Master's Thesis

Sustainable Business and Innovation
Utrecht University - Faculty of Geosciences

27.06.2020

The effects of legitimization strategies and audience typology on legitimacy creation

Legitimacy creation for prebiotics in the aquafeed industry

Utku AYDINCI
6416209
u.aydinci@students.uu.nl

Supervisor: Dr. Jarno Hoekman

Internship Company: Mature Development MD
Internship Supervisor: Paul van der Heijden
office@maturedevelopment.com

Universiteit Utrecht

Climate-KIC

Summary

The demand for aquaculture is globally increasing. However, concerns regarding sustainability and health have surged in this field. Prebiotics are immunostimulants that are proposed by some, as ways to mitigate these concerns. Even though prebiotics are not a novel innovation and their benefits to host are proven (Hoseinifar, 2017) the use in the aquaculture industry is still not widespread and has not reached less developed countries. This study aims to determine what types of legitimacy are lacking in this field, how these legitimacy types are related to each other and which activities are performed or suggested by the actors to enhance the legitimacy of the prebiotics. Thus, the study asks; *How do audiences in the prebiotics innovation pathway perceive the legitimacy of the prebiotics and how do their legitimization strategies affect different forms of legitimacy?* Following institutional legitimacy is defined in two subcategories; sociopolitical and cognitive. The activities that are performed or suggested by the actors are studied from an institutional work perspective.

Semi-structured interviews are conducted with a diverse scope of actors of the prebiotics innovation pathway. Then these interviews are transcribed, coded and analyzed in order to connect the data with the theoretical framework. Analysis of the interviews demonstrated that the challenges hindering the widespread use of prebiotics are mainly related with sociopolitical legitimacy. However, the activities that are performed by the actors and the solution suggestions are targeted towards enhancing cognitive legitimacy. The thesis analyses the relationship between the two types of legitimacy and explains how they are linked using the concepts of responsibility perception of the actors and institutional work activities. Along with its theoretical contribution, the research provides some practical recommendations about the sustainable innovation diffusion to the actors of the aquaculture industry.

Table of Contents

1. INTRODUCTION

Aquaculture is increasingly essential for human diet, and sustainability is an issue in this matter (Bhari, 2018). Fish is the fundamental source of protein for 950 million people worldwide, and it represents a critical part of the diet of many more (Pradeepkiran, 2019). According to the FAO (2018), fish is accountable for 17% of the total human protein consumption. Moreover, in the last 30 years, an 8% annual growth in demand has been observed and resulted in a constant increase in the production of farmed fish (FAO, 2018). Technological advancements within this sector contributed to increase the production yields while beating problematic diseases occurring in fish farms. Thus, healthy generations of fish are created, helping to meet the current demand. However, the demand is expected to increase in upcoming years (FAO, 2018).

Disease control in the aquaculture industry has been achieved by different approaches using traditional methods, synthetic chemicals, and antibiotics (Sahu et al., 2008). Antimicrobials are still the most common weapon to fight against contagious and fatal diseases and are still widely used (Vincent et al. 2019). However, the use of antibiotics has a negative influence on ecosystems and biodiversity (Grenni et al., 2018; Sahu et al., 2008). For instance, it increases mortality all around the world by leading to a rise in multi-drug resistant bacteria (WHO, 2018). Current bans (FDA, 2016) and restrictions on antibiotics (WHO, 2018) are bringing the need of finding alternative solutions to a more urgent state.

Alternatively, the techniques of using functional feed additives, such as prebiotics and probiotics, are considered as a promising solution to substitute the dependency on antibiotics (Dawood, 2015., Akhter, 2015). The use of prebiotics in animal feed has been tested and commercially tried before, for instance, on poultry and cattle (Patterson and Bulkholder, 2003; Reid, 2008). In the aquaculture sector, applications show that the use of prebiotics such as galactooligosaccharides has a positive effect on the immune system of fish (Hoseinifar, 2017). Thus, studies showed that prebiotics are options that should be taken into account while aiming for achieving sustainability in the aquaculture industry (Béné et al., 2016, Ringø et al., 2010). However, prebiotics are still not widely used in the sector (Castex and Okeke, 2014) and the perception against prebiotics is still an ongoing debate in the aquafeed sector (Ringø et al. 2010).

By definition, innovation itself is uncertain, and can reach the market when it gains legitimacy (Suchman, 1995). Furthermore, an innovation can only reach a high level of diffusion if it is acknowledged and accepted by its audiences (Aldrich and Fiol, 1994; Suchmann, 1995), and if it gains regulatory approval from the authorities (Markard, 2016). In the case of prebiotics, the controversy is whether they are categorized and perceived as medication or natural additives by the regulators. In other words, should they be treated as medications or natural supplements (Castex and Okeke, 2014). Thus, prebiotics are lacking recognition and are not yet well acknowledged and accepted, mainly by the regulators. In other words, prebiotics are lacking legitimacy.

Legitimacy is how much of an innovation is taken for granted, acknowledged and approved by the actors (DiMaggio and Powell, 2000; Zimmerman and Zeitz, 2002), particularly by cognitive and sociopolitical sources (Aldrich and Fiol, 1994). Legitimacy may enhance innovation's chance to overcome the liability of newness and to strengthen the possibility of survival in the market (Singh et al., 1986; Stinchcombe, 1965; Überbacher, 2014). Moreover, the legitimacy of an innovation can only be achieved through judgements from its audiences (Aldrich, 1990; Suchman, 1995). Thus, it is highly important to know the right legitimization strategy, the types of audiences based on their roles at the innovation pathway, and the characteristics of these audience (Lawrance and Suddaby, 2006). For prebiotics to gain legitimacy in the aquafeed industry, understanding the missing form(s) of legitimacy and unveiling the interaction between the two types of legitimacy is needed. Moreover, the types of audiences and their legitimization strategies has not been investigated by scientific literature before. Deriving from the enounced information, this study asks the following research question to formulate the points that might guide realizing the diffusion of this innovation:

How do audiences in the prebiotics innovation pathway perceive the legitimacy of the prebiotics and how do their legitimization strategies affect different forms of legitimacy?

By answering this research question, this research provides analysis of the activities that an innovator performs to enhance and/or create sociopolitical and cognitive legitimacy. Furthermore, it aims to make a theoretical contribution by unveiling the relationship between the two types of legitimacy and their influence on each other. Moreover, the relationship between legitimacy creation activities and the types of audiences are investigated through an in-depth case analysis. The aquafeed industry, which is a highly institutionalized industry, is chosen as the organizational field and prebiotics is chosen as the case. Furthermore, this thesis aims to explore the relationship between a sustainable innovation and legitimacy creation in the aquaculture sector.

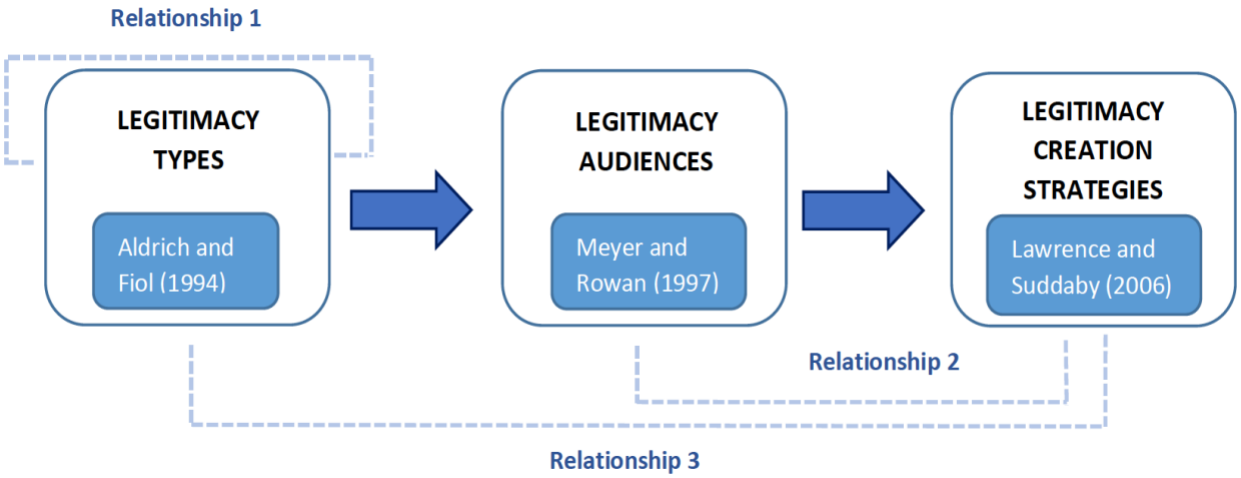
Along with its theoretical contribution, this thesis contributes to the United Nations Sustainable Development Goal 14 (UNSDG 14): Life Below Water (UN webpage, 2015) by unveiling the relationship between sustainable innovation and legitimacy creation. The importance of this study comes from the need for switching our aquatic systems to a more sustainable state (FAO, 2016). This study can possibly draw a strategic pathway for the companies that are seeking for market diffusion of sustainable and novel innovations such as prebiotics.

In order to conduct this research, first, the current state of the aquafeed industry and the position of prebiotics are examined. Then, the audiences situated around prebiotics innovation are defined and categorized. This is followed by analyzing the legitimacy perception of the audiences and their activities to spread prebiotics. Thus, the structure of this research is as follows. Firstly, a theoretical framework will be constructed, which provides an overview of the theories that will be used. Then, the sample selection, data collection and data analysis methods will be explained. Following the methods section, findings and analyses will be presented in the results section. Then, in the conclusion and discussion parts an overview of the results, limitations of the research and the answer to the research question will be presented.

2. THEORETICAL FRAMEWORK

The use of prebiotics in aquafeed is still not embraced or become a widespread application in the industry. As mentioned in the introduction, one of the possible reasons is that the novelty has not yet been acknowledged and not found appropriate. In other words, it is still not considered legitimate by its audiences. As Rao et al. (2008) indicates, the lack of legitimacy is obstructing the diffusion of many innovations.

Institutional theory (Meyer and Rowan, 1997) describes that the innovators that are creating a novel innovation are in need of legitimacy for their product to reach the market state; and the audiences are the ones that are endowing the legitimacy according to their norms, values and expectations. The area that these actors are situated is called the organizational field (DiMaggio & Powell, 2000). Every industry has different structure, in terms of relationship among actors and legitimacy endowing mechanisms (Meyer and Rowan, 1997). In order to understand the legitimization mechanism of prebiotics innovation, this paper uses two approaches (Graph 1); audiences of the innovation (Meyer and Rowan, 1977) and legitimacy creation strategies (Lawrence and Suddaby, 2006). The main reason for this approach is to understand the perception of legitimacy of audiences and link this phenomenon to their legitimacy creation strategies.



Graph 1: Utilization of theoretical framework

Graph 1 shows the utilization of the theoretical framework. Legitimacy and legitimacy types theory (Aldrich and Fiol, 1994) constructs the backbone of this thesis. However, according to the same authors, it is necessary to identify the audiences located around the innovation to understand the legitimacy concept (Aldrich and Fiol, 1994). Then, it only becomes possible to make a connection to the legitimacy creation strategies. First, the concept of legitimacy, along with the types of legitimacy, are explained (Aldrich and Fiol, 1994). Then, the audiences of legitimization activities from institutional theory perspective (Meyer and Rowan, 1977) and legitimacy creating activities from institutionalization theory (Lawrence and Suddaby, 2006) are discussed. Furthermore, the relationships (Graph 1) between and within these concepts are discussed in related chapters.

2.1 Legitimacy and Legitimacy Creation

The concept of legitimacy embodies essences from different disciplinary backgrounds, containing philosophy (Habermas, 1975), political science (Lipset, 1959), sociology (Johnson et al., 2006) and psychology (Tyler, 2006). As a concept, it is an abstract phenomenon, and it is easier to observe in its absence (Deephouse and Suchman, 2008). Legitimacy emanates from institutional literature and focuses on the credibility and stability of the activities of an organization and the organization itself. One of the most known definitions of legitimacy is from Suchman (1995); ‘‘Legitimacy is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions’’.

