

Norwegian Multinational Firms in the Chilean Salmon Farming Industry

*Developing prerequisites for innovative activities in host
countries*



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1. Introduction

Aquaculture, and in particular the salmon farming industry, have during the last decades grown and developed to become a very significant industry for both Norway and Chile. In a relatively short period of time (20-30 years) we have observed the development of a global industry, from being originally small in scale and regionally-based, to an industry principally dominated by international actors. Aquaculture and salmon farming is classified as an industry based on natural resources. At the same time, the levels of applied technology and solutions derived from advanced research and development (R&D) are increasing within the aquaculture sector. The focus on knowledge is gaining ground in the race of staying competitive among the actors, and many believe there is still yet to come in terms of further development and growth. It is conceived to be a lot of unexplored potential in for instance genetics, biology and other fields where the knowledge is considered to be of intensive character (Ørstavik 2004). Given the advances in the development, in particular technological, it creates several effects that the actors in the industry are obliged to take into consideration in order to stay increasingly competitive. Different kinds of challenges are forcing the industry to adapt and react rapidly. Challenges in food safety and traceability, environmental standards, public regulations and not least the fact that salmon is a living organism, epitomize the intricate situation the industry is dealing with.

Furthermore in this setting, it is important to introduce the main contributors to the development of the salmon farming industry, in terms of internationalization processes, namely the *multinational firms (MNFs)*¹. Their relevance and influence in the salmon farming industry is no exception, especially in view of the fact that the industrial structure is consolidating into less and larger companies. Besides the changes in market and industry structure the last decades, the trends of consolidation have to be seen in relation of the concept of globalization, a well-discussed term in different contexts. Regarding the perception of globalization in relation to innovation, Archibugi and Iammarino (2002: 99) provides a significant definition of globalization as “...*high degree of interdependency and interrelatedness among different and geographically dispersed actors...*” Nonetheless,

¹ More detailed definitions and descriptions of the multinational firm will follow in the theoretical section.

despite being exposed for both critics and praise, the significant part MNFs have as drivers for processes of internationalization, is probably the only point anti-globalization and pro-globalization factions agree on (Narula 2003: 12).

Moreover, it is important to regard how these MNFs are perceived when it comes to internationalization of their activities. Until the early 1980s, a large part of the literature has viewed MNFs as “quasi-colonial” institutions, principally known for exploiting technological advantages created at ‘home’ in their foreign markets (Castellani and Zanfei 2006). Perhaps due to this particular perception, a certain degree of scepticism concerning the MNFs international activities and foreign direct investment (FDI)², especially directed to the developing part of the world, may have arisen (Narula 2003). What is being internationalized? Production activities, like marketing, manufacturing and sales have become global and dispersed, i.e. gone through processes of globalization as we understand them. But when it comes to the more innovative and knowledge-intensive activities, especially manifested through R&D activities, it demonstrates us that the internationalization patterns are not the same as for the production activities on the value-added chain (Dunning 1993, Patel and Pavitt 1999, Zanfei 2000, Narula 2002, Maskell et al. 2006). Nevertheless, there are indications in many arenas of changes in the general perceptions on their global activities and with an increased focus on the potential benefits of the mentioned innovative activities and investments (Blanc and Sierra 1999, UNCTAD 2005). For that reason it is interesting to follow the motivations and rationales for the MNFs of organizing innovative activities the way they are in the aquaculture sector. Therefore, I have chosen to analyze the salmon farming industry and Norwegian multinational firms, and their relationship to their Chilean subsidiaries, with a particular focus on activities that are characterized as innovative and knowledge-intensive.

The understanding of internationalization processes require often a broad definition of innovation, which from a conceptual point of view has been dealt with in various ways depending on the researchers’ field and background. Still, a part of the essence lies in grasping the *complexity* that surrounds innovative processes, especially when the actors are

² Foreign Direct Investments or FDI, are closely related to multinational firms (MNFs). There are many possible definitions and manners of understanding what FDI really is, but the issue of importance here is that it entails flows of investments across borders.

involved in crossing borders and barriers that often surfaces when dealing with different cultures and environments. The specific challenges of various kinds that surround the salmon farming industry are essential in the process in fully comprehending the internationalization of innovative activities. Therefore this work will apply the *evolutionary approach* to the understanding of innovation.

Finally, the matter lies in how the mentioned concepts are relevant to the development of the salmon farming industry and why it is essential to analyze the industry in this context, concretely how the role of knowledge affects the multinationals to arrange their international activities.

1.1 Research Questions

Given this thesis' topic and the context of the case, I have formulated three research questions that will be setting the frame for the work. The first and main question sets the agenda by asking if it is appropriate to claim the occurrence of: *a shift of focus from production activities towards more innovative activities in Norwegian companies with operations in Chile in the salmon farming industry.*

Traditional indicators of innovative activities are R&D performance and patent statistics. Since innovation is broadly defined in this context, innovative activities include also other formalized and non-formalized activities that assist innovation and knowledge generation processes. However, the main focus is related to the R&D units in the companies.

As mentioned earlier, it appears to be indications of changes in the general perceptions internationalization of innovative activities, at least in the literature. At the same time it will be interesting to examine if these tendencies are absorbed by the MNF in the salmon farming industry. As the Norwegian aquaculture industry has been established for longer time than the Chilean, it is coherent to perceive them as the biggest drivers for technological development than their Chilean counterparts. Nevertheless, it would be unreasonable to suggest that a sufficient level of development has been obtained from the Norwegian industrial perspective. In an evolutionary perspective, innovation and knowledge generation processes are 'never-ending', with continuous room from improvement and change. These are obviously complex matters, but even so important issues to bear in mind when one is

concerned about the implications of globalization, especially the development and diffusion of technology.

The second research question follows up the main question and is related to the consequences of such a change of focus: *what are the organizational implications of a shift in that direction?* By being involved in international activities it is no surprise that the companies need to take many multifaceted situations and contexts into consideration in their decision-making processes. It often requires the companies to carry out different strategic decisions and manage certain organizational structures that fit their motives of international involvement and investment. It is essential to take into account how the choices of organizing and internationalizing innovative work, in particular R&D as a more applied activity, are thought out and justified by the decision-makers, in this case in the MNF. A sub-category in this part of analyzing the organizational implications is closely related the relationship between *headquarters and the subsidiary* in the multinational organization. Putting emphasis on this relationship plays a part in coming closer to the explanation of the differences in locating R&D units in either the home or host country.

The last and third research question is related to the factors, both internal and external, that affect the decisions of establishing international innovative activities in the company. More precisely: *what kind of prerequisites are needed in order to establish (and formalize) innovative activities in the host countries?*

Normally when a MNF seeks to internationalize an activity of more innovative character different factors have to be accounted for. The two main reasons are normally related to costs and competences, i.e. the search of a balance between these two factors (Maskell et al. 2006). One would also assume that one of the main reasons for MNFs to increase the level of internationalization of innovative activities is to generate more knowledge for the entire organization, not just for the host country. Hence, feedback and interaction mechanisms within the domestic activities must be adequately organized, which is closely connected to the external environment in the host country performing innovative activities.

Moreover, the external environments influence on the industry and vice versa are a consistent part of the system of innovation approach that will be applied under this research question's domain. It will provide a pertinent framework of seizing the most essential issues

that can assist the explanation of the contextual preconditions required for enabling more innovative activities in an affiliate country of the MNF.

