contingency is directly linked to maximizing utilitarian and information reinforcements, which meets the interests of both the consumers and the marketers (Vella and Foxall, 2013; Oliveira-Castro, Cavalcanti and Foxall, 2015). The following figure depicting bilateral contingency is adopted from Foxall, (2018).

The TMF is analyzed in various case studies (e.g. Xiao and Nicholson, 2010; Vella and Foxall, 2011a, 2011b, 2013; Foxall, 2014, 2015). In this paper, we use the TMF to analyze the managerial and consumer behavior in the food sector. Specifically, we consider the fish industry in the context of online marketing. As to our knowledge, this is the first study that analyzes the TMF in the online marketing of healthy food products, thus making important contributions to the food as well as to the e-commerce literature.

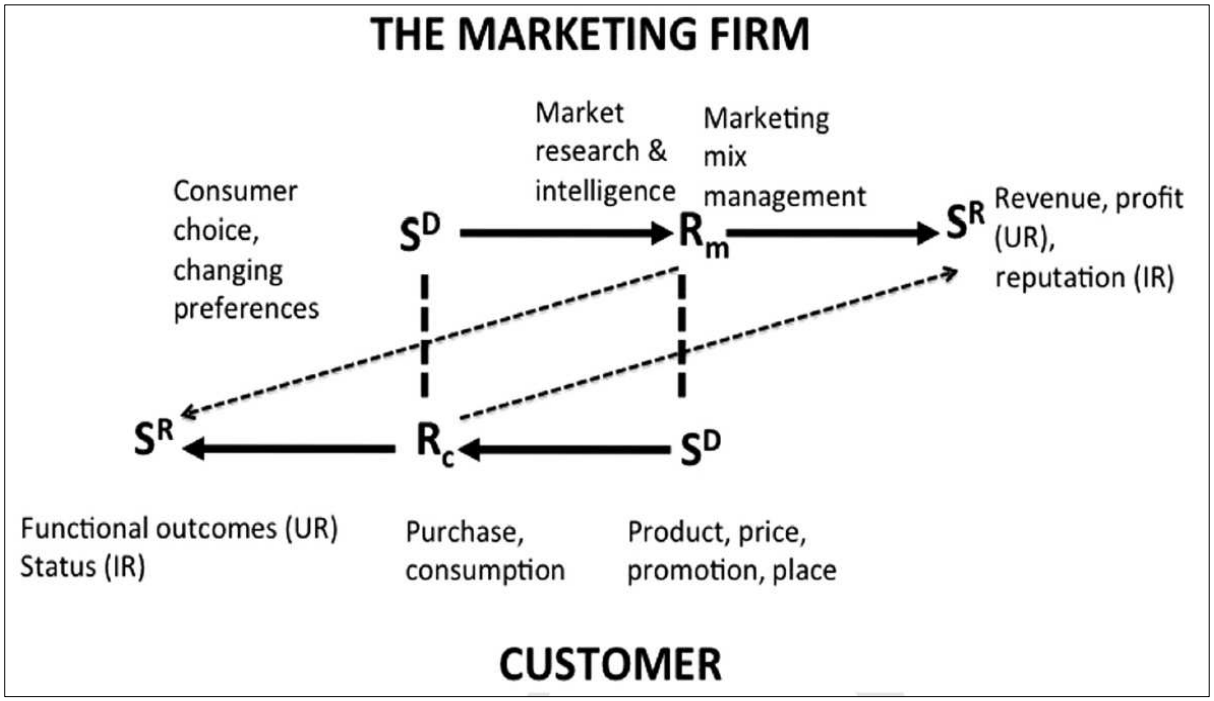

Figure 1: Bilateral contingency between the marketing firm and the customer. Source: Foxall, (2018). An economic psychology of the marketing firm. In: Lewis, A. (Ed.) The Cambridge Handbook of Psychology and Economic Behavior (pp. 365—402).Cambridge: Cambridge University Press.

1.2.2 Discrete choice experiment

Discrete choice experiments (DCEs) involve questionnaire-based surveys where consumers are asked to make choices among bundles of alternatives built up by various attribute levels.

Despite their origin in marketing, they are increasingly used in various fields of studies to assess consumer preferences and willingness to pay for products and services (Alemu and Olsen, 2017). DCEs have a unique feature in that they provide choice scenarios that resemble consumers' choices in the actual market (Adamowicz, Boxall, Williams and Louviere, 1998; Gracia, 2014). This facilitates consumers' understanding of the overall choice process. DCEs utilize two popular theories as their theoretical foundation. The first is the Lanca*sterian theory of utility* that states that consumers obtain utility from the specific attributes of a product rather than from the product per se (Lancaster 1996). The second one is the *random utility theory* (McFadden, 1986) which postulates that consumers' utility cannot be fully observed by analysts. In other words, *utility* involves a latent construct because it comprises of not only an observable component, but also an unobservable component. The former represents the choices made by consumers while the latter includes any remaining factors that may influence choice behavior. Suppose an individual chooses an alternative q among a given bundle of alternatives Q in choice situation t. Her/his utility U from this choice can be represented as a linear in parameters utility expression as follows:

$$U_{nqt} = \beta_n X_{nqt} + \varepsilon_{nqt} \qquad (1)$$

Here, the observable components, i.e. the attributes of the product in question and other explanatory variables including the socio-demographic characteristics of consumers, are denoted by X_{nqt}. The unobservable components are represented by the error term, ε_{nqt}. The impacts of the different variables in X_{nqt} on U are referred from β_n, which represents a vector of their estimated coefficients. The product of X_{nqt} and β_n gives the deterministic part of utility which is usually represented by V_{nq}.