Depending on the different literature streams, the concept of legitimacy is defined in different ways. Innovation scholars, such as Hekkert and his colleagues (2007), indicate that legitimacy creation is the key attribute that a novelty needs to have for radical innovation to earn momentum. Markard (2016) adds the role of regulation on innovations by indicating “well understood, compatible with established practices, socially accepted, and perhaps even endorsed by regulation, possesses a high degree of legitimacy.” On the other hand, authors from the strategic school of thought define legitimacy as an operational resource that can be gained from its surroundings (Suchman, 1995; Zimmerman and Zeitz, 2002; Ashfort and Gibbs, 1990). Moreover, some authors described legitimacy as a social acumen of compliance, suitability, and desirability, and they underlined the essential need for legitimacy for an innovation (Aldrich and Fiol 1994; Scott 1995). Legitimacy is one of the most critical resources for an institution and a technology to have (Pfeffer and Salancik 2003; Chandy et al. 2008). For Cyert and March (1963), legitimacy is the key to gain access to specific resources that are needed to fulfill organizational aspirations. Markard (2016) adds that legitimacy is central for novel and current technologies to mobilize resources that are necessary for growth and keeping the competitive advantage. Researchers have also recognized the influence of legitimacy on the success of an innovation (Hunt and Aldrich, 1996; Delmar and Shane, 2004). Overall, legitimacy is an undeniable factor to acquire resources such as capital, technology, managers, competent employees, customers and networks (Zimmerman and Zeitz, 2002; Delmar and Shane, 2004; Khaire, 2010) that helps understanding the processes of creation, survival, and growth of new ventures (Hannan and Freeman, 1977; Aldrich and Fiol, 1994). Overall, it is highly essential and required for an innovation to differentiate from other innovations and then to sustain its presence in an incumbent system (Hekkert et al., 2007). An innovation without legitimacy is not likely to reach the market (Aldrich and Fiol, 1994). Thus, individuals or/and companies perform a set of activities in order to create or enhance legitimacy.

Legitimacy is not a permanent value that can be sustained without any effort (Tornikoski, 2007), and the most challenging part is to create legitimacy for an innovation (Überbacher, 2014). Legitimacy can be acquired and enhanced by strategic actions taken by the innovator (Zimmerman and Zeitz, 2002; Überbacher, 2014). These are the strategic activities that are performed in order to get acknowledged and approved by audiences that are situated around the new venture. These activities are especially essential while pushing a market-changing product or a system (Aldrich and Fiol, 1994); in other words, a novel innovation. While doing so, the main target is the external social actors and the strategies differ depending on the types of these actors (Aldrich and Fiol, 1994; Suchman, 1995; Scott, 1995).

2.2 Types of Legitimacy

Along with different definitions of legitimacy, scholars classified the types of legitimacy based on domains. Aldrich and Fiol (1994) classify legitimacy in two different categories, namely, sociopolitical and cognitive. However, Scott (1995) brings another dimension and adds normative legitimacy. In reaction, in that same year, Suchman (1995) approaches from another perspective and suggests pragmatic, moral, and cognitive legitimacy. In this thesis, the definition from Aldrich and Fiol (1995) is used to understand the main types of legitimacy. Authors defined two types of legitimacy; sociopolitical and cognitive (Aldrich and Fiol, 1994).

Aldrich and Fiol (1994), tend to keep the types of legitimacy at a broad level, which makes it easier to observe for the researcher. Furthermore, two types of legitimacy are investigated in the organizational field, to understand which type is missing the most. Then, the interaction between cognitive legitimacy and sociopolitical legitimacy are discussed (Graph 1, Relationship 1). There is not much literature focusing on the interrelatedness of these legitimacy types. It is believed that the absence of one can affect the other type of legitimacy, which eventually can hamper the diffusion of the innovation (Aldrich and Fiol, 1994). This thesis is focusing on understanding the relationship between these legitimacy types, whether they enhance each other or the existence of one harm the other.

2.2.1 Sociopolitical Legitimacy

Aldrich and Fiol (1994) define sociopolitical legitimacy as the extent to which an organization complies with recognized principles or acknowledged rules and standards. They indicate that the sociopolitical legitimacy can be observed with public acceptance, government subsidies, and public prestige of the innovation (Aldrich and Fiol, 1994). Sociopolitical legitimacy can be explained by evidently conforming to rules, standards, regulations, and expectations imposed by governments, regulatory bodies, and higher-level associations (related to the innovation) (Aldrich and Fiol, 1994). The main motive is legal compatibility and being acknowledged by both international and domestic authorities (Aldrich and Fiol, 1994). In order to understand the sociopolitical legitimacy of innovation, the compatibility with the current regulations, rules, values can be analyzed (Rutherford et al., 2018). On the other hand, keeping in mind that the absence of regulations related to the particular innovation or an unclear regulatory pathway are signs of lack of sociopolitical legitimacy.

2.2.2 Cognitive Legitimacy

Cognitive legitimacy is whether the innovation is known and well understood by the social actors (Aldrich and Fiol, 1994). In other words, how taken for granted the innovation is, by the legitimacy endowing sources. The main domain is generally the public and the primary audiences that are holding the key resources that the innovation needs. Knowledge is the key factor of cognitive legitimacy, and a developper should be managing it strategically (Aldrich and Fiol, 1994). It can be acquired by adopting and linking held beliefs and assumptions accepted by the public (Aldrich and Fiol, 1994), and if the environment around the innovation perceives the innovation as ‘the new normal’, then it is considered as legitimate (Suddaby et al., 2015). The main motives of the audiences to grant cognitive legitimacy are prestige, recognizability, and acceptableness of the innovation.

2.3 Audiences

By definition, actors that are surrounding an innovation are the social actors that approves and acknowledges the legitimacy of an innovation (Aldrich, 1990). However, this thesis is focusing more on the developers and their perspectives. Regulators, who are a crucial actor in the innovation pathway, are not included in the analysis as audiences. Moreover, external actors are in the center of legitimacy gaining activities of innovators (Aldrich and Fiol, 1995), and it is crucial to have insight from the different types (Aaltonen et al., 2008; Friedman and Miles, 2006). Furthermore, Cashore (2002) defines audiences as the "the grantors" of legitimacy and the novelty as "the grantee". Innovation's survival is dependent on internal and external resources it owns or has access to (Aldrich and Fiol, 1994; Fisher et al., 2017; Lounsbury and Glynn, 2001; Zimmerman and Zeitz, 2002). Internal resources are focusing on abilities, assets, financials, managerial and employee skills. Whereas, external resources are the resources that an innovator can reach through the relationships with the surrounding actors (Fisher et. al., 2017). If a novelty has legitimacy, it can gain access to other actors' internal sources (Hanlon and Saunders, 2007). So, an innovation is gaining legitimacy through its audiences and this perceived legitimacy leads the innovation to gain more resources, which eventually increases its legitimacy. These resources should be from a diverse range of audiences including public, investors, government agencies and incumbents (Hanlon and Saunders, 2007). However, scholars point out that audiences around an innovation has contrasting logical decision points (Tyler, 2006) and thus the institutional theory (Meyer and Rowan, 1977) provides a theoretical basis to understand different audiences and importance to distinguish them (Suchman, 1995; Pahnke et al., 2015).

Different audiences have differing beliefs, procedures, norms and rules while assessing an innovation (Fisher et al., 2017). However, there is still a limited academic understanding of how legitimacy judgments of one innovation differ across various audiences (Überbacher, 2014). Hence, this thesis is focusing on the legitimacy creation activities and attributes of the audiences of prebiotics in aquafeed (Graph 1: Relationship 3) and aiming to grasp the link between the audiences and legitimacy creation. Thus, classifying the audiences provides insight into understanding the mechanism of legitimacy creation activities. For that purpose, definition of audiences from institutional theory (Meyer and Rowan, 1977) is used to understand the typology of the external audiences. In this paper, the developers are taken as actors and the audiences of legitimacy creation.

2.4 Strategies of Legitimacy Creation

Legitimacy creation is one of the most important strategic steps of a developer that is aiming to launch an innovation into the market (Suchman, 1995). Aldrich and Fiol (1994) indicate that cognitive legitimacy and sociopolitical legitimacy can be examined in four different levels, namely organizational, intra-industry, interindustry, and institutional. However, a more recent study, from Lawrence and Suddaby (2006) identifies a set of activities for creating institutions. For the institutional work, these scholars identified three main categories, political work, belief systems of actors, and boundaries of meaning systems (Lawrence and Suddaby, 2006). Institutional work activities from Lawrence and Suddaby (2006), constitutes the theoretical backbone of this study. Following graph provides the detailed definition of these activities.

Political Work	**Advocacy**	Mobilizing regulatory and political support through direct and deliberate techniques of social persuasion. Activities like lobbying for resources, promoting agendas and proposing new or attacking existing legislation can be done in order to create new institutional structures and practices.
	Defining	Constructing new rule systems that negotiate status or identity, define boundaries of membership or create status hierarchies within a field. Can be achieved by building criteria for categorizing a system for the innovation.
	Vesting	Creation of rule structures that confer property rights. Vesting occurs when government authority is used to reshape or create new structures, such as independent power generation structures. It is highly needed for an innovation.
Belief Systems	**Constructing identities**	Unveiling relationships between actors and the field they operate in order to create identities. This helps to create new categories of identities, which is essential for an innovation.
	Changing normative associations	Leaning on constructing or re-making inter-organizational connections and moral and cultural foundations. It is basically questioning the current links and building new relationships between companies. This is essential for the company when a novel innovation is getting into an area that is full of incumbents.
	Constructing normative networks	Constructing inter-organizational connections through practices that are normatively sanctioned, which potentially might form the relevant group with respect to compliance, monitoring and evaluation.
Meaning systems	**Mimicry**	Following an already existing pathway for taken-for-granted practices, technologies and rules that is drawn by a successful company. This is basically, not taking risks while creating new practices and complying with the incumbent or early adopter that is similar.
	Theorizing	Developing causes and effects of the products' (novelties') with defining abstract theories that might create a reasoning for audiences.
	Educating	Communicating with the audiences through educating, while increasing their knowledge and skills that might clarify their perception and potentially increase support.

Table 1: Institution creating strategies (Lawrence and Suddaby, 2006)

These activities are used to see how differing audiences perceive the legitimacy of prebiotics and their different legitimacy creation activities. Furthermore, strategies are used to understand what type of particular strategic activity enhances which type of legitimacy (Graph 1: Relationship 2). Moreover, it is also used to grasp which type of strategies are used by different innovators (Graph 2: Relationship 3). Because, depending on their capabilities, resources and position in the industry, innovators apply different strategies in order to gain legitimacy. On the other hand, the prerequisite of practicing a legitimacy creation strategy is to define the source of legitimacy and the types of audiences (Aldrich and Fiol, 1994; Scott, 1995). The next section discusses the application of these theories to the aquaculture industry and prepares the reader to the methodology section.

2.5 Application to the Aquaculture Industry

This thesis is mainly aiming to link three theories (Graph 1). The first is the legitimacy type that hampers the diffusion of the prebiotics the most and the interaction between cognitive and sociopolitical legitimacy (Graph 1: Relationship 1). Second aim is to understand the legitimacy creation strategies that innovators are performing in order to gain legitimacy from different types of audiences (Graph 1: Relationship 2). The final aim is to understand the legitimacy creation activities that innovators perform to gain different types of legitimacy (Graph 1: Relationship 3).

In the case of prebiotics in the aquafeed sector, lack of cognitive legitimacy occurs. Audiences think that prebiotics are medications, not natural feed additives. Because of the public perception, sociopolitical structure is not developed. Thus, in some countries, the innovation is assessed in the regulatory pathway for medicines (Castex and Okeke, 2014). Moreover, the stringency of premarket regulatory pathway for prebiotics (as a feed component) differs in some parts of the world, particularly in the EU, US, Canada, and China, and innovators have to deal with this uncertainty (Castex and Okeke, 2014). This is due to the lack of widespread knowledge and public understanding (Aldrich and Fiol, 1994), in other words, cognitive legitimacy. Because, if the public perception of innovation is not clear, regulations can stay in an indefinite state (Gurses and Ozcan, 2015). Likewise, with low cognitive legitimacy, innovation may have difficulty gaining and maintaining the support of political authorities (Aldrich and Fiol, 1994). Prebiotics are still not socially classified, it is either perceived as drugs or natural feed additives (Castex and Okeke, 2014), and it affects the taken for grantedness of this innovation. Knowing that both types of legitimacy can affect the presence and strength of the other type of legitimacy, the types of legitimacy is examined separately. Then the interaction between sociopolitical and cognitive legitimacy, in this particular industry, is researched (Graph 1: Relationship 1).

Legitimacy creation strategies are the activities that innovators deploy in order to enhance the legitimacy of prebiotics. To know the forms of legitimacy creation strategies and be able to define them, the institutional works creation framework (Lawrance and Suddaby, 2006) is used (Table 1). This framework is merged with the types of legitimacy (Aldrich and Fiol, 1994) in order to understand and categorize the strategies that are performed by the innovator (Graph 1: Relationship 2). Strategies that belong to political work, *advocacy*, *defining*, and *vesting* are the activities that are performed to create sociopolitical strategies. On the other hand, *creating meaning system activities, mimicry, theorizing*, and *educating* are accepting audiences as the main factors for achieving legitimacy. Thus, they are linked with cognitive legitimacy. However, belief systems are not mainly focusing on creating one type of legitimacy. They are mainly focusing on the norms and beliefs which are focusing both on sociopolitical and cognitive legitimacy.