1.2 Motivation and Relevance

Why is a study of the salmon farming industry in a Norwegian-Chilean perspective relevant and interesting, also beyond its boundaries?

Firstly, the complexity associated to the industry and its innovation processes, reinforces the notion of a wider relevance of this thesis. As mentioned, there are different challenges that constantly force the industry to be adaptable and versatile. Thus, it is required to examine which these factors are in the salmon farming industry.

Salmon farming is considered to be a relatively young industry, which implies its potential for further development. In view of the fact that salmon farming is one of the most advanced forms of aquaculture, it entails a deeper capability to disperse its experiences and technology to other forms of fish farming. By strengthening the significance and scope of salmon farming may facilitate the relations to others industries and sectors with the intention of increasing mutual benefits and learning for the involved parties.

Moreover, Norway's leading role in the industry empower and enable them to look at the future with the intention of securing levels of development that are prosperous and sustainable at the same time. Salmon farming, which depend very much on natural resources, does not diverge from the notion that the inputs of the Norwegian economy are mainly dominated by industries also based on natural resources. Yet it is interesting to observe how levels of innovation are to be developed in a context where industries are dependent on natural resources, and where knowledge is ever more intensive and important input to the economy. Wicken and Hanson (2008) published recently a work as part of a research project on innovation in natural resource-based industries, within the knowledge economy setting. It is often perceived that economies based on natural resources fall into the so-called 'resource-curse' with low levels of growth and low levels of entrepreneurial incentives. The curious fact is that Norway has not experienced this despite its dependency on natural resources. The contributors of the book contest the notion that there is a low degree of innovation in industries dependent on natural resources. The innovation processes

can in many cases be described as rather complex providing a foundation for dynamic changes, even though they score relatively low on official R&D statistics and surveys, which is the case in the salmon farming industry.

Since the MNFs have throughout the past decade become one of the most influential and powerful actors in both Norwegian and Chilean salmon farming, it is viable to put emphasis on their role in the industrial development. Narula (2002) presumes that these companies, which often are larger in scale and scope, possess the necessary resources and capabilities to generate new applied knowledge, and in particular R&D departments. On this note it does not signify that small and medium-sized companies (SMEs) play no a part in the innovative processes of the industry.

Another point is that Chile's fast growing status has to be taken seriously, especially since the country is the main competitor and also collaborator to the Norwegian industry. Even though they do not possess the same recognized and established structures concerning knowledge and research at the international level as in Norway, it is likely that their experience and knowledge is different and complementary to the Norwegian knowledge bases. The Chilean industry still has areas that are yet to be explored and utilized. For example it is assumed that most of the future development in the cultivation of salmon in the Chilean industry will occur in the remote southernmost geographical parts of the country (Region XI and XII).³ This future scenario entails the actors with distinct challenges of those today, concerning technology and infrastructure just to name a few. Therefore it seems essential to uphold an attitude that regards things slightly differently than before.

It appears to be a growing interest from the policy makers' side on how Norway as a small country could profile themselves as a nation rich on knowledge and focus on increasing the knowledge bases.⁴ This is related to the notion that it is highly unlikely to take for granted that the most of the development and innovation will derive from Norwegian actors, even though the relative strength in knowledge and experience on certain areas like petroleum and

³ "Explosive increase in applications fro concessions in Region XII" Published 16/04/2008
<http://www.aqua.cl/noticias/index.php?doc=23606> (in Spanish)

⁴ As an example, a press release from The Ministry of Education and Research in Norway published November 2nd 2007 stated that they wish to strengthen the contact and collaboration between research institutions and milieus in Norway and Latin America, with a special emphasis on Chile, Argentina and Brazil.
http://www.regjeringen.no/nb/dep/ud/Pressesenter/pressemeldinger/2007/la_forskning.html?id=488402

maritime sector is accessible. On this remark the public agency *Innovation Norway* recently revealed that Chile is going to be a future country of focus concerning their internationalization strategies.⁵ Accordingly these are all indications of that innovation and the search for knowledge is becoming increasingly subjected to processes of internationalization and interaction across national frontiers. Therefore, there is no reason to assume that the salmon farming industry is an exception, since it has become a global industry.

Lastly I would like to clarify that even though the Chilean industry is perceived as less advanced than the Norwegian industry; I have decided to not write a thesis where the main focus is on catching-up or other streams within developmental studies. This is because I felt it would be more appealing to write in a comparative perspective, where the industries are examined more equivalent from the start.

1.3 The Structure the Thesis

The thesis will be organized as follows: After having introduced the issue and setting the framework of the thesis in chapter one, the *second chapter* will concentrate on giving a historical background of the salmon farming industry in Norway and Chile and moreover present some recent issues that could clarify some aspects of the focus in this work. *Chapter three* will go through the methodological approaches of the thesis, as well as introducing the contributors of data more in detail. Further on in *chapter four* there will be a review of theoretical contributions from the literature that is assigned to the research questions and the thesis in general. The empirical findings and other data gathered through the collection process will be presented in *chapter five*. While lastly in *chapter six*, the conclusive arguments and some outlooks for the future will be introduced.

⁵ "Vil invadere Latin-Amerika" Published 06/01/2008
<http://e24.no/utenriks/article2181865.ece>

2. Background

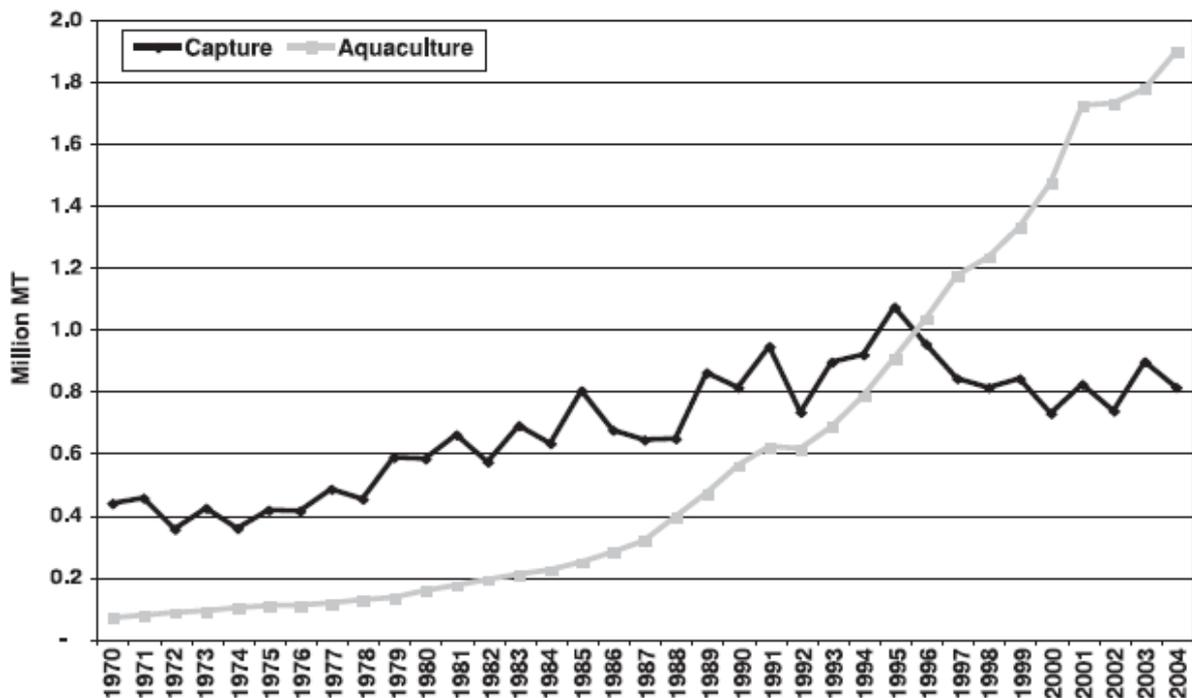
This chapter will provide some suggestions of a more profound presentation of the past, present and future development of the salmon farming industry in Norway and Chile. To understand why certain things have become the way they are it is necessary to go back and examine how the past has influenced and formed the present structures. Which are the factors that have to be mentioned with the purpose of comprehending the different path of development? By presenting a historical background of the industry and at the same time describing some current issues of relevance, will hopefully provide an adequate framework for proceeding with the work of the thesis. The final intention is to introduce some future outlooks concerning innovative activities and development in the salmon farming industry in Norway and Chile.