The presence of the error terms in the utility function compels the specification of probabilistic models to make predictions of individual choices.

$$P_{nq} = \begin{pmatrix} U_{nq} > U_{ng}, \forall q \neq g \\ V_{nq} + \varepsilon_{nq} > V_{ng} + \varepsilon_{ng}, \forall q \neq g \\ \varepsilon_{nq} - \varepsilon_{ng} < V_{ng} - V_{nq}, \forall q \neq g \end{pmatrix} \qquad (2)$$

Equation (2) states that a respondent n chooses alternative q if the utility, U_{nq} she obtains from this alternative is greater than the utility, U_{ng} from alternative g. In other words, for q to be chosen, the difference between the error terms should be less than the difference between the

deterministic parts of the utility for all q different from g. Estimation requires the specification of the cumulative distribution of the function in equation (2) over the density of the error terms.

$$P_{nq} = \int_{\varepsilon} I\left(\varepsilon_{nq} - \varepsilon_{ng} < V_{ng} - V_{nq}, \forall q \neq g\right) f(\varepsilon_n) d(\varepsilon_n) \quad (3)$$

Different models can specified depending on the assumptions placed on the distribution of the error terms. Assuming an independently and identically distributed (*i.i.d*), i.e. Gumbel distributed or type I extreme value gives rise to a logit model (Train 2009). The logit model maintains the *Independence from Irrelevant Alternative* (IIA) assumption, which restricts the flexibility of the substitution patterns between alternatives (Train 2009). In addition, the logit model with *i.i.d.* assumes homogenous preference across individuals. In actual situations, these assumptions can be violated. Other modelling approaches, which relax these assumptions, were proposed (Ben-Akiva and Lerman 1985; McFadden and Train 2000; Hensher and Greene 2003; Train 2009). These include, among others, mixed logit (MXL) models, latent class (LC) models as well as integrated choice and latent variable (ICLV) models. In the MXL model, preference heterogeneity across individuals can be captured by specifying random parameters for which means and standard deviations are estimated. This can be referred to as a random parameter logit (RPL) model. Additionally, an error component (EC) can be specified representing a potential correlation between choice alternatives. The combination of the RPL and EC models can also be used as proposed by Scarpa et al. (2005) and Scarpa et al. (2007).

2. Data and methods

2.1 Data description

We developed two different questionnaires to collect qualitative and quantitative data in Iceland and Norway. The former was collected from managers selling fish while the latter from consumers. Prior to the main survey, the questionnaires were tested by a group of students and experts. They were updated and improved based on incoming feedback in such a way that questions deemed to be irrelevant were excluded while important ones were included. In addition, the feedback was used to ensure the questions were cognitively easy to understand.

2.1.1 Qualitative data

A questionnaire was developed to collect qualitative data from managers selling fish. Generally, two types of questions were included in it: 1) motivation of managers to sell fish online, their awareness of online marketing in the fish industry, their perception of the market share of online marketing in the fish industry, 2) factors and tasks that make their firms

profitable including issues related to research and market intelligence, marketing mixes, and interaction with existing customers and identifying new ones. Table 1 provides the overview of the main questions.

Table 1: Overview of the qualitative questions

Question category	Key questions
Online marketing in the fish industry	− Do you sell fish online? − Why did you choose to sell fish online? − Do you want to sell fish online? Why? − Do you have a social media page? Why? − Do you know other Icelandic fish stores selling fish online? − Do you know fish stores outside Iceland selling fish online? − Do you think online marketing in the fish industry in Iceland, or at least interest in it, is increasing or decreasing? Why do you think so?
Marketing operations	− If you sell fish online, what are the primary marketing tasks of your firm in order to be profitable in online marketing of fish? − If you are not currently selling fish online but would like to sell in the future, how do you learn about your markets? What market research or market intelligence is being done? Why? − How do you decide what fish products to sell online and how do you price them? How do you promote the products, and how do you select your placement? Placement being the location of the store in the country and the distributional strategy. − If you are currently selling fish online, how do customers place orders to buy your fish products online? If customers have several options of order placement (e.g. email, online basket, etc.), why do you devise these options?
Customer choice and preference	− What do you think are the main attributes for customers when they buy fish in both traditional store and online. Are there differences in these attributes? What are the differences?
Customer-oriented marketing management	− What do you do in order to retain your customers and attract new ones? − Do you provide information related to the health benefits of consuming fish to customers? If so, in what ways do you do so?