The aquafeed sector is not transparent in terms of value chain activities (Castex and Okeke, 2014), and this makes it hard to observe the interaction between audiences. In order to understand the perceived legitimacy, knowing and identifying the external audiences is essential (Scott, 1995). Since this thesis is aiming to clarify the relationship (Graph 1: Relationship 3) between the audiences and legitimacy creation activities (Table 1), preliminary audiences are identified. For this identification process, this paper is using the information that is collected from the actors of the aquafeed industry. Thus, unveiling the relationships between the audience typology, their interactions with other audiences, and the kind of legitimacy creation activities they perform and observe would add to the current literature in this field.

3. METHODOLOGY

This chapter explains the research methods that are used to conduct this research and shows the implementation and application of the selected theoretical concepts. The first section explains the research design as well as the methods to operationalize the aforementioned theories. The explanation of data collection methods and processes follows. Lastly, the final section describes the process of coding and data analysis.

3.1 Research Design

The theoretical background is drawn from legitimacy, types of legitimacy, institutionalization activities, and audience typology, while the empirical study focuses on the prebiotics innovation and its use in the aquafeed sector. In order to answer the research question with the aforementioned theories, this thesis takes a qualitative approach. The main reason for choosing a qualitative research methodology is the scarcity of the studies and data within this particular field. Additionally, the multidimensional nature of the term legitimacy is making it difficult to interpret the concept numerically. Thus, a newsworthy and explorative study on legitimacy has to follow from qualitative data to better understand the relationships between the theories, based on inductive reasoning (Baxter and Jack, 2008; Bryman, 2012). Moreover, the qualitative research methodology allows the researcher to describe, interpret, and gain in-depth insight (Baxter and Jack, 2008) of the legitimacy concept in prebiotics usage in the aquafeed industry.

The case study method enables the researcher to closely examine the collected data within a specific context and understand the phenomena in terms of industrial dynamics (Yin, 2013). This creates a better understanding of the concept of legitimacy through the audience's perspective, in particular the perspective of the developers, academicians and end-users. As indicated before, the chosen case is the use of prebiotics in fish feed and the global aquaculture industry is chosen as the geographical scope.

3.2 Data Collection and Sampling Process

The data collected in this research follows from three forms of data collection methods: desk research, observation of key events and semi-structured interviews.

The qualitative document analysis method (Bowen, 2009) is used to collect insights about the structure of the organizational field in general. Document analysis inputs are publicly available firsthand publications (news, reports, interviews, etc.) which are gathered from the websites of selected companies. Collected documents are analyzed and used to create a table in MS Excel (Appendix C). This table contains the information; the position of the actor in the innovation pathway, the activities of the actor and the collaborations of the actors. This information is further used in the analyses while categorizing the actors. Moreover, the information collected from the desk research phase is also used to shape the interview and to prepare different types of questions specifically for that audience.

Observations of key events is also used as a data collection method and a way to engage with interviewees. In order to collect data and reach actors; seminars, webinars, information meetings, expos, and other kinds of events are attended. Moreover, during the events, the researcher had conversations with the professionals of aquaculture industry and collected information. The information collected during these events are added to the MS Excel table (Appendix C), which is

also filled with the information gathered from the document analysis method. This data is acted as supportive method to understand the structure of the organizational field and the positioning of the actor within the industry. Further on, these contacts are reached out by email, phone calls, and physical appointments in order to conduct an interview.

The primary data collection method is semi-structured qualitative interviews with open ended questions. This method is used in order to gain flexibility during interviews while also keeping the interviews aligned with the theory. In total, fifteen interviews were conducted (Graph M1). The interviews are conducted with the developers; R&D actors, market actors and intermediary actors. However, the regulating actors are not included in this study. Data collection continued until the saturation point was reached (Bryman, 2012). Purposive sampling was used as the sampling method since the number of audiences is not small and choosing inappropriate samples might affect the outcome of the research (Koerber and McMichael, 2008). Moreover, stratified sampling is applied, where audiences are divided according to their activity, role and position in the organizational field. Later on, contacts are interviewed with specific questions (Koerber and McMichael, 2008). The initial group of audiences was contacted by the internship company. Thus, these are the audiences that are close to the company and possibly central to the topic. Moreover, the second group of audiences was reached via a snowball sampling method from the first group of interviewees (Bryman, 2012). Furthermore, the researcher also used the selective sampling method and contacted the interviewees that are related to the prebiotics topic in the aquaculture industry. The interviews contain questions to understand different types of activities that are being used, interactions among actors, relationship between two types of legitimacy and the typology of the audiences (Appendix B). In order to improve the understanding of the organizational field and the differing perception of legitimacy amongst audiences, interviewees are grouped (Graph M1).

Space	**Types**	**Number**
R&D	Academician	3
	Test & Trial	1
Market	Feed Company	3
	Compound Producer	2
Other	NGO	2
	Non-profit	1
	Int. Association	1
	Consultant	1
	Professional	1

Graph M1: Overview of the interviewee

3.3 Coding Process

Firstly, all interviewees were introduced with an interview guide (Appendix A) and asked to sign the informed consent form. Then, the interviews were recorded with the permission of the interviewee. Since the interviews were conducted by one researcher, there was a risk of biased interpretations (Flick, 2009). To prevent that, interviews are transcribed. Thereafter, the data is coded in NVivo. To do that, the researcher broke down the raw data into component parts and labelled the content. Then the nodes are created in order to categorize these labels. Some of these nodes are created deductively. In other words, they follow from concepts in the theory, such as, the legitimacy types and institutionalization activities. Which is done in order to enhance the external reliability of the analysis. On the other hand, some of these nodes are created inductively to correspond with the categories that emerged from the interviews. For instance, characteristics of the organizational field, categorization and distribution of the challenges, and unveiling the relationship between the two types of legitimacy were constructed inductively by the researcher. The codes were then organized under the purposely created nodes in order to prepare for analyzing.

3.4 Data Analysis

This paper uses abductive reasoning, which is a combination of both inductive and deductive approaches (Jokhio and Chalmers, 2015). While the data gathered from the interviews represents a single point of experience, the collective view of all interviewees allows for the identification of patterns (Walker, 1997). On the other hand, this paper is also leaving room for improvement and embraces an inductive approach to understand the concept of legitimization better. Following this section are the methods used and the questions asked in each result section. The analysis section consists of three parts; organizational field, problems and challenges, and solutions.

3.4.1 Organizational Field

The information and insights collected during the interviews are used to understand the structure and the dynamics of the industry. Before conducting the interviews, desk research and observations at key events were done. The information collected during the desk research and the observations at the key events are used to construct the basis of the organizational field and to understand the relationship between the actors of the organizational field. The interviews have been used as a complementary method to understand the structure better. In order to understand the organizational field, specific questions (Appendix B: Questions A1 and C4) have been asked to the interviewees. The answers to these questions are transcribed and open coded. Then, these codes are used to create members of the categories of the organizational field where they are coded and analyzed in order to inductively construct the organizational field scheme (Graph R1). Furthermore, the codes have been inductively grouped and matched with the locations and the names of the actors.

3.4.2 Problems and Challenges

Challenges mentioned by the interviewees are aimed to collect in this section. In order to identify these challenges, specific questions are asked. For instance, Question C1 (See Appendix B) has been asked if the interviewees would identify some challenges themselves. Then more focused open questions were asked, such as, question C1B (See Appendix B), in order to understand the challenges from a higher perspective the following question C2 (See Appendix B) is asked. After receiving the answers, the responses are used for the analysis of the challenges. These challenge analyses are explained in following sub sections.

a. The Challenge Analysis

The answers to the interview questions are first transcribed, then labelled, and open coded. After the coding process, these challenges are analyzed under two different approaches: understanding the location of the challenges and understanding the route of the challenges. There are two reasons for doing such an approach. Firstly, to increase the reliability and trustworthiness of the challenge analysis. Secondly, to make sure that the twice coded data shows the same direction, otherwise known as cross checking the analyses.

In order to analyze the coded challenges, the researcher used the names of the organizational field spaces. The challenges are approached from a location specific angle. In other words, the challenges are categorized based on which space of the organizational field they occur. For instance; the challenges that are related to the farmer are gathered under the end-user space, whereas the challenges with the salesmen and intermediaries are collected under the market space. All identified challenges are included in this analysis. In this analysis, even if the challenges were repeated by different interviewees, they were not removed because they were distributed based on how many times they occurred in the interviews. If the interviewee mentioned the same challenge directed to the same organizational field space this is counted as one challenge. However, if one challenge is related to several organizational field spaces challenge counted each time. Thus, rather than hierarchically evaluating the challenges, this analysis counts the challenges related to the different organizational fields.

This is cross checked by the route of the challenge approach. The challenges are broken down into labels and merged back with the inductively created open codes. For instance, the problems that are related to the cost of prebiotics or the cost of production of prebiotics are coded as economic problems, whereas the gap between the science and the farmer is coded as a structural problem. Several categories emerged from the data and these constituted the nodes. However, if the challenge is addressed multiple times by the same interviewee, it is excluded. By approaching the same data from two different analyses, the researcher verifies the challenges and the main domains of the challenges. In other words, the data is cross-coded.

b. Challenge Causers Mentioned by interviewees

During the interviews, the barriers in front of the prebiotics and the methods to overcome the challenges were aimed. In other words, the perception of actors about the other actors was aimed to learn. The answers are axial coded under the actors and spaces created at the organizational field analysis. Thus, the spaces created at the organizational field analysis are used as the nodes. For instance, if the interviewee mentioned feed companies in relation to a particular challenge this is coded under the market space.

In order to understand the perception of the actors, the challenges that they observe in the innovation pathway and the challenge causers they mentioned are used. Thus, the researcher became able to observe the relationship between the real challenges and the perceptional challenges and challenge causers mentioned by the interviewees. In order to unveil this relationship, the actor types and the spaces created in the innovation pathway are used. Interviews utilized the coded interviewee specific approach, which gave the insight of "who said what about who?" to the researcher. Then these codes are matched to the related area and the actor. The legitimacy reflection of these perceptions is deductively identified by using the legitimacy theory

of Aldrich and Fiol (1994). The definitions from the theory are used to match the perceptions of the actors with the related legitimacy types. Thus, the information of the solutions has been used to unveil the relationship between where the actors see the problem and who they think is causing that problem.

c. Types of Legitimacy

This section acts as an interim conclusion to answer the perception of the legitimacy part of the research question. In order to do that, the legitimacy equivalents of the challenges and the perception of the audiences are generated. The researcher coded the interview transcripts in an actor specific method. Then, used these actor specific codes and the findings of the previous sections to inductively give meaning to these results from a legitimacy perspective. The theoretical definitions (Aldrich & Fiol, 1994) of the sociopolitical and the cognitive legitimacy are used as nodes. And the results from the earlier sections are distributed according to their sociopolitical and cognitive routes. Then the consistency between these findings are analyzed, which are further used in the following part, where the relationship between the two types of legitimacy is examined.

3.4.3 Solutions

a. Relationship between the types of legitimacy

After understanding which types of legitimacy are lacking, the next step was to understand the relationship between the legitimacy types. It is expected to find a correlation between the two types of legitimacy. In order to analyze this, specific questions were asked (Appendix B: Question C3). In case the interviewee was not familiar with the concepts, the researcher explained it further by providing some examples from the industry. Then the answers to these questions are open coded and categorized under the inductively emerged nodes; “Sociopolitical affects cognitive”, “cognitive affects sociopolitical” and “other type of relationship”. Some interviewees didn’t see a relationship between the types of legitimacy. The other interviewees implicitly or explicitly indicated that there is a relationship between the types of legitimacy. With this section, the sub-question; “the relationship between the types of legitimacy” is answered and the reader is prepared for the further analysis on the institutionalization activities.

b. Institutionalization activities

In order to understand the solution suggestions of the interviewees, the questions C4, C5, and their sub-questions are posed (See Appendix B). The activities are distinguished as performed strategies and suggested strategies. Performed strategies are used to understand the organizational field as well as to generalize the activities that the specific type of actor performs. Suggested strategies are used to understand the perception of responsibility of the interviewees. Then, the solution suggestions and/or theories of change addressed by the interviewees are coded in terms of activities. During the initial coding round, the researcher created the nodes according to the theoretical framework. This is followed by matching these activities with the institutionalization activities (Lawrence and Suddaby, 2006), using the definition of each activity (Table 1). The matching is made by what the interviewee explicitly suggested, not based on inference about the underlying aim of that specific activity. For example if the interviewee suggested educational activities should be done, then either the interviewee specified the actor that should perform the educational activities or it is asked by the interviewer to specify the actor that should perform the activities. However, if the interviewee didn’t specify a domain of actors to perform it is not included in the study.

4. RESULTS

4.1. Organizational Field

The information and insights collected during the interviews are used to understand the structure and the dynamics of the organizational field. As can be seen from the table R1, in the aquaculture industry, the prebiotics as a compound in fish feed has several steps before reaching the end user, the farmer. There are three main phases between the prebiotics and the farmer. These steps are, respectively; R&D space, regulation space and market space. Specifications of the space, located actors, main activities and the relationship between the actors are explained in the following parts.