2.1 Historical development in Salmon Farming

Salmon farming is a relatively young industry. From the beginning the global production of salmon has been dominated by a few nations. The four countries; Norway, Chile, the UK and Canada, supply around 80% of the total production (Liabø et al. 2007). Nevertheless, since the early 1980s the international salmon aquaculture industry has experienced growth rates that have been surpassed by few other production sectors. Annually the output growth levels have surpassed 25% in the period from 1980 to 2000 (Bjørndal et al. 2001). The aquaculture industry in general, included all species, has more than quadrupled the growth levels today compared to 1990 (Liabø et al. 2007).

As the stock of wild caught salmon is decreasing, it just underscores the importance and potential of developing a sustainable industry producing farmed fish. Estimates claim that in order to cover the future demands of the world's fish markets, the global production of fish has to be increased from 120 million tons in 2005 to 180 million tons in 2030. This increase of fish production will come through marine aquaculture (FAO 2006).

Figure 2.1 World Production of Salmon and Trout: Capture Fisheries vs. Aquaculture

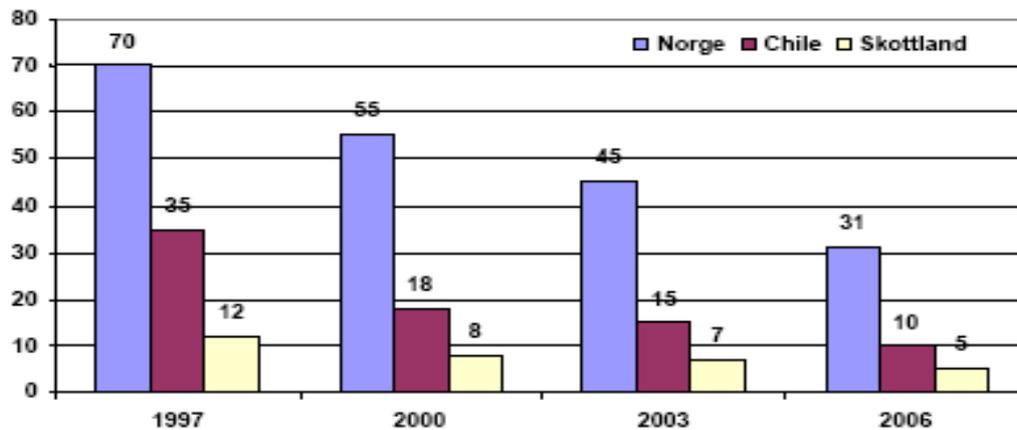


Source: FAO (2006)

Figure 2.1 illustrates graphically the ratio between wild caught and farmed salmon fish, where the amount of fish produced in aquaculture really started to augment in the beginning of the 1990s.

Several studies indicate that the salmon farming industry, in Chile as well as in Norway, has gone through processes of consolidation during the 1990s. As a result, the MNFs have become the most dominant actors in the industry and hold the grand part of the market share (Aslesen 2004, Liabø et al. 2007). We began also to witness more downstream integrated companies that controlled the main parts of the value added chain, essentially from inputs to products to the end consumer, especially in the Chilean industry where the food production industry has undergone a consolidation (Kjesbu et al. 2005). As an example, a major process of merger and acquisition occurred between Fjord Seafood, Pan Fish and Marine Harvest in the summer of 2006. Now Marine Harvest, the new company name, is the world's largest producer of salmon and accounts for nearly 40% of the market in Chile through the subsidiary Marine Harvest Chile.

Figure 2.2 Consolidation of firms in the Norwegian, Chilean and Scottish industry:



Source: Liabø et al. (2007)

The figures represent the number of companies responsible for 80% of the total production of salmon. All the countries have gone through a process of consolidation since mid-1990s, as the figure 2.2 illustrates. Still, the numbers reveal that the industrial structure is more fragmented in Norway than in Chile.

2.1.1 The Salmon Farming Industry in Norway

According to Kjesbu et al. (2005), the Norwegian salmon farming industry as we know it today started its earliest developments in the 1970's, although there were many trials and experiments with salmon as early as in the 1920s. Many fish farming pioneers, scientists and politicians saw great potential in developing a new industry in Norway. In 1971 the Ministry of Fishery and the Ministry of Agriculture suggested in collaboration that it were to be clarified to what extent Norway was able to develop 'the possibilities of artificial hatching and fish farming as a viable industry' (ibid: 25). It resulted in a highly regulated industry with a clear focus and emphasis on regional policies and development. Some of the regulations were for instance related to limitations in volume of slaughtered fish in tons, ownership regulations of the concessions and regulations that would secure geographical diffusion of the industry. Table 2.1 portrays the development of total production of salmonids in Norway since the early 1970s until today.

Table 2.1: Development of production of salmon and trout in Norway (in tonnes):

	1971	1975	1980	1985	1990	1995	2000	2005
Atlantic Salmon	100	900	4,300	29,500	165,000	249,000	422,100	572,200
Rainbow Trout	450	1,700	3,700	5,100	3,600	13,900	49,100	59,500
Total	550	2600	8000	34600	168600	262900	471200	631700

Source: Liabø et al. (2007)

Given the newness of cultivating salmon in constructed environments and locations, both in Norway and other parts of the world, the development was characterized by going through a lot of ‘trial-and error’ processes in the beginning. The main actors during those times were fishermen who had a lot of experience with fisheries and the maritime industry. Many of these people have been described as being endowed with a lot of entrepreneurial spirit, due to their situation as self-owners of fishing fleets. They possessed the adequate experience, knowledge and capital related to launching fish farming as an industry. This development resulted in many ways into a technological revolution where it became possible and viable to establish a salmon farming industry commercially in Norway, based on the practical knowledge from the catch-based fish industry (Jakobsen et al. 2003).