Information regarding the motivation of managers to sell fish online provides important insights into the drivers of online marketing in the fish industry. Managers' responses to their

awareness of and perception of such markets gives an indication of their interest in online marketing. Consumer-oriented marketing management is a key aspect of the theory of marketing firm. A profitable existence of firms is subject to their relationship with customers. Firms whose primary aim is satisfying customers and fulfilling their needs by devising and modifying marketing mixes can create a sustained relationship. In others words, both the firms and their customers coexist if they maximize their utilitarian and informational reinforcements. These are revenue and reputation maximization for managers, and consumption and social status maximization for consumers. Qualitative information from managers regarding the factors and tasks that make their firms profitable can unlock our understanding of whether firms adopt customer-oriented marketing management. This can be achieved by asking managers how they determine the types of products to sell online, how they promote the products, how they price them and how they select placement including distribution of products. Additionally, how they interact with existing customers and how they identify news ones, and finally what kind of information they give to their customers can be used to assess the marketing strategies of fish selling firms in terms of customer-oriented marketing management.

Based on convenience sampling procedure, xx managers were interviewed face-to-face in Iceland and Norway. The respondents are retail and store managers selling fish as well as managers of companies related to online sales of food including fish products.

2.1.2 Quantitative data

A second questionnaire was developed to quantitative data from consumers. It has four parts. The first part is dedicated to the DCE questions. The second part contains questions regarding consumers' experience with purchase and consumption of fish, source of information about fish and experience with and attitude towards giving and reading customer reviews. The third part presents questions on consumers' perception of how others see eating fish in their households, in their surroundings, and in their country using a five-point Likert scale ranging from very negative to very positive. The fourth section asks consumers of their demographic and socio-economic information.

Before designing the DCE, we selected the type of fish. Pre-survey market assessment reveal that *Haddock* is the most consumed fish in Iceland whereas Cod is one of the common fish in Norwegian diets. This information was necessary as we intended to produce a market scenario that resembles the real market situation. The next step was identifying relevant attributes and their levels for our DCE concerning choices of fish products sold online. Based

on extensive literature review as well as expert discussions, we identified five attributes. These are product type, production method, order placement, health claim and price.

The *product type* attribute was included in the DCE because consumers face different types of fish in the markets including whole fish, fish steak, fish fillet, smoked fish, chilled fish, dried fish, fried fish, frozen fish and fresh fish. We conducted our own pre-survey market assessment to identify the most popular fish products. we found that fresh fish, frozen fish and smoked fish are the most popular ones both in Iceland and Norway. Dried fish is also popular in Iceland but it was excluded from the DCE, as it is very expensive. A number of studies take this attribute into consideration when assessing consumer preferences for fish products (e.g. Jaffry et al. 2004; Roheim et al. 2011; Nguyen et al. 2015; Bronnmann and Asche 2016; Darko et al. 2016). This attribute constitutes the *product* element of the marketing mixes. It is in the interest of the marketing firm to know which type of fish products increase consumers' utility because consumer choose the ones that maximize their utilitarian reinforcements. Put differently, marketing firms are likely to seek intelligence (information) on the most profitable way of designing and presenting the fish product to consumers. This can be addressed by investigating consumer preferences for fish different fish products in the context of the behavioral perspective model.

Reports indicate that capture fish production is no longer able to meet the increasing global demand for fish as it already reaches its production potential (Subasinghe et al., 2009; FAO, 2016). In this regard, the importance of aquaculture, i.e. farming fish, is enormous. Researchers investigated consumers' responses to farmed versus wild caught fish. The results of most of the studies show that consumers prefer the latter to the former (see Rickertsen et al., 2016 for review). However, such evidence is scanty in the e-commerce setting. Therefore, it is imperative that we extend this line of research by investigating the influence of production method on consumer preferences (utilitarian reinforcement) for fish sold online. This attribute represents the *product* element of the marketing mixes, and information in terms of preference estimates provide vital intelligence for marketing firms. The behavioral perspective model will be employed as a theoretical framework in the analysis.

The objectives of this study is to investigate managerial and consumer behavior in the e-commerce setting. The results are expected to provide important insight into online marketing in the fish industry in comparison to the traditional marketing in brick and mortar shops. This is addressed by identifying an e-commerce attribute, namely *order placement.* The possibility of ordering products without physically visiting shops is the unique feature of e-commerce. It is, thus reasonable that this attribute is included in our study which is concerned with consumer

preferences for fish products sold online. Menon and Sigurdsson (2016) assessed the role of this attribute in their study on the importance of social media marketing but not in the context of fish products sold online. This attribute is part of the marketing mixes because it represents the *place* element. It has four levels, which are via online website, by telephone, by email and in a physical store. The results are expected to generate important information related to the relative importance of each level. Marketing firms can utilize this to devise order placement strategies that can fulfil consumers' desire and increase their market shares. Our theoretical framework will be the behavioral perspective model.

Different types of claims have been used in promoting and selling products in different markets. For example, one can find nutritional claim (e.g. contains nutrients), health claim (e.g. supports bone density), risk reduction claim (e.g. lowers the risk of heart disease), production claim (e.g. from aquaculture), and environmental claim (e.g. carbon zero). Putting claims on consumer products including food products is believed to increase the competitive advantage of marketing firms because it has a likelihood of inducing trust between the firms and their customers. The role of claims in consumer preferences for food products has been investigated by several authors (see e.g. Hu et al. 2012; Loose et al. 2013; Risius et al. 2017) but this has not been the case in the context of fish products partly due to the belief that fish is generally healthy. Our research will provide a firsthand information in this regard. We identified an attribute called *health claim* to assess its role in driving consumer preferences. If it turns out that consumers attach high preference on this attribute, marketers can easily increase their market share by simply using this claim on their fish product packages. This attribute makes up the marketing mixes by representing the *promotion* element. The health claim will be read to consumers as *"eating fish contributes to the normal function of the heart"*. It is approved by the EU (EU register on nutrition and health claims EU No. 432/2012) which makes it lawful for marketers to adopt it.