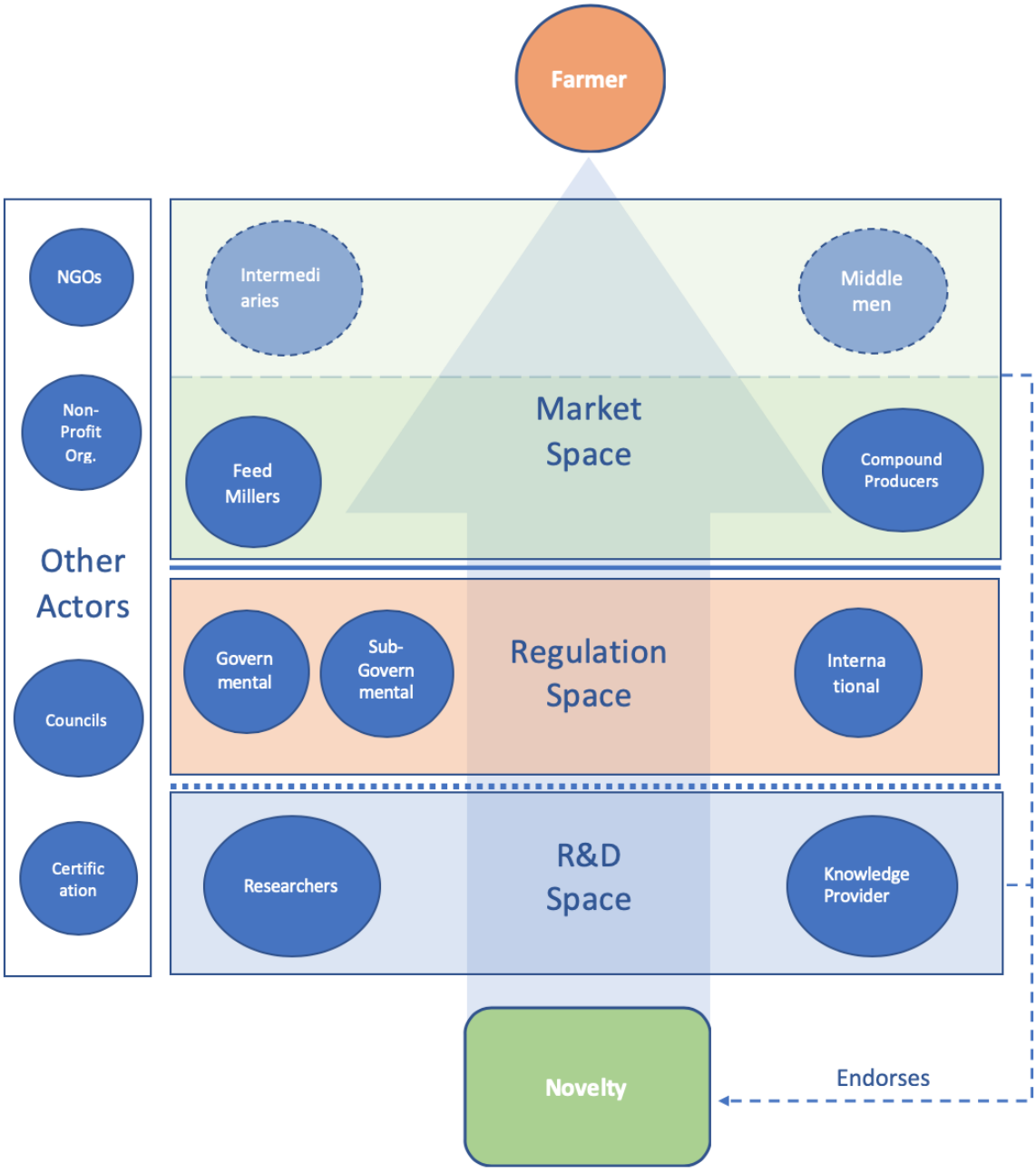


Table R1: Innovation Pathway in the Aquafeed Industry

a. R&D Space

In the R&D space, the prebiotics gets scientifically and technologically developed and tested. The area functions as an incubation phase of the prebiotics, where the benefits and feasibility studies are conducted. The necessary documentation demanded by the institutions in the regulatory area, in order to comply with the legislations, is generated in this space.

Universities, researchers and testing facilities are the main actors in this area. The main information gathering activities are; testing in the artificial environment, testing in laboratories, pond and field trials, big scale commercial trials and publication of the results. The results from these steps are necessary by law. Thus, the test information has to be documented and reported to the regulation space actors. On the other hand, effects on the immune system of the fish, conditions of use and interaction with the other compounds are the main information that are generated by the actors of this area.

Depending on the market structure, these activities are supported by the feed millers or compound producers, both financially and in terms of shared facilities. Some feed millers and compound producers choose to insource these activities by doing their own R&D. Otherwise, the support can be financial or in terms of resources, such as sharing laboratories or giving access to technologies. Funding mostly occurs at the ponds and field trials. The activities performed require the institution in charge to be transparent and credible in order for results to be counted valid by the regulatory organizations.

If these activities are performed in collaboration with the market area actors or within their organization, the information might not be publicly available. However, if they are performed by universities, then the results usually be published in printed media or in academic sources.

b. Regulation Space

In this area, the information created in the R&D space is used. After the validity, credibility and scientific consistency of the documents are proven, the compound gets its permissions. Depending on the market the compounds area again tested by the governmental agencies or by sub-governmental actors. For example, in European countries, authorization of the feed additives is granted by the European Food Safety Authority (EFSA), whereas in Thailand the Department of Livestock Development grants the permission (Lee & Salminen, 2009). Tests and required documents, as well as the process time varies in every country. The documentation related to prebiotics goes through the legislative framework to get validated and if it complies with the necessary requirements it becomes endowed with the license to use and produce.

In this space the main actors are International Organizations, Governmental Organizations and Sub-governmental organizations. Governmental organizations and sub-governmental organizations have two main functions; one is to regulate the market by developing policies and the other is to act as an approval body for the use of the novelty (Lio and Liu, 2008). Governmental actors consist of ministries and connected working groups. Whereas the sub-governmental actors are departments, research institutions, councils, and related committees. These actors work together to create policies, develop regulatory pathways, sustain legislations and to approve the novelties.

International Organizations are either industry specific international associations or joint institutions of several countries. These organizations work on macro policies and create a legislative and regulatory framework for the industry with a broader focus. These organizations build collaborations within their own cluster and with the actors that are located in the regulations space.

The actors of Regulation Space occasionally collaborate with R&D space actors by consulting or including them in the related sub-governmental working groups. By this means, organizations keep the regulations dynamic and update the regulations to sustain the innovation inflow into the industry. However, international organizations have no regulatory power on national level, which creates differences in each country in terms of regulatory conditions, required resources and duration of the product registration process.

c. Market Space

After getting necessary approval the compound arrives to this space to be marketed. This area is the last area before the prebiotics reach the end user, the farmer. The actors of this area are separated into two categories: feed millers and compound producers. Other than these actors, these companies use sales actors to reach the farmers.

In this space, feed millers and feed companies operate in national and international markets. The prebiotics arrive here and then companies work on several aspects such as, production, strategy, marketing, advertising, sales channel and pricing. The actors of this area are strategically connected to each other. In other words, feed millers and compound producers need each other to produce the feed for the fish. The actors of this area usually endorse R&D and testing activities in order to penetrate the industry with novel products.

Compound producers are the ones that produce the functional feed additive in desired specifications, under required conditions. Then they sell these compounds to feed millers. Feed millers are the companies that produce the consumable product for the specific species. Depending on the size of the company, some global feed millers produce their own compounds, but small scale prefers to purchase some of the compounds and mix it with their formula. Their main collaboration is with compound producers and occasionally with sales channels. These are the companies that are marketing the product and running the operation. Middlemen and intermediaries are occasional actors of this pathway. They exist in the industry depending on the market structure in that particular country. In the countries that have a developed aquaculture industry, the sector is mostly dominated by the MNCs and there is no need for middlemen to build the bridge between the end user and the market area. In these markets, big feed companies use their representatives or sales forces to present their product to the farmer. In less developed markets, the market is consisting of small but numerous farmers. Thus, are not middlemen and merchandisers taking the role of selling the feed to the farmer. Besides selling the feed, the actors of this area are information carriers, in other words, they are the cognitive bridge. They are responsible for carrying the benefits and instructions of the product.

In the countries that have a developed and regulated aquaculture sector, actors of this area collaborate with the actors of regulatory areas, in order to bring the national aquaculture industry

to a more competitive state in the global market. However, in less developed countries the industry is fragmented, and the actors of this area only have economic relationships with other actors. In the fragmented industries, intermediaries fill the gap between the consumer and the producer.

d. Other Actors

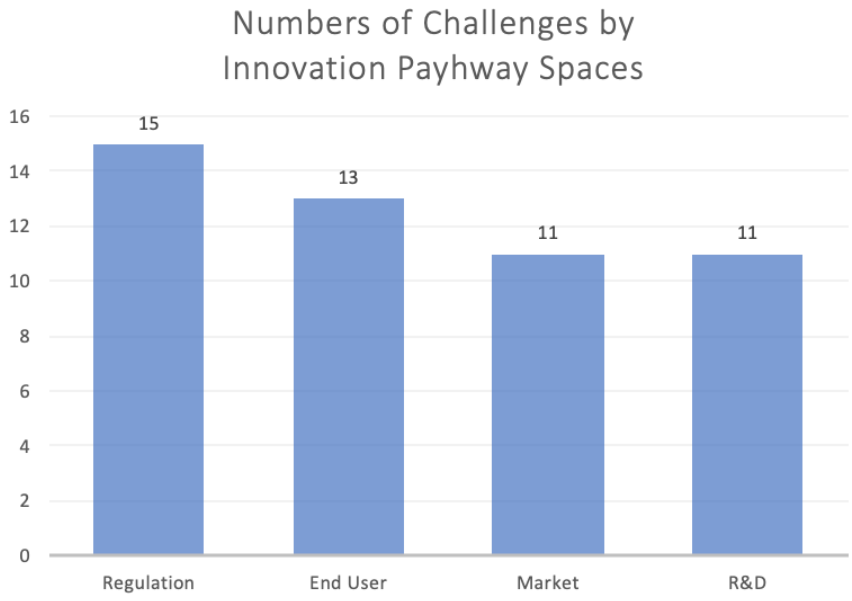
Intermediary organizations, such as NGOs, Non-Profit Organizations, Certification Bodies and Private Councils are one of the most important actors in the industry. They are strengthening the link in between the actors from different areas and creating new associations in between these areas. They have different roles within the industry. Usually, they focus on advocating an innovation, implementing new standards, educating the actors and driving the industry to a more efficient state in terms of sustainability or technology use. However, they are not solely focusing on one space or not one innovation. Thus, there are no specific intermediary actors only focusing on prebiotics use. They collaborate with several actors and create synergy within the industry to encourage the use of the innovation or open a road to the industry to pass through the thorny road of innovation diffusion.

4.2 Challenges

This section contains the challenges mentioned by the interviewees and the perception of the interviewees of the other actors that are causing these challenges.

4.2.1 Challenge Analysis

During the interviews, interviewees were asked to name the challenges that are hampering prebiotics to become widespread. After eliminating the challenges that are mentioned multiple times by the same interviewee, in total, 51 challenges are identified by the interviewees. These challenges are used for constructing the Graph R2, which represents the distribution of the challenges according to the innovation pathway spaces.



Graph R2: Challenges identified in the Innovation Pathway

Challenges at the R&D Space

According to the analysis, the least amount of challenges appeared in the R&D space. The challenges occurred at this space are mostly related with the pre-registration steps of the product. Such as, creation of the documentation, number of test facilities, test restrictions, unclear interaction with other components, all benefits are not discovered and need for consultants for small companies. These challenges are mostly mentioned by the interviewees that are located in the R&D space. X15, who is working as a test and trial official, said "not every company or individual has test opportunities. They apply to consultants and this creates cost problems" and further added "documentation for the legislation is complex and has to be generated by verified institutions" X3 added to this statement "test facilities are not spread. Not every researcher has access to pond trials and necessary equipment". Combined, these statements underline the test and trial issues of the prebiotics. Other challenges are related with scientific challenges, such as "interaction with other components are still unclear" stated by X4. Interviewee X10 indicated "further research on benefits of prebiotics is needed for feed companies. Not every prebiotic works on every fish" and similarly X2 said "MOS is working on tilapia and it strengthens the skin mucosa but not working on crustaceans. More research on health benefits has to be done". These statements show that even if the prebiotics are in the market for some years, the amount of scientific research is not at the required level. This is also backed up by X8, who said "they think prebiotics are here for many years. That's true but the health benefits are still not clear. There is high potential but scientifically it has to be proven". In total, 11 challenges are identified by the interviewees, addressing the R&D area.