Today, the Norwegian salmon farming has become one of the leading industries based in aquaculture globally. Norwegian companies are at the front in areas like genetics, feed, pharmaceuticals and equipment technologies, which are highly integrated in the salmon farming industry. This development has been facilitated by the cooperation between the public sector and the businesses, since it has been an early focus on developing educational and research institutions that assist the industrial development (Kjesbu et al. 2005). Aslesen et al. (2002) examines thoroughly the innovation system connected to the Norwegian salmon farming industry at both national and sectoral level.⁶ The main contributors in both private and public sector and their particular role in the industry are identified. The study raises several interesting questions concerning which role innovation play in developing the industry and also the companies directly. According to Ørstavik (2004) aquaculture in general has the potential to become a key industry in Norway in the future, where profitable

⁶ The system of innovation (SI) approach will be described in the theoretical chapter.

activity can be sustained at the long term. He maintains that learning more about the innovation systems related to the aquaculture sector, will be important to contribute to the creation of a stronger knowledge base of further development of the industry. Increased knowledge about these relations and processes, it could facilitate the procedures of the decision-makers in the industry to progress further and confront specific challenges in the different locations across the world.

2.1.2 The Salmon Farming Industry in Chile

Chile is divided into 13 main regions, of which Regions X, XI and XII in the south of the country have the natural conditions for salmon farming. Chile has a coastline that stretches over 6000 kilometres, including climate zones from dry subtropical in the north to sub-arctic in the south. Although the Atlantic salmon is not a native species to the country, good climatic conditions along with abundant freshwater resources have facilitated the development of the industry (UNCTAD 2006). The biggest city and harbour in the southern part of Chile, Puerto Montt, has become the capital and focal point of the Chilean aquaculture industry. The term *salmon cluster* has been occupied with reason in the Chilean industry. This is because more than 85% of the total production is located around Puerto Montt and the Chiloé Island in the Los Lagos region (Maggi Campos 2006). According to recent figures, there are more than 53.000 persons employed directly or indirectly in the Chilean industry (SalmonChile 2007). This indicates a much higher level of labour-intensiveness compared to the industry in Norway. The main explanation of this trait in the Chilean industry is the relatively low price and wage levels in the country, compared to its main competitors in salmon farming. Additionally, there is an available stock of labour force that can allow a higher level of fish processing and other value-added activities. It has to be mentioned that Chile is characterized as a country with an export-led economy based on their natural resources, like copper, fruits, wood, fish and wine. This is an indication of that the country has much experience in elaborating products in different natural resource sectors.

Table 2.2: Development of production of salmon and trout in Chile (in tonnes):

	1980	1985	1990	1995	2000	2005
Atlantic Salmon	NA	NA	10,000	54,300	166,900	385,200
Rainbow Trout	NA	NA	5,481	42,700	79,500	122,600
Coho	NA	NA	13,300	44,000	93,500	106,700
Chinook	NA	NA	300	400	2,500	2,900
Total			29081	141,400	342,400	617,400

Source: Liabø et al. (2007)

Table 2.2 presents the intensive growth levels in Chilean production. Looking closely at the details of the historical development, many have divided the progress of the industry in Chile in stages. Underneath we can observe a map over Chile and a map over the geographical areas where the salmon farming industry is located in the south (Regions X, XI and XII).

Figure: 2.3. Geographical illustrations of Chile:

Chile



Source: www.wikipedia.org

Region X, XI and XII



Source: www.nytimes.com

The earliest stages of the salmon farming industry in Chile were not entirely similar to the Norwegian context where the small entrepreneurial farmer was granted the concessions. In Chile, farming concessions were granted to firms with a lot of experience in other industries based on natural resources. These were actors who had a clear ‘business approach’ and preoccupation with creating suitable structures for the industry to be profitable, rather than necessarily taking different regional policies or small-scale considerations into account, as in Norway (Kjesbu et al. 2005).

A division presented by UNCTAD (2006) consists of four different phases in the development of the Chilean industry and provides an overview of the main occurrences in the Chilean industry until today. The four phases are:

- a) *Experimentation phase (up to 1973)*
- b) *Industrial initiation phase (1974-1984)*
- c) *Industrial expansion phase (1985- 1995)*
- d) *Market expansion phase (1996- to date)*

The first phase is characterized as very basic, where the Chilean Economic Development Agency, CORFO, played a role in establishing agreements with US universities to facilitate the feasibility of fish farming, identifying the appropriate locations for fish farms and develop suitable conditions for aquaculture activities (UNCTAD 2006: 5). Another significant occurrence was an agreement between the National Fishery Services, SERNAPESCA, and the Japanese Cooperation Agency in 1969. The objective of the cooperation was to introduce the Pacific salmon into Chile by focusing on human resource development and feasibility studies of the technical and economic viability of salmon farming in Chile. Even though the project did not conclude with the possible economic viability, it demonstrated that salmon farming was technically feasible. It was one of the first steps to develop the industry further.

The next important steps towards a modern salmon farming industry were initiated in the late 1970s, early 1980s during the second phase named *industrial expansion*. The development was driven by the public and private sector. The strategic partnership between public and private development organizations facilitated the adaptation of superior foreign technologies, which assisted the development of a highly dynamic and export-orientated

salmon sector we are familiar with today (Kjesbu et al. 2005). Governmental institutions like CORFO and Fundación Chile acted as catalysts during these founding stages together with other public and private actors by coordinating the processes with the aim of establishing viable industrial structures (Maggi Campos 2006).

Moreover, the role of Fundación Chile is important to emphasize in this setting. It is a non-profit private institution, established in 1976 as a result from cooperation between the ITT Corporation from the United States and the Chilean Government. Fundación Chile's main objectives were initially to help facilitate the introduction of innovation and technology transfer processes. Both Fundación Chile and already mentioned CORFO were involved in the start-up of new companies during this phase. Fundación Chile created a demonstration company, which was shown to actors from different industrial sectors, in order to prove that the cultivation of salmon was technically feasible. In this way, their initiative demonstrated the huge potential and opportunities within salmon farming, as well as helping to reduce the risk for investors. The other initiative by Fundación Chile was the purchase of the facilities to Domsea Farms and the subsequent creation of Salmones Antarctica, which became the first company to exceed the 1000 ton mark of salmon production in 1988 (Maggi Campos 2006). In this period the foreign involvement increased and many local entrepreneurs acquired important know-how concerning salmon farming. Among these entrepreneurs were biologists, veterinarians and other marine experts, who founded these early enterprises like the CORFO-supported company Lago Llanquihue (UNCTAD 2006). CORFO and Fundación Chile will be included in the empirical section and their current activities and objectives are relevant to the context of this thesis, in particular in relation to the perspective of systems of innovation that comprise a significant part in understanding the contextual prerequisites of innovative activities.

The third phase was characterized as expanding, with increase in industrial growth on various areas such as fish handling and cold chain management, which were activities geared towards production and market expansion. The numbers of firms grew rapidly along with the amount of total exports in the international markets.

The currently last and fourth phase could be described as having commenced in the mid-late 1990s as a result of new and altered needs in the markets. Since the steady decline in the international prices of salmons had led to the exit of smaller firms and to industrial

consolidation, foreign capital was attracted to Chile, especially through mergers and acquisitions. These processes occurred because the investors were in search for new production sites, including Norwegian investors. Large firms moved towards vertical integration (controlling more activities on the value-added chain), including feed and egg production to make use of economies of scale and reduction of production costs (UNCTAD 2006: 7). This trend demonstrated a globalization process of the Chilean industry, and brought it closer to international standards of other leading countries.