The final attribute is the *price* attribute. It is an important monetary attribute, which will be used to calculate willingness to pay (MWTP) for the qualitative attributes of the fish product in question. We identified four levels of price, which is informed by pre-survey real market assessment. In the context of the theory of marketing firm, price is one of the marketing mixes, and understanding consumers' sensitivity to price is the central element of customer-oriented marketing management. We can infer the consumer sensitivity from the estimated price parameter in the choice model. It is a common practice in the literature to include the price attribute in DCE studies involving consumer valuation of quality attributes (non-price attributes). All the attributes and their levels are presented in table 1.

Table 2: attributes and their levels

Attribute	**Level**	**Coding**
Price	Iceland (350, 450, 550, 650), Norway (50, 60, 70, 80)	Continuous
Product form	Fresh fish	Dummy
	Frozen fish	Dummy
	Smoked	Reference
Production method	Farm-raised	Dummy
	Wild-caught	Reference
Order placement	Via online website	Dummy
	Telephone	Dummy
	Email	Dummy
	In a physical store	Reference
Health claim present	Yes	Dummy
	No	Reference

We produced the DCE design using the SAS macro as described in Kuhfeld 2010. The smallest orthogonal design contains 48 choice sets, which were blocked into six, so each respondent get eight choice sets (see an example of a choice set in figure 1). Each of them contains four alternatives of fish product. Respondents can choose one of these alternatives or the 'none of these' alternative. Inclusion of this option is likely to resemble the actual market situation where consumers can opt out not to buy products (Lusk and Schroeder 2004). Respondents were provided with a description of the product in question as well as its attributes and levels before they answer the DCE. The overall choice procedure was explained to respondents using a subject instruction in line with, e.g., Alemu and Olsen, (2018). Due to the hypothetical nature of the study, consumers know that they will not make real payment in which case they pretend to be willing to pay a high price. One way to address this is to use a *'budget reminder'* that reminds their budget constrain when they make choices (e.g. Mørkbak et al., 2014).

2.2 Data collection

The qualitative data was collected from managers of firms selling fish using semi-structured interviews. A total of ten managers in Iceland and three manager in Norway provided complete responses to the different questions. The quantitative data was collected from consumers using internet survey mode. The questionnaires were distributed online in Iceland and Norway, and completed questionnaires were returned from 150 consumers from each country. The sample was randomly drawn from students varying education level, age and gender. Table 2 provides a summary of the characteristics of respondents.

2.4 Data analysis

2.4.1 Quantitative data analysis

As indicated above, we analyze the data using the random utility theory as a theoretical foundation. An individual's *n* utility *U* from choosing an alternative *q* among a given bundle of alternatives *Q* in choice situation *t* can be represented as a linear in parameters utility expression as follows:

$$U_{nqt} = \beta_n X_{nqt} + \varepsilon_{nqt} \qquad (4),$$

where β represents the estimated coefficient of the attribute levels in X_q, and ε_{nqt} is the a Gumbel-distributed error term. We employed a mixed logit model to capture preference heterogeneity by specifying random parameters, which vary across individuals. This leads to a formulation of a random parameter logit model (RPL) (Train, 2009). Following equation (2) and (3), the probability that individual *n* chooses alternative *q* in choice situation *t* can be expressed as:

$$P_{nqt} = \frac{e^{\beta_n X_{nqt}}}{\sum_q^Q e^{\beta_n X_{nqt}}} \qquad (5),$$

which is the standard conditional logit model. The RPL model can be specified by taking the integral of this model over the density of β to satisfy the random nature of the estimated parameters. This leads to:

$$P_{nqt} = \int \left(\frac{e^{\beta_n X_{nqt}}}{\sum_q^Q e^{\beta_n X_{nqt}}} \right) f(\beta) d\beta \qquad (6)$$

The random parameters in β consist of the mean and the standard deviation which are assumed to be normally distributed. Significant standard deviation indicate consumer preferences are heterogeneous. We estimated this equation based on the maximum likelihood procedure (see Train, 2009) using 300 Haltom draws.

The RPL model fails to capture preference heterogeneity across segments of consumers as some consumer may have homogenous preferences within a group but heterogeneous across groups. Latent class (LC) models are suited to serve this purpose (see Boxall and Adamowicz, 2002 for detailed discussion). In the LC models, consumers are grouped into different latent groups described by their socio-demographic characteristics and attitudinal information. The

utility expression in equation (4) can have two components that include the choice model and class membership model. Based on the logit model specification with Gumbel-distributed error term, the LC model for *S* classes can be specified as:

$$P_{nqt} = \sum_{s=1}^{S} \left(\frac{e^{\gamma_s' Z_n}}{\sum_{s=1}^{S} e^{\gamma_s' Z_n}} \prod_{t=1}^{T} \frac{e^{\beta_s' x_{nqt}}}{\sum_{j}^{J} e^{\beta_s' x_{nqt}}} \right) \quad (7),$$

where γ_s' denotes the class-specific vector of estimated parameters, and Z_n represents the individual characteristics. We estimated this equation using the maximum likelihood framework as discussed in Boxall and Adamowicz, (2002).