Challenges at the Regulation Space

By looking at the graph, it can be seen that the interviewees mostly addressed challenges related to the regulation area. Interviewees think that different regulations are affecting the diffusion of prebiotics, globally. Not only the times it is mentioned during the interviews but also the importance of this area makes it more crucial for the innovation. Interviewees underlined how crucial this space is for the innovations in the aquaculture industry; X6 said "legislation and regulations make innovation possible" and X12 added "you can invent anything but if it is not recognized by the law it is nothing. For prebiotics the law is stricter than it should be", This area is also where the legislative activities and product registry performed, and the approval of the product is endowed. In sum, the registration of prebiotics, complex documentation, differing stringency of the regulations in different countries, hardship of animal tests, unfair legislation for small scale companies and risks at intellectual property are the different challenges identified in this area.

Most indicated challenge is the regulations vary by countries, in terms of strictness, documentation, process time and costs. Interviewees X1 and X12 said that "internationally, strict and unfair regulatory schemes negatively affect the number of academic researches created" and X8 added "registering the product in different countries is the hardest part of the product development". Affirmatively, interviewee X4, one of the market area interviewees, said "including us, many MNCs have their own benchmark where they sort the countries according to their regulatory strictness and time needed for the approval". On the other hand, about the animal tests interviewee X3 said "it is extremely hard to do tests on animals in the UK, while in China it is so easy". Another challenge is named out by the interviewee X6 "registration of a compound is costly, but not for a big company. It is not always easy for small companies or individuals to register their

products" and X9 added "registration in some countries causes intellectual property loss". In total these challenges occurred 15 times during the interviews, which shows that the regulatory scheme is not equal in every country and for small companies it is hard to comply. In other words, for the interviewees, the main challenge is to register the product and get the necessary permissions to sell the product.

Challenges as the Market Space

The second least amount of challenges occurred in the market space. The interviewees indicated numerous challenges of prebiotics in this area, such as; the production costs, low profitability, low communication within the industry, untrained sales forces and middlemen problems.

About the lack of communication, X3 said "companies tend to hide their activities, and this slows down the speed of spread" and X7 added "feed millers and compound producers are not transparent. They focus on their competitive advantage, but this is not good for prebiotics", on the other hand, X8 underlined the sales forces and said "sales forces are not educated enough. They don't know what they are selling" and accordingly, X1 added "representatives go to the farm with their fancy cars and latest smartphones. The first thing that farmers look at is the hands of that representative because their hands are scar-free and clean. Farmers don't believe what they say because they can't even throw a net". Interviewee X5 further indicated "said "we have to explain to our customers (feed millers or feed companies) what prebiotics are and what their benefits are, on a daily basis", which shows that prebiotics are not well-known in the market space. In some countries the industry structure is fragmented. Thus, it requires middlemen and intermediaries to sell the feed to the farmer. Interviewee X1, who is also an experienced field researcher, indicated that "middlemen and sellers create the gap between the science and the farmer". In other words, X11 said "prebiotics can't reach small farmers because of the fragmented structure of the industry". Another challenge is the production costs. Interviewees X10 and X5 both indicated that the production costs of prebiotics are high and said "it is not a cash cow. That's why companies are not leaning on it". In total, these challenges occur 12 times and indicate challenges in the market space.

Challenges at the End User Space

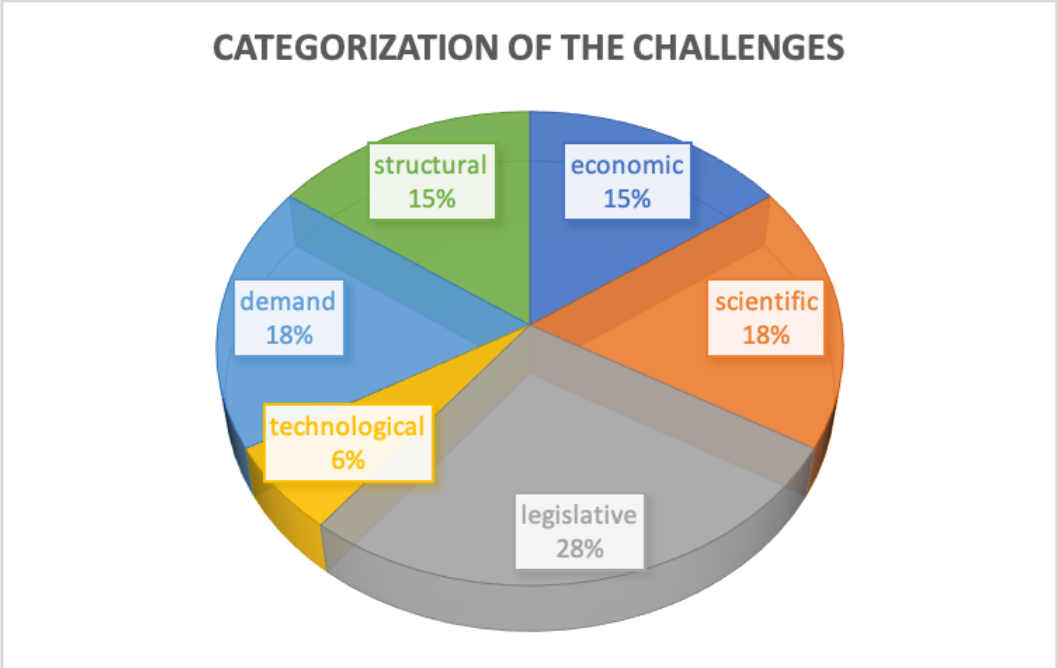
The second most often occurring challenges are located in the end user space, where the farmers are situated. The challenges addressed by the interviewees are related with the low intake of the prebiotics by the farmers, such as, diffidence of the farmers, not changing their habits, costs of the products, sticking with their past practices and the complex usage of the compounds.

Most occurring challenges are the farmers' habits and their perception of this compound. Interviewee X11 said "by nature, they are superstitious", X3 added "farmers tend to stick with traditional farming methods" and X1 said "farmers only use what their father or the neighbor farmer uses. Their beliefs are stronger than their fish". Accordingly, X8 said "farmers always do cost-benefit analysis, the benefits of prebiotics are not easily observable by a farmer", and X6 added "many farmers think that it is better to give money to antibiotics, because it cures the diseases, but prebiotics are preventing. This is not easily observable". About the complex usage, interviewee X10 said "Prebiotics might sound easy to use but it is not. Especially for the farmers because it requires different frequencies each time. Because, if it is overused it can cause immune fatigue" and X1 added accordingly "farmers are not well understanding how to use these

compounds. This is different from what they are used to". Interviewee X14 added "introducing prebiotics to a farmer is easy but making them use it is not, because it is complex, sometimes it is used in fish sometimes it is used in the water". About the willingness to pay, X2 added to X8 and said, "these are natural compounds, fibers, but still expansive for the farmers". These challenges occurred 13 times in total during the interviews and indicates the reasons why the prebiotics have not become prevalent in fish farms.

Classification of the Challenges

As mentioned in the methodology section, this analysis is used as a complementary method to the challenges section. The main reason is to cross check the results by identifying the reasons for these challenges. Thus, these challenges are classified with the reasons emerged during the data analysis. These challenges are not specifically tied to a one particular organizational field, but they can be related to these areas by their reasons. This section helps to deeply understand the origin and the reason of the challenges and relate these to the organizational fields. Graph R3 represents the categorization of the challenges and further results shared below.



Graph R3: Categorization of the Challenges

These challenges are; structural, economic, scientific, legislative, technologic and demand issues. Structural problems refer to the industrial structure and the issues that are caused by the practices in the industry, such as fragmented structure of the industry, need for consultants for small companies and low transparency of the companies. Economic challenges are the financial problems that the actors are facing while reaching, producing or registering the prebiotics. For example, prices of the products, the production costs. Scientific issues are the ones that are related with the research and not yet proven health benefits of the product. Such as, the complex usage of the compounds, unclear interaction with other components, all benefits are not discovered.

Legislative problems refer to the issues that are related with the registration, validation and verification of the compound. For instance, registration of prebiotics, complex documentation, differing stringency of the regulations in different countries, hardship of animal tests, unfair legislation for small scale companies and risks at intellectual property creation of the documentation, number of test facilities. Technological issues refer to the challenges that occur during the production or use of the product. As interviewees mentioned, test restrictions, complex production and storage are the technological challenges. And finally, demand issues occur at the farmer level and refer to low intake of the products. For instance, diffidence of the farmers, not changing their habits, sticking with their past practices.

According to the results, most occurring challenges are legislative challenges, which is supporting the fact that the regulation area is where the prebiotics get stuck or slows down (Table R2). This is followed by the scientific and demand issues. This information is also on the same line with the figures of issues identified along the innovation pathway in Table R2. By looking at the categorization of the challenges figure (Table R3), it can be seen that the main challenges are not technological, not economic and not because of the structure of the industry. In other words, according to the interviewees the main issue is not practical, at least not at the market or sales areas (Table R1). “Prebiotics are not hard to produce. You get if from nature and simply process it”. “Benefits are humongous but hard to observe, because these are insurance policy of your fish”

4.2.2 Perception of Responsibility

This part shows the actors mentioned in relation to the challenges. In other words, how does the actors of the organizational field see each other and what is their perception of responsibility while solving the challenges. The interviewees are asked to address some solution suggestions. Their theories of change and suggestions are grouped under the targeted domain. In the graph R4 the solutions and the domains of these solutions are shown. Columns contains the suggestions distributed to the targeted domains by the interviewees and the rows represents the interviewees, and their organizational field spaces.

		Theories of Changes				
Interviewees & Spaces			**R&D Space**	**Market Space**	**Regulation Space**	**Domain**
	R&D Space Actors	Academician 1		Farmers should have a voice in the product development	Creating a forum that would bring actors together	Cognitive
		Academician 2		Educate farmers and use better sales force	Better categorization of natural compounds	Both
		Academician 3	More scientific publication	Simple communication	Create joint associations	Cognitive
		Test & Trial		Close the gap between science and farm	Standardized regulations	Both
	Market Space Actors	Compound Producer 1	Create a network of academics		Create universal standards	Both
		Compound Producer 2		More events for farmers	Keep regulations updated with latest innovations	Both
		Feed Company 1	More scientific publication		Education on the field	Cognitive
		Feed Company 2			Simple Regulations	Sociopolitical
		Feed Company 3			Creating fair legislation system	Sociopolitical
	Intermediary Space Actors	NGO 1		Train and inform farmers		Cognitive
		NGO 2		Pilot farms and trainings		Cognitive
		Non Profit Org	Disseminate more results	Data Management		Cognitive
		International Association		Educate the farmers and sales forces	Keep themselves updated with latest innovation	Cognitive
		Consultant	Further research on benefits needed	Inclusive approach to the farmer		Cognitive
		Sea Food Professional		Simple communication of the benefits of prebiotics		Cognitive

Graph R4: Perception of responsibility of the interviewees

During the interviews, it is observed that the actors are pointing at each other and are mainly suggesting solutions that targets the other actors in other areas of the innovation pathway. Most of the interviewees are aware of the problems occurring in their space, however, their suggestions or the theories of change are mostly directed to the other actors. As can be seen from the graph R4, interviewees from the R&D space are mostly making downstream suggestions pointing the market space and the regulation space. Interviewee X15 pointed out that "the market space actors should work on their communication of feed and keep their health claims simple". And X3 added "the farmers should be educated by the feed companies and governments". This shows that in the perception of academicians and test & trial actors, their own space doesn't have as many problems as other spaces. Nevertheless, for the R&D space actors the regulatory organizations should work on standardizing the regulations internationally, create inclusive associations where the farmer is also included and better categorize the chemicals. By looking at the Graph R6, it can be seen that the remarks are mostly targeting the regulation space.

The market space actors; compound producers and feed companies directed their recommendations to their upstream actors, regulation space actors. Their main points are standardizing the regulations, keeping regulations up to date, assistance to companies along the innovation pathway and focusing on the education of the farmers. X4 said "the regulatory authorities don't have special teams for every single innovation. They ask high ranked academicians and get their opinion while regulating new products" and X8 added accordingly "information inflow into these regulatory bodies are less than we can imagine. They have to keep themselves updated with the latest innovations". These quotes show that the regulatory space actors lack new information flow. On the other hand, suggestions are for market space actors and R&D space actors, but these are remarkably less than the regulation space. The suggestions that they have made for regulatory areas are not only focusing on one particular legitimacy domain, it is focusing on both sociopolitical and cognitive legitimacy.

Other actors mentioned several suggestions to the problems that are slowing down the diffusion of the prebiotics in the aquafeed industry. This diverse group of actors focused their suggestions on the market space actors. Three of the interviewees in this space thought that the market actors should be more integrated with the farmers by educating them through experimental training and pilot farms. The other interviewee suggests that an inclusive data management system between regulatory and market spaces actors, including the practical data from the farmer. Interviewee X8 highlighted the problem at regulatory space and said, "nationally and internationally people that are working in regulatory institutions should keep themselves updated." and further added "this would integrate R&D activities with the regulations". Overall, the suggestions made by the actors of this space focused on solutions with cognitive routes. By all means, this indicates that their perception of lack of legitimacy is on cognitive problems in market space and combined by the previous section this shows that the remarks are targeting cognitive reasons.