However, it might be important to assert that the industrial development in Chile has to be viewed in the context the country was going through at the particular period of time. After the military coup led by General Augusto Pinochet⁷ in 1973, Chile, as one of the first countries in the world, implemented neo-liberal economic policies as originally advocated by ideas from the Chicago school of economics. The openness to foreign investments and the acquirement of leading technology and knowledge at the international market were two of the essential pillars in this newly adopted economic paradigm that affected the development of the salmon farming industry. The aim of mentioning this is not to go into a detailed analysis of industrial economic policies of Chile, but rather to add to the awareness of what kind of circumstances one have been and still to a certain degree are involved in. Bearing these factors in mind, it is easier to see that the objective from the beginning was to look abroad in order to expand and develop the fish farming industry. Vergara et al. (2004) wrote:

“The state contributed by creating the Regional planning Service, SERPLAC, in regions X and XI, which together with CORFO and the Office of the Undersecretary for Fisheries, developed and financed feasibility projects to farm salmon with foreign technical and financial help.”

This citation underscores the importance of foreign investment, competence and technology in the establishment of the Chilean salmon farming industry. This particular trend creates a foundation for understanding the current focus on innovative activities, namely how the process of technology upgrading has occurred in Chile, from technology transfer, imitation, adaptation to the development of endogenous innovation capabilities (UNCTAD 2006:17).

⁷ There are many contributions on the liberal economic policies established during the dictatorship and their validity today. Jonathan Barton (2002): “*State Continuismo and Pinochetismo: The Keys to the Chilean Transition*” or Lear and Collins

The Chilean development of fish farming is definitely a success story described by rapid expansion, especially in view of the fact that salmon is not a species native to the country. Iizuka (2006) assert that the salmon farming industry in Chile is something of a unique case for its successful integration into the global economy, with the combination of local linkages and competitiveness based on the development of its own capabilities. These capabilities are important to follow up the in the process of developing prerequisites for innovative activities, especially when it comes to absorptive capacity and collective capabilities in host countries.

2.2 Norwegian involvement in Chile

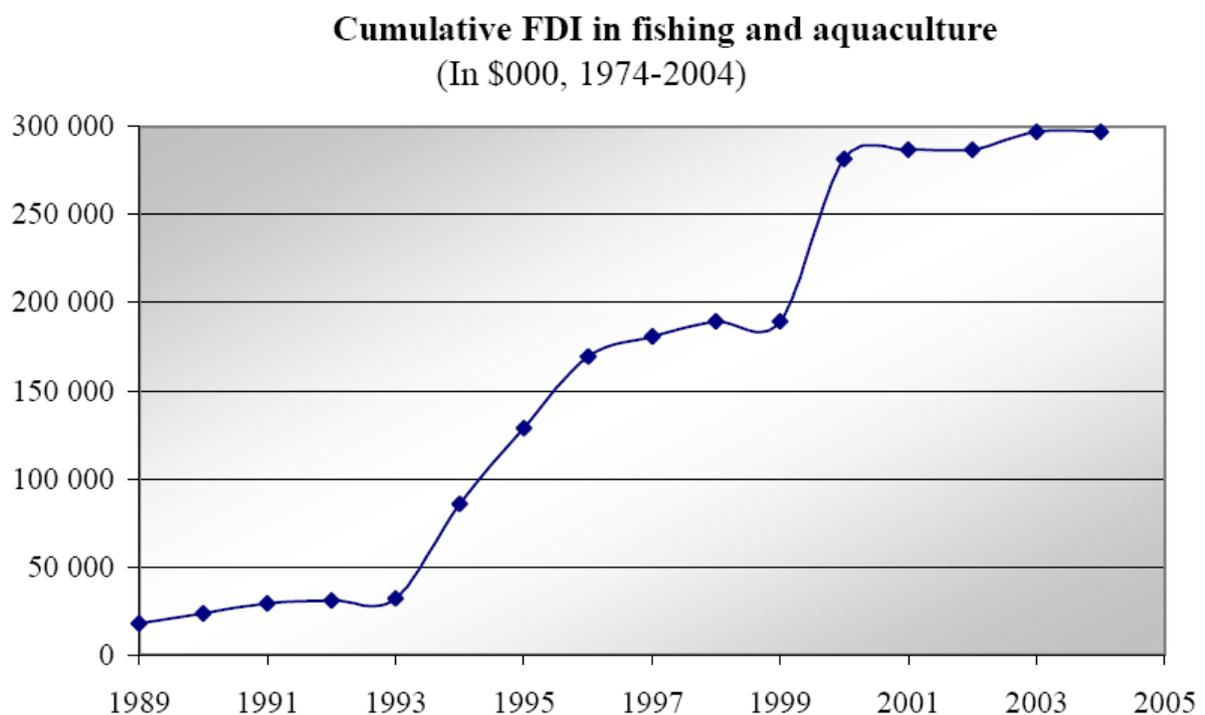
The tight regulations and industrial engagement from the authorities in the Norwegian aquaculture industry, especially concerning concessions of new farming locations, forced many Norwegian actors with capital and competences to look abroad. These actors mainly went to Chile, Scotland, Canada and the US. The foreign-investor friendly environment assisted the first Norwegian company in Chile, Chisal, which was established in 1984 and considered as one of the pioneers among foreign investors (Kjesbu et al. 2005). Turning the focus on today, figures from December 2007 reveal that there are currently 61 Norwegian companies represented in Chile.⁸ Practically all of the companies act as subsidiaries of a MNF, while the central offices are located in Norway. According to recent statistics, Norwegian-owned companies are behind more than 1/3 of Chilean aquaculture. This is mainly due to large multinational firms like for instance CERMAQ (engaged both in fish farming and feed production), Marine Harvest (in fish farming), AKVA Group and Ocea (suppliers of equipment) and Pharmaq (pharmaceuticals). There are also several Norwegian small and medium-sized enterprises (SMEs,) present in Chile, who have specialized themselves in specific areas of technological products, whether it is genetics, hatchery technology, water recirculation systems etc. Examples of these SMEs are: Alvestad Marin,

(1995) "Chile's Free Market Miracle: A Second Look" provide both a good overview of issues that have been discussed the most.

⁸ <http://www.noruega.cl/press/companies.htm>

Haug Aqua and Mercatus. The increase in Norwegian investments in Chile directed to aquaculture and fisheries sector occurred in end of the 1990s. This is in correspondence with the fourth stage of the industrial development in Chile mentioned in the past section, and graphic structure of the figure 2.5 which reveals a general growth of cumulative FDI in fisheries and aquaculture in Chile. The major transformations in the industry structure were obtained through mergers and acquisitions, changes in ownership, increase in FDI and in general a rapid process of internationalization (Katz 2007).

Figure 2.5 Cumulative FDI in fishing and aquaculture in Chile:



Source: UNCTAD (2006)

An article from Maurseth (2006) presents findings of Norwegian companies, both MNFs and SMEs, in aquaculture and fisheries and their motives for international investments and expansion. According to the paper the main incentive for international expansion among the Norwegian companies are access to new markets and lower production costs. Although this work cannot be regarded as fully representative for the entire sector, it provides an indication on patterns of internationalization.

2.3 Innovation challenges for the sector

In view of the fact, that the salmon farming industry requires knowledge in a number of diverse areas, and often different types, both codified knowledge and practical knowledge since it is ultimately an industry based on natural resources. What does this imply in terms of challenges for the industry?