2.4.2 Qualitative data analysis

In terms of qualitative data analysis, responses from the semi-structured interviews of managers are analyzed using a thematic analysis approach (Braun and Clarke, 2006). This approach is useful for identifying themes in qualitative data that involve written texts as well as recorded and transcribed audios. In our case, managers' responses were handwritten while simultaneously being audio recorded. They were thoroughly checked in order to identify any mismatch in their contents. Relevant information in relation to the objective of the research was extracted by reading the transcripts repeatedly. This was followed by identifying themes and ensuring that they do not overlap among them. This was necessary to ensure that themes form coherent pattern with clear distinctions.

3. Results

3.1 Quantitative results

3.1.1 Consumers' experience with purchase and consumption of fish

Around 90% of the consumers in our survey stated that they consume fish with most of them consumed it in the last four weeks. When asked how often they consumed fish in the last 12 months, most consumers responded once a week, more than once a week and two to three time a month (see figure 1). When asked the reasons for eating fish, most consumers referred to the good taste of it while others indicated that it is good for mental and heart health, the whole family likes it, it helps to reduce body weight and a combination of these (see figure 1). Results from the survey also show that most consumers eat fish because it tastes good, it good for mental and heart health.

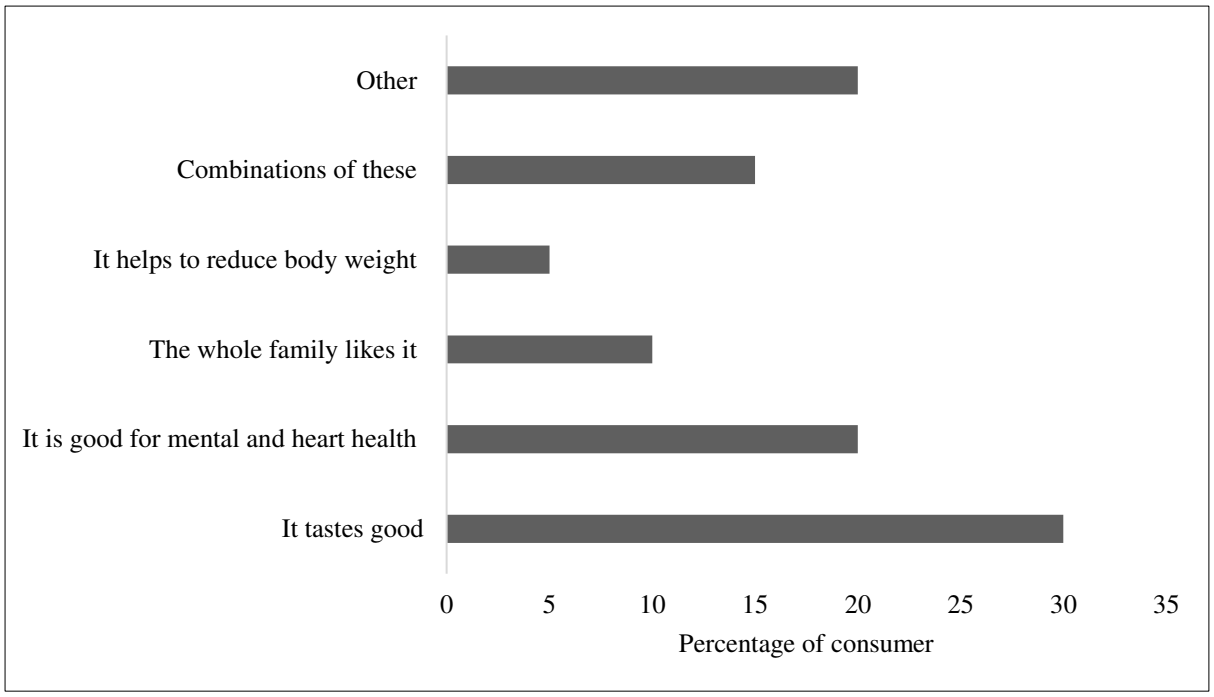

Figure 1: Reasons for consuming fish

Regarding experience with purchase of fish, almost no consumers, who participated in our survey, purchase fish online. Consumers responded that they do not know it was possible to purchase fish online. However, a third of them said they would like to purchase fish online today and almost half of them in the future. It can be imperative to understand consumers' responses in relation to the benefits of purchasing fish online. As can be seen in figure 2, 35% consumers indicated that it saves time whereas 15% and 10% of them answered that it is easy to place orders and it is easy to compare prices, respectively. Elsewhere, results reveal that 60% f the consumer get information about fish from personal sources including family, friends and fish dealers. Other get such information from internet browsing, mass media (Television, Radio, Newspaper, and Magazines) and social media (Facebook, Twitter, and Instagram).