4.2.3 Interim conclusion: Types of Legitimacy

In this section, the findings are wrapped up in order to relate the problems with legitimacy types and explain the discrepancies occurred at the results of the previous sections. This section aims to partially answer the research question by understanding the legitimacy reflections of the challenges, which is a necessary step to understand the relationships between the types of legitimacy.

By looking at the innovation pathway described by the interviewees, it is observed that the industry structure is fragmented, and it causes actors not seeing each other's activities. In other words, there are gaps between the actors of different spaces of the innovation pathway. For instance, the farmers are not connected with market space actors. Thus, they are not included in the innovation pathway as a stakeholder. So, they are unaware of the novelties coming. This is also highlighted by the actors of R&D space as a solution suggestion. Another similar connection is in between the market actors and the regulation actors. Regulation actors are not aware of the problems of the feed millers and compound producers. Thus, this is increasing the unfair legislation and makes innovation stuck in the regulation space. On the other hand, it is observed that the interviewees tend to put their suggestions or blame the following actors in the organizational field. So, the recommendations of change of some interviews shows a downstream pattern while the others show an upstream pattern. Thus, the actors are not able to see the innovation pathway as a whole. These examples are pointing towards a lack of shared understanding of the innovation pathway, which is one of the main problems of the industry and prebiotics to become widespread.

On the other hand, during the data analysis, a discrepancy between the results or previous sections occurred. In the previous sections, challenge analysis has been used to understand the routes of these challenges, where the second analysis has been used to understand the perception of the actors, through their accusations and solution suggestions. The identification of the challenges (Section 4.2.1) section shows that the main problem is in the legislative level. The identified challenges are related with regulations, documentation, registration and legislations. As interviewee X8 said, "regulations are not helping prebiotics to become widespread" and the results show that, 15 of 51 challenges occurs at the regulation space. Thus, the challenges are mostly is related with sociopolitical legitimacy. The reflection of sociopolitical legitimacy in this study is the problems occurring during the legislative process. Sociopolitical legitimacy problems are mostly observed in forms of, problems occurring regulations, categorizations of the compounds, registration of the compounds and the approval of use. This also backed up by the categorization of the challenges, which showed that most of the challenges are legislative and the challenges mostly arose at the regulation space in the organizational field.

However, the results of the perception of responsibility (Section 4.2.2) are different. Looking from a different angle, the solution suggestions are not only suggestions to solve the problem but also, they are pointing where the problem is underlying. Thus, it would be expected to receive similar results to the previous section. However, the results of this part show that the market space and the regulation space actors should take initiative to solve the problems by cognitive solutions. In other words, as interviewee X3 indicated "Indeed more publication needed, but if the pipeline is blocked this is only a waste of time. Government and feed companies should unblock the pipe first" and further added as a solution "an inclusive approach should be taken, and all actors should be educated on prebiotics". Interviewee X8 has a similar thinking "different regulatory schemes in

particular countries creates less research to be done in the industry" and further adds "regulators also keep themselves updated with the latest information and the newest innovations". Thus, these actors are suggesting cognitive solutions or cognitive reasonings to the sociopolitical challenges. In this study, the problems that are related with the information and the knowledge level in the industry are taken as cognitive legitimacy problems. Cognitive legitimacy issues are mostly observed in forms of, low intake of the product, negative perception against the compound, lack of communication between the actors and misinformation on the benefits of the compound.

Thus, by looking at the two analyses, it can be seen that there is a discrepancy between the legitimacy reflection of the challenges addressed by the interviewees. To explain better, the challenge analysis shows that the challenges are underlying at the regulations space and they are related with the sociopolitical legitimacy. However, the perception of the actors is pointing that the main problems are at the market space and the regulation space but most of these challenges are related with the cognitive problems. Thus, unexpectedly, the results show inconsistency. The reason for this is not because the research is wrongly constructed. It is because that there is a correlation between the two types of legitimacy and the sociopolitical challenges have cognitive reasons underlying. Thus, the two types of legitimacy affect each other, which might be affecting the overall legitimacy of the prebiotics.

4.3 Solutions

The solutions part brings the suggestions mentioned by the interviewees, during the interviews. This section consists of two parts; the relationship between the types of legitimacy and the institutionalization activities that are mentioned by the interviewees.

4.3.1 Relationships between the types of legitimacy

As discussed in the previous section, the discrepancy between the challenge analyses shows that there is a relationship between the two types of legitimacy. Six interviewees saw no indication of interaction among the two types of legitimacy. However, the rest of the interviewees implicitly or explicitly indicated that there is a relationship between the two types of legitimacy. As discussed in the previous section, the relationship between sociopolitical and cognitive legitimacy has been identified a couple of times during the interviews. During the interviews, in total, three types of relationships are observed. These are, cognitive legitimacy affects sociopolitical legitimacy, sociopolitical affects cognitive legitimacy and a vicious cycle, where the two types of legitimacy affect each other. All observed types of relationship are negatively routed, which means lack of one type of legitimacy affects the other in a negative way.

One of the relationship types is, lack of cognitive legitimacy causes sociopolitical challenges. This type is emphasized more than the other types. Interviewee X8 explicitly said "cognitive problems are leading to socio political problems, especially in less developed countries because the regulators lack information" and X1 said "you would be amazed how many employees in legislative level think that prebiotics are medicine". Interviewee X5 indicated "in some countries, regulations are hard to comply, and registration is thorny, especially if there is lack of science and information". Furthermore, interviewee X6, who works with registration of the compounds, said "the gap between the regulators and the science causes registration to be harder for the innovators". These quotes exemplify the lack of information in the market and regulatory areas that affect innovation uptake and cause regulations to become stricter.

Another type is, lack of socio-political legitimacy causes the cognitive legitimacy to decrease. If the regulation, registration and documentation is hard for actors to pass through, then this means that there is a lack of sociopolitical legitimacy. For X10 “In the UK it is not easy to do tests on animals and these can take up to a year whereas in China it takes less than 10 days, this changes the perception of the people in the market. They start thinking that the product is complex, or it is a medicament”. Similarly, interviewee X4 state “difficulty of registration creates uncertain and uneven industry which affects the scientific productivity”. Interviewee X9 said “professionals might be scared to get into this area” and gave an example “if you need a visa to go to a certain country, first you think if it's worth going there”. This shows that the sociopolitical restrictions create cognitive facts on actors and affect their level of commitment or productivity.

The last relationship type observed is the vicious cycle in between the two types of legitimacy, which cause both types of legitimacy to decrease. During the interview, interviewee X3 said “the problem is not the regulations or the farmers, it is the both" and when asked for further explanation X3 said “So people have this cognitive misunderstanding, cognitive vagueness. And this affects the regulations because regulators are not well equipped with the latest information. This leads to regulations that affect the cognitive challenge as well, by leading people to uncertainty. So, it's like an intrinsic loop.” And further added “innovators become convinced that this is a complex compound and they choose to not to work in this area anymore and if they don’t work the market can’t prove that this is a beneficial natural compound” which would keep the regulations as they are. Similar to that statement, interviewee X15 said “(…) legislative and regulatory schemes are thorny in some countries and this drives researchers and entrepreneurs to stay in between the brackets that these rules impose. This lowers the number of products because the area is restricted” and added “if there is less productivity the regulations stays the same, as like in the case of autonomous cars”. This shows that the cognitive problems causing sociopolitical challenges, which, in return, feeds the cognitive problems as well.

Overall, it can be seen that the relationships between the sociopolitical legitimacy and cognitive legitimacy affects each other in a negative way. To solve this problem, the interviewees suggested various activities. These solutions of actors to overcome the lack of legitimacy are mentioned in the following section.

4.3.2 Legitimization Activities

The actors suggested numerous activities in order to solve the challenges and also to solve the vicious cycle between the two types of legitimacy. The suggestions are matched with the institutionalization activities (Lawrence & Suddaby, 2006) and combined in Table R5. According to the analysis, most of the solution suggestions directed to the regulation and market spaces, 11 each. And the most suggested legitimization activity is educating the actors. These solution activities are distributed according to their targeted legitimacy problems.

Audiences/interviewees	Domains of the Suggestions						
		R&D Space	Leg.	Market Space	Leg.	Regulation Space	Leg.
	Academician 1			Changing Normative Associations	C	Constructing Normative Networks	C
	Academician 2			Educating	C	Defining	SP
	Academician 3	Educating	C	Construct Identities	C	Constructing Normative Networks	C
	Test & Trial			Constructing Normative Networks	C	Defining	SP
	Compound Producer 1	Constructing Normative Networks	C			Defining	SP
	Compound Producer 2			Changing Normative Associations	C	Defining	SP
	Feed Company 1	Educating	C			Educating	C
	Feed Company 2					Defining	SP
	Feed Company 3					Changing Normative Associations	SP
	NGO 1			Changing Normative Associations	C		
	NGO 2			Changing Normative Associations	C		
	Non Profit Organization	Educating	C	Theorizing	C	Theorizing	C
	International Association			Educating	C	Educating	C
	Consultant	Educating	C	Constructing Normative Networks	C		
	Seafood Professional			Construct identities	C		

Graph R5: Distribution of Institutionalization Activities to Innovation Pathway Spaces

As can be seen from the Graph R6, the solution suggestions are first converted to the challenges that the interviewees have already mentioned (Graph R4) and then, replaced to the related innovation pathway spaces. The small boxes represent the legitimacy domain of these solution suggestions. It is clear that the solutions that are aiming to solve the cognitive issues are higher than the sociopolitical solutions.

Sociopolitical Problems

Activities that are under the *defining* category are more focused on solving sociopolitical problems (as discussed in the problem section: Section 4.2.1). In order to solve these problems, solution suggestions interpreted by the interviewees; such as, standardizing the regulations, creating universal standards, better categorization of the compounds, keeping regulations up to date and creating a fair legislation system. When we look at these suggestions, we can clearly see that these suggestions are made by the R&D space actors and market space actors. These suggestions are based on regulations and legislative pathways. Interviewee X4 said that "(…) regulations are strict and they require a modernization". Accordingly, interviewee X10 added "the registration process should become automatized and standardized all over the world" while, X14 indicated "product registration has to be easier to understand for every company, in any size. International associations should create new standards". Thus, the *defining* activities are suggested by the actors of the innovation pathway in order to solve sociopolitical problems.

Cognitive Problems

Cognitive problems are more complex than the sociopolitical problems. As can be seen from the challenge analysis and solution suggestion parts (Section 4.2) the cognitive problems are scattered along the innovation pathway, whereas the sociopolitical problems only occur at the regulation space. The cognitive problems are the problems that are identified at market, R&D and end-user phases (Graph R2) and the problems that are identified under demand, structural and economic categories (Graph R3). The interviewees that identified the challenges are also suggested several solutions. These activities are clustered under the legitimization activities; education, changing normative associations, constructing normative networks and theorizing.

In order to solve cognitive issues, educating types of activities are the ones that are mostly suggested. Suggested activities are focusing on informing and educating the actors about the specification of prebiotics and the benefits that prebiotics bring. X11 says "the only way the farmers embrace prebiotics is having more and more academic studies" and X3 added "benefits of prebiotics should be highlighted". Interviewees think that, with education, the farmers would be informed about the prebiotics, which would increase their uptake. It is not only suggested for the farmers, also suggested for the market space actors and regulation space actors. X8 said "different regulatory schemes in particular countries creates less research to be done in the industry" and identified the challenge. Then the same interviewee suggested "regulators should keep themselves updated with the latest information and the newest innovations", which indicates the need for education for regulatory actors. On the other hand, X3, who identified that the gap between the actors in the innovation pathway, said "there should be an online platform that every single actor can reach and get educated. Not only the farmers but also the representatives and the regulators". With these suggestions we understand that the cognitive issues related to the misinformation or lack of information can be solved by the educating activities.

Another cognitive challenge was the negative perception of the actors on the prebiotics. As discussed in the previous chapters, the prebiotics are sometimes considered as medicines or considered as a treatment compound. Thus, in order to change the wrong perceptions of these actors, creating new practices and engaging actors more into the product development process is suggested by the interviewees. X12 said “feed companies should have pilot farms that are owned by them and they should invite farmers to observe the products by themselves” on the other hand X1 said “Events in the past were more engaging. Feed companies must include farmers or associations more to their product development” X3 said “nowadays, feed companies are more short-term oriented. They see farmers as customers not as stakeholders”. On the other hand, interviewee X5, who is a market space actor said “there should be more events like open-house or product demonstration. Seminars are for businessmen”. So, the market area actors are blamed by not engaging with the farmers enough, like they used to do in the past. Thus, activities that are suggested to change the normative associations are related with the engagement of the actors and it is believed that these kinds of activities can close the gap between the actors of innovation space.