As indicated previously, there is without a doubt an emerging focus on advancement in technology and knowledge as an asset for growth within the salmon farming industry nowadays. Employees in the top management of the biggest Norwegian aquaculture companies have in recent times expressed the importance and necessity of research and innovation in the future of the salmon industry.⁹ Policy-makers have been advocating the importance of internationalization of research for Norway as a high-cost country being dependent on knowledge generation and innovation. Research institutions are encouraged to establish strategic alliances and collaboration with counterparts across the globe. The Norwegian Minister of Research and Higher Education attended recently the AquaSur conference in Chile in relation to these issues.¹⁰ Given these recent statements in the media and other forums, it is important to follow up how the firms operating in the salmon farming industry are reacting to the changes in perception that seem to be emerging, at least on the policy level and in both theoretical and empirical contributions like the UNCTAD (2005) report on 'Transnational Corporations and the Internationalization of R&D' have asserted. This will be done by describing some of the issues of interest that enables the focus on innovation in the companies and their surroundings, especially in our time when the development is increasingly global. This underscores the probability of converging objectives and challenges across the national borders to a larger extent than before.

⁹ "La næringen bruke egne penger på forskning" Published 9/4/2008
http://www.kyst.no/index.php?page_id=95&article_id=80982

"Onarheim vil ha mer forskning" Published 7/3/2008
http://www.kyst.no/index.php?page_id=95&article_id=80666

¹⁰ AquaSur is considered as the most important aquaculture fair in the southern hemisphere.

Nowadays, environmental and sustainable development issues are increasingly important in different areas, also aquaculture.¹¹ At times the salmon farming industry is under heavy scrutiny and criticism by diverse organizations and actors. This is because its foundations on natural resources like freshwater and living organisms imply fragility. It may act as external pressures for further advancement of technological development and applicable solutions for the industry that could cause less negative impact on their surroundings. Consumer awareness is also an issue for the industry. Food traceability, use of antibiotics and effects of farmed escapees from the cultivation centres on the wild salmon are topics that are receiving more attention from authorities, environmental groups, and consumers and also from the industrial actors themselves.

On the whole, the increasing complexity and involvement of scientific fields in aquaculture, for example biology and genetics in fish health and nutrition, pharmaceuticals in fish vaccines, also information technology and even robotics in equipment, has led to competition and struggle for reducing production costs and developing improved products and services. This underscores the manner that the industry has developed and technology-intensive during the passing of the years. The issues described above can obviously not be mutually excluded, since they are all connected to each other at some place on the production process of the salmon.

2.3.1 Challenges in Chile

...Right now the Chilean industry is facing challenges regarding fish health, which in the long run is not good for salmon as a product in the global market and thus not positive for the Norwegian industry either...

Norwegian researcher working in Chile

If we look at the issue of sustainable development with respect to the Chilean and Norwegian context, it is obvious that the current situation in Chile has ignited a spark to that

¹¹ a) FAO recently arranged a seminar with special focus on sustainable development within the aquaculture sector. <http://www.fao.org/fishery/topic/17000>

b) Sustainable Development is also a vital part of the Foresight report called “*Havbruk 2020: Grensesprengende hvis...*” published by the Norwegian Research Council in 2004.

particular area.¹² The industry is going through one of its roughest period ever due to biological problems and other intricate reasons. The challenges are in particular related to a viral fish disease called *Infectious Salmon Anemia*, commonly referred to as ISA. The situation has affected the entire industry, including the Norwegian firms represented in Chile.¹³ The citation above demonstrates the magnitude of the situation for the industry. The complexity of the situation has both social and economic implications, since a decrease not only will lead to negative impacts on production volumes, but ultimately leading to losses of jobs. Thus providing a clear-cut explanation on why the situation has escalated to the present magnitude is nearly impossible due to the available factors and aspects that have affected the Chilean industry during many years. The important thing would be to focus on which measures have to be taken to restore the situation and perhaps more importantly; which decisions must be made in order to prevent such effects and secure a stable growth and not least a sustainable development? It leads us to ask which role could research and innovative solution play in this context. These questions have been raised at different seminars that I attended during the data collection process of the thesis in both Chile and Norway. Additionally, an OECD (2007) report on the Chilean innovation system presents different viewpoints of the how innovation policy and innovation structures are handled. Issues of essence to the innovation system, like the interactions between public and private sector, R&D performance etc. were highlighted. Several recommendations for the future development of a viable innovation system are also introduced.

Having all these topics and challenges associated to innovation in mind, we will continue with presenting the methodology of the work by presenting how the research questions have been approached in field.

¹² “Possible variant of ISA affecting Chilean Atlantics” Published 31/07/2007
http://www.fishfarmingxpert.no/index.php?page_id=37&article_id=78297

¹³ “Innrømmer Lakse-tabbe” Published 15/02/2008
http://www.dn.no/forsiden/borsMarked/article1315816.ece?jgo=c1_re&WT.svl=article_readmore

3. Methodology

Methodology is not only about describing research processes in empirical works, but also bearing in mind the boundaries attached to such a cognitive process. What kind of information and data can a researcher expect to find? What lies outside of the scale and scope of the work? Are there biases in the research process? Which flaws lies in the data sources? Ultimately to recognize all the limitations related to the research process, whether they are based on time, language, culture, distance etc, are imperative to describe and be aware of when writing a thesis.

In this chapter I will present the methodological approaches applied in this study. A description and presentation of the data collection process and the contributors of data in Norway and Chile will follow. Lastly, some limitations of the study will be presented.

3.1 Qualitative Research Methods

This thesis has undertaken a qualitative approach. Qualitative research properly seeks answers to questions by examining various social settings and the individuals that inhabit these settings. According to Berg (2007: 8) a qualitative researcher is most interested in how human beings arrange themselves and their settings, and how inhabitants of these settings make sense of their surroundings through symbols, rituals, social structures and so forth. Thus, qualitative techniques allow researchers to share the understandings and perceptions of others and to explore how people structure and give meaning to their daily lives (ibid: 9).

3.1.1 Case Study

The case study has been increasingly acknowledged as a fruitful research approach, in particular within qualitative studies in different areas like business, marketing, information systems and social sciences (Yin 1994). A case study has been defined in many different ways and one of them are put forward by Berg (2007: 283) who suggests that the case study is 'an approach capable of examining simple or complex phenomenon, with units of analysis varying from single individuals to large corporations and businesses; it entails using a

variety of lines of action in its data-gathering segments, and can meaningfully make use of and contribute to the application of theory’.

Yin (1994) asserts that there are three appropriate designs for case studies: *exploratory*, *explanatory and descriptive*. These three approaches consist of either single- or multiple case studies. Comparing different cases, be they of individuals, groups or organizations, can illuminate the significance of the idiosyncratic as opposed to the common, or shared experience. Multiple cases can strengthen the results by replicating the pattern-matching, thus increasing confidence in the robustness of the theory (Yin 1994: 45). Berg (2007) maintains that when conducting an *exploratory* case study, the data collection and fieldwork may be undertaken before defining the research questions. Nonetheless, the study must have some kind of framework designed prior to commencing the process. Exploratory studies may be useful as a pilot study, part of planning a larger comprehensive investigation. *Explanatory* case studies are considered useful when conducting causal studies. Often in complex studies, where a plurality of influences needs to be examined. A *descriptive* case study requires the presentation of a descriptive theory, which establishes an overall framework that the research follows throughout the study. Nevertheless, it is common that a case study consist of characteristics deriving from all three types of approaches, instead of being strictly defined as one particular type of study.