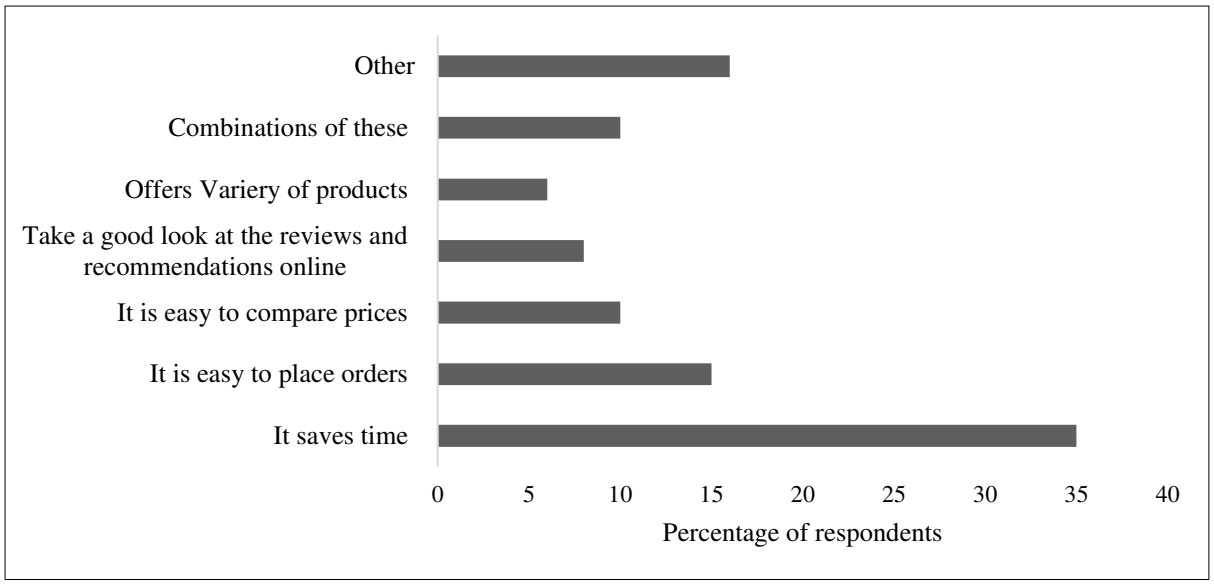

Figure 2: Benefits of purchasing fish online

3.1.2 Estimation results

The estimation results from CL and RPL models are reported in Table 3 whereas those from the LC model are presented in Table 5. The RPL model has better model performance than the CL model when looking at the log-likelihood values. This is explained by the fact that unlike the latter, the former captures heterogeneity in consumer preferences. The significant standard deviation estimates of the random parameters corroborate the preferences of heterogeneity across consumers. Failure to account for this leads to downward bias in the estimated parameters in the CL model. The estimated coefficient of the *price* parameter is negatively significant in consistent with economy theory. The estimates coefficients of the random parameters indicate that consumers prefer fresh and frozen fish to smoked fish when considering the product form attribute. Concerning production method, wild-caught fish is preferred over farm-raised fish. Consumers have negative preferences for order place methods including via online websites, by telephone and by email as compared to purchasing in physical stores. The preference for fish products packed with health claim is positively significant. Overall, consumers have the highest preference for fresh fish followed by fish with health claim present. We report the marginal WTP from the RPL model in Table 4.

Table 3: Estimation results CL and RPL models

	CL model	RPL model
Parameter	Estimate	Estimate
		Fixed parameters
Price	-0.112 (0.017)***	-0.157 (0.025)***
		Random parameters
Fresh fish	1.054 (0.068)***	1.892 (0.180)***
Frozen fish	0.130 (0.048)***	0.593 (0.183)***

Wild-caught fish	0.541 (0.062)***	0.792 (0.124)***
Order via online website	-0.641 (0.078)***	-1.277 (0.181)***
Order by telephone	-1.066 (0.089)***	-2.053 (0.191)***
Order by email	-0.943 (0.084)***	-1.768 (0.167)***
Health claim present	0.811 (0.065)***	1.124 (0.144)***
Standard deviation of random parameters		
Fresh fish		1.790 (0.181)***
Frozen fish		1.614 (0.170)***
Wild-caught fish		1.249 (0.143)***
Order via online website		1.659 (0.183)***
Order by telephone		1.480 (0.269)***
Order by email		1.062 (0.190)***
Health claim present		1.462 (0.160)***
Log-likelihood	-2096.2	-1764.5
Choice observations	1528	1528

Table 4: Marginal WTP estimates from the RPL model

WTP for	Estimate (95% confidence interval)
Fresh fish	1200*** (845 – 1563)
Frozen fish	377*** (151 -603)
Wild-caught fish	504*** (305 – 703)
Order via online website	-813*** (-1147 – (-478))
Order by telephone	-1307*** (-1772 – (-841))
Order by email	-1125*** (-1536 – (-714))
Health claim present	716*** (457 – 974)

Results from the LC model are presented in table 5. The optimal number of classes has been chosen by estimating up to nine classes. The log-likelihood and the adjusted *R-squared* values improve as the number of classes increases suggesting the existence of multiple classes. We select a LC model with five classes based on the BIC and AIC statistical information criteria.