These activities are mostly suggested for the market space and the regulation space by the actors of R&D space. Most of these suggestions are aiming to create a synergy between the industry by connecting actors from different spaces. Creating forums, creating joint associations and creating a network of academics are the prominent suggestions. X1 said “there should be a forum of prebiotics where the farmers talk about their experiences, academicians tell their new studies and feed companies to be inspired by those.”. Similarly, X2 said “the government can create a joint association to work on these novelties. This would definitely create fair legislation”. Interviewee X7 said “The gap between the science and the market is 10 years. This could only be closed by including farmers into the development of the technology phase. Companies should have work groups”. These thoughts show that the interviewees think that the cognitive problems can be solved by constructing normative networks, under the leadership of the market actors or regulation space actors.

Another suggested activity type is theorizing. The interviewee X12, named some challenges in the innovation pathway by saying “the benefits of prebiotics are not clear for some people” and added “usage is still complex, this makes people stay away from prebiotics”. As solutions to these challenges, interviewee X12 said “big data collection from the farms and detailed analysis of the data would increase the use of prebiotics”. The interviewee referred to developing cause and effect study by using the data, which would eventually show if the prebiotics make a change in fish health or not. Thus, mainly the end users and then the market actors would be able to make abstract reasoning by the results of analyzed data. The interviewee suggested this solution for market and regulation spaces actors to have a joint platform where the data from the field is uploaded and used to understand the optimal conditions for every species, which would be a solution for the not completely identified benefits and the

5. CONCLUSION

The aim this study was to understand how audiences in the prebiotics innovation pathway perceive the legitimacy of the prebiotics and how do their legitimization strategies affect different forms of legitimacy. Moreover, this research question brought some sub-questions. Such as, identifying the lack of legitimacy of prebiotics in the aquaculture industry and understanding the relationship of the two types of legitimacy. The results from the interviews indicate that prebiotics innovation is lacking both sociopolitical legitimacy and cognitive legitimacy. The challenges that prebiotics face is mostly legislative and occur in the regulation space; which are related with the sociopolitical legitimacy. However, the suggestions of the actors and the activities they perform are towards enhancing the cognitive legitimacy, such as educating, changing normative associations, constructing normative networks and theorizing. This interprets a strong mutual dependence between sociopolitical and cognitive legitimacy in the prebiotics field. Furthermore, the results demonstrate that there are three relationships observed; cognitive affects sociopolitical, sociopolitical affects cognitive and vicious cycle. In all these relationships the type of relationship is negative. Thus, the affecting type of legitimacy has a negative impact on the other or each other. Hence, the lack of one type of legitimacy might cause the other to decrease, and this slows down the institutionalization of the innovation.

While reaching these results, behaviors of the innovation pathway actors are examined and shown some similar patterns. Actors are aware of the problem in their space, however, their suggestions or the theories of change are directed either to their upstream or downstream actors. In other words, the actors tend to address their suggestions to the other actors in the innovation pathway and they think that the another actor has to take action to solve the problems. This shows a lack of shared understanding within the sector, which might be a reason for other problems to occur. Furthermore, these suggestions show that the institutional work activities are used to increase a certain type of legitimacy. Educating, changing normative associations, constructing normative networks and theorizing are the categories of activities in order to enhance cognitive legitimacy. Whereas, defining activities are used to enhance sociopolitical legitimacy.

6. DISCUSSION

Overall, this research provides empirical insights and adds to the literature. The thesis contributes to the literature with applying the institutional theory to an innovation in the aquafeed industry. Furthermore, identifying and specifying the relationships between the types of legitimacy and the legitimization activities that affects the certain type of legitimacy are the following contributions.

The data quality was adequate to extract necessary findings for the research question to be answered. Expectedly, the analysis confirms that prebiotics are having a lack of legitimacy in the aquaculture industry. Still, these results might not represent other products in the aquaculture industry. Moreover, the results also indicate that there is a relationship between the sociopolitical legitimacy and cognitive legitimacy. However, this might not be the case if the product or the industry is changed. On the other hand, the study demonstrates that industry actors have some behavioral patterns, such as, finding challenges outside of their own spaces, making downstream or upstream suggestions and specific choices of institutional activities they perform. These results might only be valid for this specific industry and for the prebiotics.

While analyzing the data, the use of three different main theories created some issues. Since there was no other example research that merges legitimacy (Aldrich and Fiol, 1994), institutional work activities (Lawrence and Suddaby, 2006) and audience theory (Meyer and Rowan, 1977) the researcher took initiative while coupling these activities and went with the simplest solutions. Thus, these steps might lower the reproducibility of this research. On the other hand, there were several points where the interview data was merged with the practices of the theory section. Categorization of the challenges with the legitimacy types, matching the suggestions (theories of change) of the interviewees with the institutional work activities and merging these activities with the types of legitimacy are the steps where the researcher used the theoretic framework to construe the data. During these categorization activities, consistency and reproducibility were taken as priority. However, the results might still show differences if the study is repeated by another researcher. In order to keep the consistency, categorizations were made based on what the interviewee directly stated, not what they try to imply. Nevertheless, interviews are conducted in English and this is the secondary language of some interviewees, which creates a room for error when interviewing. Thus, this might also affect the outcome of the results.

One of the limitations of this research is that the research is lacking interviewees from regulatory space. Initial thesis plans were including at least having five interviews from regulatory space. However, changing global conditions affected the thesis planning and the availability of pre-scheduled interviews. In total there are fifteen interviews conducted. In order for the results to be more robust, a larger number of interviewees, from different scopes, could be conducted for the robustness of the results. Including the farmers into the research was an idea in the beginning of the data collection. However, the perception of the farmers would be limited if they were not introduced with the prebiotics before. Another limitation is that it is beyond the scope of this study to indicate that the results are expandable to the other livestock industries that prebiotics are used or for the other feed compounds to be used in the aquaculture sector. Hence, the results are limited to the aquaculture industry and might show differences if the industry or the product is different. Thus, including the regulatory space actors, increasing the number of interviewees and including farmers into the research would be recommendations for further research.

This thesis provides some practical suggestions and strategic insights to its reader. The findings of this study could guide actors of the aquaculture industry to strategically use the institutional activities to enhance the legitimacy of a new fish feed compound, including the prebiotics. For intermediary actors and entrepreneurs, knowing that the challenges in the aquaculture system can be solved by educating activities, this would mean that an inclusive and multidisciplinary education platform, which provides space for all the actors to share their experiences and thoughts would be an area to focus. Moreover, understanding the relationship between the two types of legitimacy would help the actors to build commercial strategies. For regulation space actors, knowing the relationship between the legitimacy types would increase their interaction with the other actors and become a supportive party along the innovation process. For the market space actors, the relationship could mean even more. By using the right strategies, they might take their products or innovations to the market faster and with firm steps. For the R&D space actors, knowing the relationship between cognitive and sociopolitical legitimacy would lead to a better management of their innovations and use their educational activities more effectively.

The starting point of this thesis was to bring the global aquaculture sector to a more sustainable state and contribute to SDG 14 by creating a link between a sustainable disruptive innovation and the role of legitimacy on the diffusion of this innovation. In the beginning of each interview, the interviewer asked several questions to understand the perception of the level of sustainability in the global aquaculture sector. The answers showed a similarity; fourteen interviewees said that the global aquaculture industry is not sustainable and there are still a lot of steps to be taken. In the light of this information, the insights provided in this study would potentially speed up the process of innovation diffusion in the innovation pathway and novelty intake at the farmer level, which would help the aquaculture industry to responsibly grow and sustainably develop. Thus, it is recommended for further research to expand the scope and apply the research to different industries with different innovations.

In summary, the research illustrates legitimacy as the main obstacle for the development of prebiotics in the aquaculture sector. It identifies the type of legitimacy that hampers the diffusion of the prebiotics, explains the interrelated relationship between sociopolitical and cognitive legitimacy, and illustrates their impact on the development of the prebiotics. Furthermore, it provides a strategic insight by illustrating the crucial role of innovations in helping the aquaculture industry to responsibly grow and sustainably develop. Lastly, this paper explains the institutionalization activities that are used by the actors and the types of legitimacy these activities aim to enhance.

Reference List

Akhter N., Wu B., Mahmood A. M. Mohsin M. (2015) Probiotics and prebiotics associated with aquaculture: A review. Gathered from https://doi.org/10.1016/j.fsi.2015.05.038

Aldrich, H & Fiol, C.. (2007). Fools Rush In? The Institutional Context of Industry Creation. Entrepreneurship: Concepts, Theory and Perspective. 19. 105-127. Doi: 10.1007/978-3-540-48543-8_5.

Aldrich, H. And Waldinger, R. (1990) Ethnicity and Entrepreneurship. Annual Review of Sociology, 16, 111-135. Http://dx.doi.org/10.1146/annurev.so.16.080190.0005

Ashforth, Blake & Gibbs, Barrie. (1990). The Double-Edge of Organizational Legitimation. Organization Science - ORGAN SCI. 1. 177-194. Doi: 10.1287/orsc.1.2.177.

Aaltonen, K., Kujala, J., Tuomas, O. (2008). Stakeholder salience in global projects. International Journal of Project Management- INT J PROJ MANAG. 26. 509-516. 10.1016/j.ijproman.2008.05.004.

Béné, C., Arthur, R., Norbury, H., Allison, E.H., Beveridge, M., Bushe, S., Campling, L.,Leschen, W., Littled, D., Squires, D., Thilsted, S.H., Troelli, M., Williams, M., (2016). Contribution of fisheries and aquaculture to food security and poverty reduction:assessing the current evidence. World Dev. 79, 177– 196. Gathered from: https://qmro.qmul.ac.uk/xmlui/bitstream/handle/123456789/11179/Campling%20Contribution%20of%20Fisheries%20and%20Aquaculture%20to%20Food%20Security%20and%20Poverty%20Reduction%3A%20Assessing%20the%20Current%20Evidence%202015%20Accepted.docx?Sequence=1

Bhari, Bishal., Visvanathan, C. (2018). Sustainable Aquaculture: Socio-Economic and Environmental Assessment. Gathered from: https://link.springer.com/chapter/10.1007/978-3-319-73257-2_2

Bryman, A. (2012). Social research methods. Oxford. Oxford university press. Gathered from: www.researchgate.net/profile/Yousef_Shahwan4/post/What_is_the_best_and_the_most_recent_ book_in_medical_research_methodology/attachment/59d6525179197b80779aa90f/AS%3A511717807 321088%401499014441133/download/Social+Research+Methods.pdf

Bowen, G. (2009). Document Analysis as a Qualitative Research Method. Qualitative Research Journal. 9. 27-40. Doi: 10.3316/QRJ0902027.

Baxter, P., Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. The qualitative report, 13(4), 544-559 gathered from: Https://nsuworks.nova.edu/tqr/vol13/iss4/2/

Castex, M. , Durand, H. And Okeke, B. (2014). Issues with Industrial Probiotic Scale-up. In Aquaculture Nutrition (eds D. Merrifield and E. Ringø). Doi:10.1002/9781118897263.ch13

Chandy, R., Aboulnasr, K., Narasimhan, O., Blair, E., (2008). Competitive Response to Radical Product Innovations. Journal of Marketing American Marketing Association ISSN. 72. 94-110.10.1509/jmkg.72.3.94.

Cyert, R., Feigenbaum, E., March, J.. (1963). A Behavioral Theory of the Firm. Behavioral Science. 4. Doi: 10.1002/bs.3830040202.

Cashore, B. (2002), Legitimacy and the Privatization of Environmental Governance: How Non–State Market–Driven (NSMD) Governance Systems Gain Rule–Making Authority. Governance, 15: 503-529. Doi:10.1111/1468-0491.00199

Dawood M. And Koshio, S. (2015). Recent advances in the role of probiotics and prebiotics in carp aquaculture: A review. Aquaculture. Gathered from: 10.1016/j.aquaculture.2015.12.033

Dimaggio, P., Powell, W. (2000). 'The Iron Cage Revisited: Isomorphism in Organizational Fields'. American Sociological Review. 48. 147-160. Doi: 10.2307/2095101.

Deephouse, D. & Suchman, M. (2008). Legitimacy in Organizational Institutionalism. The Sage Handbook of Organizational Institutionalism. 49. Doi:10.4135/9781849200387.n2.

Delmar, F., Shane, S. (2004). Legitimating First: Organizing Activities and the Survival of New Ventures. Journal of Business Venturing. 19. 385-410. 10.1016/S0883-9026(03)00037-5.

FAO. (2018). The State of World Fisheries and Aquaculture. Gathered from: http://www.fao.org/3/i9540en/i9540en.pdf

FAO (2016) Sustainable value chains for sustainable food systems. Gathered from: http://www.fao.org/3/a-i6511e.pdf

FDA, (2016), Summary Report on Antimictobials sold or Distributed for Use in Food-Producing Animals. Gathered from: https://www.fda.gov/media/109457/download

Fisher G., Kuratko D. F., Bloodgood J. M., Hornsby J. S. (2017), Legitimate to whom? The challenge of audience diversity and new venture legitimacy, Journal of Business Venturing, Vol.32, Gathered from: https://doi.org/10.1016/j.jbusvent.2016.10.005.