I suggest that the multiple-case approach would be a pertinent description of this work. Since I have chosen to analyze the salmon farming sector and Norwegian multinational firms, each of the companies could be defined as different cases in the study. The purpose of the study is to examine to what extent it is relevant to speak about a movement of focus towards innovative activities in salmon farming. Also being aware of the modest emphasis given to this specific topic in terms of previous studies and contributions, leads me to portray this study as exploratory. At the same time it does not purport that aspects of the study are more of descriptive and explanatory character as well.

Besides creating the possibility of going in-depth in the field within the case study approach, one has to be aware of the limitation the approach entails. Some important questions related to the scientific benefit of the case study are firstly related to the *objectivity* of the investigator and secondly to whether the method offers information that can be seen as *useful beyond the individual case*. Objectivity rests on the ability of an investigator to

articulate what the procedures of the research are, so that others can repeat the research if they choose. Only further research can reveal the degree of accuracy of the research. While the *generalizability* is upheld when case studies are properly undertaken, they should not only fit the specific individual or group studied, but also generally provide understanding about similar individuals, groups or events (Berg 2007: 295). Other suggestions of limitations are associated to representing complexity in the case studies. Writing about one aspect of an issue as, for example, in one person's story, can often lead to that other features of the phenomena are unintentionally concealed. There are often several different ways to present the same set of issues, each one of which is subtly different in its approach and emphasis. This situation can make the findings of such research very difficult to summarize.

3.1.2 Interviews and observation

One of the most important sources of case study information is the interview (Yin 1994: 84). The interview technique has been subjected to numerous descriptions on how it should be conducted in the data gathering process of a research. Traditionally the interview has been divided into three different types: a) standardized interview, b) unstandardized interview and c) semi-standardized interview (Berg 2007). The major difference between these interview types is their degree of rigidity with regard to presentational structure. Where the standardized interview is characterized as formally structured and does not deviate from the order of the questions, the unstandardized interview is the total opposite characterized as unstructured and very flexible. The semi-standardized interview is located in the middle, where the interviewer is in a position to adjust and organize the interview according to the interviewee if that is necessary.

Direct observation occurs when a field visit is conducted during the case study. It could be as simple as casual data collection activities, or formal protocols to measure and record behaviours. This technique is useful for providing additional information about the topic being studied (Berg 2007).

Yin (1994: 80) mentions that the potential weaknesses with conducting interviews, lies in constructing poor question in advance, and a potential risk of receiving information that the interviewee wants you to hear because of different reasons. For that reason it is important to

formulate good questions on beforehand that define the work, no matter what the response from the interviewees entails

3.2 Research Process and Data Sources

Defining the salmon farming industry

The aim of this study as mentioned is to follow and describe the innovative activities of international Norwegian MNFs in Chilean salmon farming. Thus, it is important to define precisely what is meant by the *salmon farming industry* in the context of this work. Although the term salmon farming gives specific connotations to the actors operating in fish farming activities, the term is defined broader in this context. I have also included other suppliers on the value added-chain like feed and technological suppliers, additionally to a purely research-based company. Since they all are engaged in the production of the same output, the salmon, I have decided to define salmon farming companies wider than usual, by incorporating different types of actors engaged in the aquaculture industry. Moreover, I think it is important to underscore that all actors contribute with different inputs in terms of knowledge and experiences, which ultimately help comprise what is defined as an innovation system.

Data Gathering

The most effective manner to achieve the objective of the study was by entering directly the context of the salmon farming industry. This was done through formal interviews with individuals in companies, by attending aquaculture seminars in Norway and Chile,¹⁴ and lastly through informal meetings associated to the interviews and trips.

¹⁴ The first aquaculture seminar *Salmon Industry in Norway and Chile* was held in Trondheim in August 15th 2007. The seminar was arranged in connection with the yearly AquaNor convention. http://www.sintef.no/content/page13_16168.aspx

The second aquaculture seminar arranged by *Innovation Norway* was held in Puerto Varas, Chile, January 24th and 25th 2008. <http://www.innovasjon Norge.no/Satsinger/Internasjonalisering/Delegasjoner/Offisielt-besok-Chile-2008/>

The main instrument utilized for the data collection in this study was done through *personal interviews, which were* carried out with certain individuals in different companies I have managed to select on the basis of their activities in the salmon farming industry. The interviews were taped with a digital tape recorder which later became the source for transcription, and can be described as semi-standardized in form. This is because I felt on beforehand that it would be reasonable to have a flexible interview approach, but at the same time forming a couple of fundamental themes in the interview which the conversation would focus around. Due to the general wishes expressed by the interviewees, I have come to the conclusion of referring to anonymously to them.

Having the opportunity to travel to Chile has been indispensable, since it has enabled me to receive information directly through arranging interviews and conversations with representatives for Norwegian companies engaged in the Chilean context. It has definitely served as an approach to get to know and observe the Chilean industrial context in relatively short period of time. The idea of travelling to Chile and collect data directly in their context was more appealing and fruitful than collecting data per telephone e-mail or through other secondary sources. During the aquaculture seminar in Chile, I was able to speak to a variety of people engaged in the industry. Conducting personal interviews have definitely given me relevant inputs of data of more formal character, which was essential. At the same time, one cannot disregard the *informal* settings and channels one will to some degree enter in when directly observing the field of study. Dinners, coffee breaks, excursion to processing plants and other social activities, are part of the process of creating the image on how the reality could be perceived more realistically. Although the stay in Chile cannot formally be described as a fieldwork per se, it does obviously bear some similar characteristics.

Another point that has facilitated the access to impressions and information in the Chilean context is related to language. Since I speak Spanish fluently and have a Chilean background on my father's side, it has helped me to communicate easier with individuals that did not manage English that well. It has to be mentioned that some of the interview objects in Chile also spoke English fluently. Knowing the language and culture are two factors that facilitated the data gathering process in the Chilean field. It also shortens the period of time one need to relate to people in more informal settings, which could be a source of information directly and indirectly. Additionally, data has been collected through literature and other written documents, both physical publications and through web-based sources.

3.2.1 The contributors

Which companies do the interview objects represent? Under follows a short presentation of the companies I have been in contact with in Norway and Chile.

- *One Fish Farming Company.* I have carried out interviews with people working in both the central offices in Norway and the subsidiary in Chile. The company has operations in the all the major international markets where salmon is produced. Additionally the company is engaged in value added process activities across the world. The headquarters are located in Norway.
- *Three Fish Feed Companies,* where two of them are of Norwegian origin and one entirely Chilean owned.
 - *Fish Feed Company 1.* I carried out interviews in Norway at the central offices and in the subsidiary Chile. The company is one of the leading producers and has operating companies on five continents to supply feed for more than species of farmed fish. They have a R&D department in Norway.
 - *Fish Feed Company 2.* I carried out one interview in the subsidiary in Chile. The Company is one of the leading suppliers of feed to the aquaculture industry. They have a central R&D department in Norway, and a smaller R&D unit in Chile.
 - *Fish Feed Company 3.* I carried out one interview in this entirely Chilean-owned feed company. The company has extensive operations in the Chilean market.
- *One Supplier of Technological Equipment.* I have conducted interviews with employees in both headquarters in Norway and in the subsidiary in Chile. The company is one of the principal producers of technological equipment to the aquaculture industry. They are present in more than 10 countries across the world and are engaged in all kinds of activities on the value-added chain.
- *One Research Company in Chile.* I carried out one interview in their offices in Chile. The company is a joint collaboration between Norwegian research institutions, who are delivering research, knowledge-based solutions and consultancy services to the Chilean salmon farming industry.