The results reveal that heterogeneity in consumer preferences exist at group level justifying the application of the LC model. Results from the class membership model show that a consumer belongs to class 1, class 2, class 3, class 4 and class 5 with a probability of 36.2%, 26.1%,15.2%, 12.9% and 9.6%. The first class (36.2%) contains consumers who are likely to focus on all the product attributes of the fish as compared to consumers in other classes. They have strong preference for wild-caught fish, which is either fresh or frozen as well as packed with health claim. They would purchase it online. The second class (26.1%) is allocated for consumers who strongly prefer shopping in physical stores as they have very high negative preferences for order placements via online website, by telephone and by email. Taste is the main driver of their purchase decision, which might explain their preference for fresh and wild-caught fish. The third class (15.2%) is associated with fresh fish preferring consumers with the highest preference for fresh fish as compared the other classes. These consumers are also willing to purchase fish online and they eat fish for its taste. The fourth class (12.9%) contains

consumers with positive and significant preference for ordering fish via online website. These consumers are characterized as male who responded that they would purchase fish online because it is easy to place order. The fifth class (9.6%) represent consumers with insignificant preferences for all attributes but price. The absolute value of the coefficient of the price parameters is the highest among the classes suggesting that they focus only on the price attribute when making choice decisions.

Table 5: Estimation results from LC model

	Class 1	Class 2	Class 3	Class 4	Class 5
	Product attributes conscious consumers	Consumers content with shopping in physical stores	Fresh fish preferring consumers	Consumers content with shopping online	Price conscious consumers
Choice model					
Fresh fish	2.302 (0.262)***	1.046 (0.236)***	2.911 (0.433)***	0.074 (0.221)	3.166 (2.213)
Frozen fish	1.718 (0.212)***	0.349 (0.214)	-0.363 (0.830)	-0.191 (0.2223	-1.299 (3.874)
Wild-caught fish	1.116 (0.169)***	0.614 (0.187)***	0.643 (0.276)***	0.013 (0.189)	-3.945 (3.622)
Order via online website	-0.395 (0.191)***	-2.067 (0.246)***	-0.245 (0.342)	0.661 (0.249)***	-7.181 (5.481)
Order by telephone	-1.029 (0.237)***	-2.614 (0.277)***	0.491 (0.333)	-0.509 (0.301)*	-6.115 (5.262)
Order by email	-0.678 (0.189)***	-3.416 (0.575)***	0.007 (0.303)	-0.214 (0.284)	-5.314 (4.921)
Health claim present	1.643 (0.250)***	0.149 (0.179)	1.145 (0.322)***	0.508 (0.203)***	3.794 (3.083)
Price	-0.116 (0.050)***	0.039 (0.042)	-0.398 (0.089)***	0.090 (0.050)*	-1.391 (0.683)**
Class membership model					
Constant	0.869 (0.524)*	0.998 (0.504)**	-0.800 (0.820)	-0.689 (0.733)	
Gender[a]	-0.535 (0.589)	-0.875 (0.600)	-0.588 (0.699)	-1.699 (0.787)**	
Purchase_online[b]	2.133 (1.035)***	0.572 (1.139)	3.587 (1.208)***	3.678 (1.163)***	
Tastes_good[c]	1.496 (0.804)*	1.739 (0.807)***	1.684 (0.931)*	0.566 (1.005)	
Order_online[d]	0.956 (1.072)	0.638 (1.111)	0.869 (1.261)	2.436 (1.164)**	
Class probability in %	36.2	26.1	15.2	12.9	9.6
Log-likelihood	1614.2				
Adjusted R-squared	0.421				
#choice observations	1520				

Note. a = Gender is equals 1 if female, 0 otherwise.

b dummy variable representing whether consumers would purchase fish online.

c = a dummy variable representing whether consumers purchase fish because it tastes good.

d = a dummy variable representing whether consumers would purchase fish online because it is easy to place orders.

3.2 Qualitative results

In this section, we present results from the qualitative data analysis. In total, eight managers of firms selling fish in Iceland were interviewed. The average duration of the interview was 18 minutes. In terms of the size of the firms, five of them were medium whereas three were large and one was small. The results from the semi-structured interview are presented in table 4.

Except supermarkets, most managers of fish stores indicated that they do not sell fish via online website directly as the e-commerce business in the fishery industry is yet to develop in Iceland. For example, a manager small-sized firm said: *"We don't actually sell fish online, but all of our infrastructure is built towards being able to do that…there are a lot of things we need to clean up on our side before we can actually start exporting fish directly to consumers…"* Other managers express their willingness to sell fish online in the future with a manager of a medium-sized firm stating: "…we might actually establish startups, and be a part of a team that operates and owns a startup like that." Referring back to the results from the quantitative analysis, most consumers did not purchase fish online and their preferences for the *via online website* order placement attribute level is negative. The results from the qualitative analysis can explain this in that consumers lack such purchase experience, as firms selling fish online are yet to emerge in Iceland. Regarding consumer-oriented marketing management, managers emphasized the importance of maintaining consumer satisfaction. A manager of medium-sized firm said: *"We try to give people good customer service, we try to keep the price low, and keep good quality…we have weekly offers, and we have a big selection…"* (Manager of medium-sized firm). In addition, managers indicated that providing fresh fish with great quality is an important factor in marketing in the fishery industry. Here, a manger of medium-sized firm said: *"Fresh fish, like new...in the store, people like that it is good looking, and that there are difficulties with the online store…there is a certain wait*." Another manager was quoted as saying: *"…more people buy in stores and see what they get…people want to buy instantly…" (Manager of medium-sized firms).* Again relating this to the results from the quantitative results, consumers have strong preference for the *fresh* fish attribute level, which seems to be realized by the managers. Provision of information especially related to health can also can also be a useful strategy in customer-oriented marketing management. This is exemplified by a statement from a manager of small-sized firm: *"Health and clean eating…"* are the main attributes for consumers when they shop fish. This corroborates the results from

the quantitative analysis that revealed that fish products that have *health claim* attribute are preferred by consumers to those products without.