Friedman, A., Miles, S. (2006). Stakeholders: Theory and Practice

Flick, U. (2009). An Introduction to Qualitative Research. Los Angeles: Sage Publications. Gathered from: scholar.google.nl

Grenni P., Ancona V., Varacciolo A. B. (2018) Ecological effects of antibiotics on natural ecosystems: A review. Microchemical Journal. Gathered from. Https://www.hort.vt.edu/args/documents/ecologicaleffects.pdf

Gurses, K., Ozcan, P. (2015) Entrepreneurship in Regulated Markets: Framing Contests and Collective Action to Introduce Pay TV in the US. The Academy of Management Journal. 58. 1709-1739. Gathered from: 10.5465/amj.2013.0775.

Hanlon, D., & Saunders, C. (2007). Marshaling Resources to Form Small New Ventures: Toward a More Holistic Understanding of Entrepreneurial Support. *Entrepreneurship Theory and Practice*, *31*(4), 619–641. Https://doi.org/10.1111/j.1540-6520.2007.00191.x

Hoseinifar, S. H., Ahmadi, A. , Raeisi, M. , Hoseini, S. M., Khalili, M. And Behnampour, N. (2017), Comparative study on immunomodulatory and growth enhancing effects of three prebiotics (galactooligosaccharide, fructooligosaccharide and inulin) in common carp (*Cyprinus carpio*). Aquac Res, 48: 3298-3307. Doi:10.1111/are.13156

Habermas J., (1975) Legitimation Crisis. Gathered from: Https://s3.amazonaws.com/academia.edu.documents/30468536/jij5s.legitimation_crisis.pdf?Responsecontent-disposition=inline%3B%20filename%3dlegitimation_crisis.pdf&X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWOWYYGZ2Y53UL3A%2F20191130%2Fus-east1%2Fs3%2Faws4_request&X-Amz-Date=20191130T223747Z&X-Amz-Expires=3600&X-amzsignedheaders=host&X-Amz-Signature=6d54ca271db807393c385cdccd16fd223fa86d0e75001bc6fdb6670f3d96aa58

Hunt C.S., Aldrich H.E. (1996) Why even Rodney Dangerfield has a home page: Legitimizing the world wide web as a medium for commercial endeavors Annual Meeting of the Academy of Management,

Hannan, M., Freeman, J.. (1977). The Population Ecology of Public Organizations. American Journal of Sociology. 82. 10.1086/226424.

Hekkert, M.P. & Suurs, Roald & Negro, S.O. & Smits, R.E.H.M. & Kuhlmann, Stefan. (2007). Functions of Innovation Systems: A New Approach for Analysing Technological Change. Technological Forecasting and Social Change. 74. 413–432. Doi:10.1016/j.techfore.2006.03.002.

Jokhio, I., Chalmers, I. (2015). Using Your Logical Powers: Abductive Reasoning for Business Success. User Experience Magazine, 15(4). Gathered from https://uxpamagazine.org/using-your-logical-powers/

Johnson C., Dowd T. J., and Ridgeway C. L. (2006) Legitimacy as a Social processannual Review of Sociology Vol. 32:53-78 (Volume publication date 11 August 2006) gathered from: https://doi.org/10.1146/annurev.soc.32.061604.123101

Khaire, M., Wadhwani, R. (2010). Changing Landscapes: The Construction of Meaning and Value in A New Market Category - Modern Indian Art1. Academy of Management Journal. 53. 1281-1304. 10.5465/AMJ.2010.57317861.

Koerber, A., mcmichael, L., (2008). Qualitative Sampling Methods A Primer for Technical Communicators. Journal of Business and Technical Communication - J BUS TECH COMMUN. 22. 454-473. DOI: 10.1177/1050651908320362.

Lipset, S. (1959). Some Social Requisites of Democracy: Economic Development and Political Legitimacy. *The American Political Science Review, 53*(1), 69-105. Doi:10.2307/1951731

Lawrence, T. And Suddaby, R. R, (2006). Institutions and Institutional Work. Gathered from: Https://ssrn.com/abstract=3197577

Lounsbury, M. And Glynn, M.A. (2001), Cultural entrepreneurship: stories, legitimacy, and the acquisition of resources. Strat. Mgmt. J., 22: 545-564. Doi:10.1002/smj.188

Meyer, J., & Rowan, B. (1977). Institutionalized Organizations: Formal Structure as Myth and Ceremony. *American Journal of Sociology*, *83*(2), 340-363. Gathered from: www.jstor.org/stable/2778293

Markard, Jochen & Wirth, Steffen & Truffer, Bernhard, 2016. "Institutional dynamics and technology legitimacy – A framework and a case study on biogas technology," Research Policy, Elsevier, vol. 45(1), pages 330-344. Gathered from: https://ideas.repec.org/a/eee/respol/v45y2016i1p330-344.html

Pahnke, E., & Katila R., Eisenhardt, K. (2015). Who Takes You to the Dance? How Partners' Institutional Logics Influence Innovation in Young Firms. Administrative Science Quarterly. 60. DOI: 10.1177/0001839215592913.

Pradeepkiran J. A., (2019). Aquaculture role in global food security with nutritional value: a review, *Translational Animal Science*, Volume 3, Issue 2, March 2019, Pages 903–910, gathered from: https://doi.org/10.1093/tas/txz012

Patterson J.A., Burkholder K.M. (2003) Application of prebiotics and probiotcis in ppultry production. Gathered from: https://www.ncbi.nlm.nih.gov/pubmed/12710484

Pfeffer J., Salancik G. R. (2003) The External Control of Organizations: A Resource Dependence Perspective.

Reid, G. (2008) Probiotics and prebiotics – progress and challenges.Int. Dairy J., 18, 969–975. Gathered from: https://doi.org/10.1016/j.idairyj.2007.11.025

Ringø, E. , Olsen, ,R. , Gifstad, T. , Dalmo, R. , Amlund, H. , Hemre, G. And Bakke, A. (2010), Prebiotics in aquaculture: a review. Aquaculture Nutrition, 16: 117-136. Doi:10.1111/j.13652095.2009.00731.x

Rao, R., Chandy, R., Prabhu, J. (2008). The Fruits of Legitimacy:Why Some New Ventures Gain More from Innovation Than Others. Journal of Marketing - J MARKETING. Gathered from: 72. 58-75. Doi: 10.1509/jmkg.72.4.58.

Rutherford, M. W., Mazzei, M. J., Oswald, S. L., & Jones-Farmer, L. A. (2018). Does Establishing Sociopolitical Legitimacy Overcome Liabilities of Newness? A Longitudinal Analysis of Top Performers. Group & Organization Management, 43(6), 906–935. Https://doi.org/10.1177/1059601116676391

Sahu, M.K., Swarnakumar, N.S., Sivakumar, K. Et al. (2008) Probiotics in aquaculture: importance and future perspectives Indian J Microbiol 48: 299. Gathered from: https://doi.org/10.1007/s12088008-0024-3

Suchman, M. (1995). Managing Legitimacy: Strategic and Institutional Approaches. Academy of Management Review, 20, 571-611. The Academy of Management Review. 20. 571. Doi:10.2307/258788.

Singh, J.V., Tucker, D.J., House, R.J., (1986). Organizational legitimacy and the liability of newness. Adm. Sci. Q. 31, 171–193.

Stinchcombe, A.L., 1965. Social structure and organizations. Handbook of Organizations, pp. 142–193.

Scott R. (1995), Institutions and Organizations. Ideas, Interests and Identities.. 17. 136. 10.3917/mana.172.0136.

Suddaby R., Bitektine A., Haack P. (2015) Legitimacy gathered from https://aom.org/uploadedfiles/Publications/Annals/ANNALS-2015-0101.R3.pdf

Tornikoski, E. (2007). Legitimating behaviors and firm emergence: A resource dependence perspective. International Entrepreneurship and Management Journal. 5. 121-138. Doi:10.1007/s11365-007-0049-9.

Tyler, T. (2006). Psychological Perspectives on Legitimacy and Legitimation. Annual review of psychology. 57. 375-400. Doi: 10.1146/annurev.psych.57.102904.190038.

UN SDG 14. UN webpage, 2015. Sustainable Development Goals. Https://www.un.org/sustainabledevelopment/oceans/

Überbacher, F., (2014). Legitimation of new ventures: a review and research programme. J. Manag. Stud. 51, 667–698

Vincent A.T., Gauthier J., Derome N., Charette S.J. (2019) The Rise and Fall of Antibiotics in Aquaculture. In: Derome N. (eds) Microbial Communities in Aquaculture Ecosystems. Gathered from https://link.springer.com/chapter/10.1007/978-3-030-16190-3_1#citeas

Walker, D. H. (1997). Choosing an appropriate research methodology. Construction management and economics, 15(2), 149-159. Gathered from: https://doi.org/10.1080/01446199700000003

WHO, (2018), WHO Report on Surveillance of Antibiotic Consumption, gathered from https://www.who.int/medicines/areas/rational_use/who-amr-amc-report-20181109.pdf

Yin, R. K. (2013). Case study research: Design and methods. Thousand Oaks. Sage publications. Gathered from: https://doi.org/10.1177/1356389013497081

Zimmerman M. A., Zeitz G. J.. (2002). Beyond Survival: Achieving New Venture Growth by Building Legitimacy. *The Academy of Management Review, 27*(3), 414-431. Gathered from www.jstor.org/stable/4134387

Appendices

Appendix A - Interview Guide

Interview Guide

Dear Madam / Sir,

This interview guide is prepared to give an insight of the topics that will be covered during the interview with Utku Aydıncı.

Aquaculture is highly susceptible to the risk of contagious diseases, and this threatens the health of fish and the wealth of farmers. Antibiotics were a promising solution for decades; however, recent studies show that it is creating a threat for both farmers and marine ecosystems. UN took aquaculture and fisheries in the Sustainable Development agenda and encouraged actors in this sector to innovate for more sustainable solutions. Thus, this study is focusing on barriers that innovations and innovators are facing while diffusing a novelty into aquaculture sector. This master's thesis is working on the effects of legitimacy on the diffusion of innovation and the effects of different actors on legitimacy. The case chosen is, use of novel natural substances, such as prebiotics and not being widely applied in shrimp feed.

It is aimed to conduct a set of interviews with the actors that are located around this innovation. Mature Development BV is providing initial contacts for interviews and supporting this thesis with the motivation of bringing the aquaculture sector to a sustainable state.

Please read the **Interview Consent Form** and carefully go through the conditions. If you have any objections regarding the permissions demanded or any other requests, please inform the interviewer before the interview. This interview will take approximately 20-30 minutes.

The following topics will be addressed during the interview:

- Organization
  - Your role in the company
  - Intended purpose of your company
- Prebiotics innovations in Fish feed
  - Sustainability and Prebiotics
  - Prebiotics in Fish Feed
- Use of Prebiotics
  - Is this the innovation that aquafeed industry needs?
  - Is this an acknowledged product?
  - Future of prebiotics?

Appendix B - Interview Questions

Interview Questions

Questions

A. Organization Related Questions

1- What is your company's intended purpose?
2- What is your role in the company?
3- What do you think about the current state of sustainability in aqua feed sector?

B. Prebiotics and Fish Feed Related Questions

1- What do you think of functional feed additives? Mainly prebiotics?
2- Do you know how prebiotics work? Additional questions would be:
    a. What are pros and cons of prebiotics?
    b. Can they eliminate antibiotics?
    c. Do you consider prebiotics as a sustainable product?

C. Legitimacy Related Questions

1- Do you think if this innovation is embraced enough by the aquafeed industry?
    a. If positive: Do you believe that it is or will be a widespread product?
        i. How?
    b. If negative: Why it is not embraced? Is it because of:
        i. Technological
        ii. Public Perception
        iii. Regulatory Framework
2- What is the biggest challenge for prebiotics to be in the market?
    a. What are the key resources that can help prebiotics to be an acknowledged and widespread product in the market?
3- (Assuming that the answer will be either related to regulations or public perception) Do you think that the "Public Perception and Regulations" are affecting each other?
    a. How? Positive or negative?
4- Are you performing any activities to overcome these barriers?
    a. If yes: What are those activities?
        i. Are you collaborating with other actors?
    b. If no: Why?
5- What are other types of activities that can be performed to overcome these barriers and make prebiotics a widespread product?

D. Overall

1- Would you like to add something?
2- Do you know any contacts that might be relevant for this thesis study?

Appendix C – Contacts Table and Information

Name	Company	Company's Focus	Current Role	Sustainability Focused?	Importance	Familiarity with the prebiotics	Cluster	Collaborations	Willingness to be Interviewed	Contact Details	Can introduce to XX	Name of the Event

(to prevent confidentiality issues the table is kept blank)