Online marketing operation including marketing research and intelligence, marketing mix management and marketing strategy in the fishery industry was also the focus on the qualitative analysis. Managers pointed out marketing research as part of their marketing operation to establish business in this sector. In this regard, a manager of a medium-sized firm stated: *"I would probably do some research, and see how other are doing it, and go that way..."* In terms of marketing mix management, promotion, place, product and price constitute the main elements of mangers' responses. A first example is here is the response of a manager of medium-sized firm: "XXX is promoting online stores….half of that is advertised online over the weekend…." (Manager of medium-sized firm). A second example is the responses of managers of medium- and large-sized firms: "Getting the fish on good price online...communicate product getting quality….", "..when you go online convenience is number one …it needs to be easy, secure, safe…it needs to be simple, fast, easy to execute the order itself…", respectively. Another important aspect in marketing is the issue of transaction cost. During the semi-structured interview, managers responded that if they are going to sell fish online, they would likely to work with other firms. For instance, a manager of a medium-sized firm said: *"if going online, we would use a company…"* Such interaction with other firms is likely to increase horizontal integration as the firms seeks to outsource some of the marketing operations to an external actor.

Table 3: Emerging themes from the managers' responses to online marketing in the fishery industry in Iceland

Category	Sub-category	Illustrative quotes
Online marketing in the fishery industry	Selling fish via online website	"No, but we do take phone calls and email order" (Manager of medium-sized firm) "We don't actually sell fish online, but all of our infrastructure is built towards being able to do that…there are a lot of things we need to clean up on our side before we can actually start exporting fish directly to consumers…" (Manager of small-sized firm).
	Social media presence	"Yes, we use all platforms…Twitter, Instagram, and Facebook. Instagram and Facebook are the main platforms we use for targeting and consumer messaging." (Manager of small-sized firm).
	Willingness to sell fish online	"Indirectly yes, we might actually establish startups, and be a part of a team that operates and owns a startup like that." (Manager of Medium-sized firm).
	Awareness and perception selling fish online	"I know, at XXX website you will find lots of fish in Iceland." (Manager of medium-sized firm). "I think the interest in online marketing in the fishery industry is definitely increasing and everyone is curious about it…I think what I saw needs to do is to go much deeper in understanding what it means what is online marketing of online seafood..." (Manager of large-sized firm)
Marketing operations for profitability	Marketing mix management	"XXX is promoting online stores….half of that is advertised online over the weekend…." (Manager of medium-sized firm). "Getting the fish on good price online...communicate product getting quality…." (Manager of medium-sized firm). "..when you go online convenience is number one …it needs to be easy, secure, safe…it needs to be simple, fast, easy to execute the order itself…" (Manager of large-sized firm)
	Market research and intelligence	"I would probably do some research, and see how others are doing it, and go that way…" (Manager of medium-sized firm).
	Marketing strategy	"Our strategy and our status strategy has been to be as close the consumer as possible…" (Manager of large-sized firm)
	Transaction cost	"Unknown at the moment, would have to outsource to make it high quality, use professionals…" (Manager of medium-sized firm). "…if going online we would use a company…" (Manager of medium-sized firm) "No, enough business through the _. To do it online [we'd have to] associate with foreign countries, and use an extra man to do so, so not…" (Manager of medium-sized firm).
Customer choice and preferences	Main attributes for customers	"Fresh fish, like new...in the store, people like that it is good looking, and that there are difficulties with the online store…there is a certain wait…" (Manager of medium sized firm).

		"I think convenience must be one of the greatest attributes…I believe quality will play a big role as well" (Manager of medium-sized firm). "Health and clean eating…" (Manager of small-sized firm). "…more people buy in stores and see what they get…people want to buy instantly…" (Manager of medium-sized firms).
Customer-oriented marketing management	Customer retention and identifying new markets	"Try to not go over price limit, because people have tools to compare…have a really good service..." (Manager of medium sized firm). "We try to give people good customer service, we try to keep the price low, and keep good quality…we have weekly offers, and we have a big selection…" (Manager of medium-sized firm). "Stay in good communication with them and don't let them down…" (Manager of large-sized firm). "We run our sales through demos, when we are launching a new store for example…" (Manager of small-sized firm).
	Customer orientations	"I think the main thing here is for us to get to know the customers..." (Manager of medium-sized firm). "…good quality service and fresh fish everyday…" (Manager of medium-sized firm). "…in our business like in most businesses it is about people and actually having processes in place at work based on the strategy that we built…." (Manager of large-sized firm).
	Information provision	"…it is embedded in our APP, we have nutrition information on all our products…because I think that is the best way to get our premium customer who are concerned about their health…"

4. Discussion and conclusion

References