I have conducted all together 6 interviews in Norway, and 7 interviews in Chile, all of formal character. The aim was to select a range of companies that are engaged in different parts in the salmon industry, in order to obtain a broad selection as possible in terms of receiving empirical inputs stemming from distinct perspectives. The people I have talked to and formally interviewed are either employed in the company's top management or middle-management. They are the ones with the adequate knowledge; experience and overview to describe which are the specific points and issues of interest. These individuals probably

posses the proximity to the decisions that create the foundation for devoting focus on innovative activities, whether they concentrated internationally or nationally.

The *fish farming company* was selected on the grounds of its connections and interactions with a variety of suppliers and producers in the industry. Although statistics reveal that the formal degree of R&D performance is low in the farming companies, they possess knowledge that is indispensable in innovation generating processes. It is likely that their knowledge bases are different than in companies who specialized on certain products on value chain. Thus, I feel it is quite important to include a farming company in the array of data contributors to this work.

The *fish feed companies* are essential to the industry as the suppliers of feed inputs to the fish farming companies. Additionally, the feed companies are probably most engaged in research and development among the companies in the data set. One of the main issues they are currently engaged in, based on the indications given to me during the data collection process, is the availability of input to the feed. The majority of the inputs in the fish feed formulation has traditionally been based on raw materials like fish oil and fish meal, the researchers are looking for possible substitutes to these raw materials. Therefore there is a degree of complexity of developed new diets for fish.

The *equipment supplier companies* are involved in many aspects of the industry, from advanced feed system technology to control software system. Although they produce the equipment utilized by the fish farmers and others, it is pertinent for equipment developers to possess knowledge of various areas related to the salmon farming industry, such as fish biology, health, environment etc. This implies the need of communication and interaction across company and sectoral limits. Aslesen et al. (2002) reveals how the aquaculture innovation system illustrates how the different sections are organized and dependent on each other.

Additionally, I chose to include a newly established *research company* in Chile that functions as a subsidiary of a joint-venture between three major research institutes in Norway. This initiative is very new and their perspectives seemed relevant to the work, in particular since their activities could definitely be characterized as innovative and knowledge-intensive.

Lastly, it would be interesting to receive information from a non-Norwegian company. Therefore I managed to conduct an interview with a fish feed company that was purely Chilean-owned. This was done with the aim of receiving some data from a point of view that was not necessarily directly shaped by a Norwegian industrial reality.

I was not able to conduct interviews with MNCs engaged in genetics and pharmaceutical sectors. These have become more relevant in salmon farming, and would have been fine contributors to the work. Nonetheless, some of these companies have been present at the seminars I have attended with presentations and viewpoints from their perspective. Therefore I believe that it has provided me with information that might support some arguments of this work.

3.3 Reliability, Generalizability and Validity

We have already gone through some aspects that may explain some challenges for the research process. Generalizability and objectivity was two key challenges presented under the case study approach. By entering an industry with the objective of following certain decisions and strategies as an external student, I believe it is important to bear in mind that such a position could create some limitations for the process. Although one would presume that the external roles as a student or researcher seem relatively unbiased, for instance compared to the role of a journalist, it is still important to question how such a role might be perceived by the ones who are examined. Another important aspect in this context is how fast one would assume to be granted entry to a field as an external observer; especially when one has a limited amount of time at disposal.

Since case studies involve one single individual sample or a few, many claim that the study cannot be representative for a larger group or population, i.e. the difficulty of generalizability. On the other side, one must remember that qualitative approaches often are based on individuals' viewpoints, which not necessarily imply that these individuals reveal a representative point of view of their organization. In a sense, that is a perceived risk when one is engaged in a case study, since its objective is to undertake a narrow scope, and not necessarily focus on the generalizability.

To construct *validity* is especially problematic in case study research. It has been a source of criticism because of potential investigator subjectivity. Yin (1994) proposed three remedies to counteract this: using multiple sources of evidence, establishing a chain of evidence, and having a draft case study report reviewed by key informants.

The issue of *reliability* is achieved through structuring adequately the preparations of the study and its methodological approaches. Yin (1994: 64) suggests for instance case study protocols, which would consist of:

- An overview of the case study project (objectives, issues, topics being investigated)
- Field procedures (credentials and access to sites, sources of information)
- Case study questions (specific questions that the investigator must keep in mind during data collection)
- A guide for case study report (outline, format for the narrative)

Moreover, the aim has been to enter as well-prepared as possible into the industrial context, in order to reduce the likelihood of biases and wrongful information from the interviewees. Forming fundamental research questions and agreeing appointments with companies on beforehand, were two measures that can contribute positively to these effects, and hopefully legitimize the role of an interested external student to enter in an industrial reality in search for good information.

4. Theoretical Framework

The purpose of the upcoming section is to shed light on theoretical concepts that have the aim of providing a relevant overview for the context of the thesis. At the same time the objective is to establish a connection between the concepts and the empirical case, in order to later commence with the analysis of the data findings adequately.

The section begins with a general presentation of evolutionary theory, and its impact on economic growth and the understanding of innovation. Subsequently, some notions on the systems of innovation approach will be introduced. Then we will put forward the role of multinational firms, organizational issues and their different internationalization strategies for innovative activities.

4.1 Evolutionary theory and economics

Fagerberg (2002) claims that 'evolutionary' ideas has been subjected to a growing interest among economists and other researchers within the social sciences, especially because of economist Joseph Schumpeter literary contributions. Although the concept of 'evolution' has more connotations towards another science, namely biology, there has in fact been a long tradition in economics for using biological metaphors, as evidenced by different economists like Thorstein Veblen, Alfred Marshall and Friedrich Hayek (Fagerberg 2002: 5). The mandate here is not to enter in a wider debate concerning the origin of evolutionary theory in either biology or social sciences. Schumpeter sought to analyze capitalist development as an evolutionary process based on a perspective that was firmly rooted in economics and the social sciences, and not copied uncritically from the natural sciences, which tended to be usual at the time. Schumpeter's work on the capitalist evolution had a clear emphasis on *innovation* as the driving force behind economic, social and institutional change. Although he formed his academic background and work during a time when the neoclassical stand within economics was emerging and segmenting, he never shared the vision of the more static, equilibrium theory developed by the neoclassical economists. In his view, economic development had to be seen as 'a process of qualitative change, driven by innovation taking place in historical time' (ibid: 6). Schumpeter maintained that innovation could take place in

form of five different types: *in products, in processes, in markets, in organizations and in sources of supply*. The newness in his contribution on understanding economic growth and development was the fact that innovation could be seen as new combinations of existing resources, equipment and so on (Fagerberg 2004). The defining characteristic as he saw it was simply the doing of new things or doing of things that are already being done in a new way. In the beginning, Schumpeter focused on radical innovations introduced by entrepreneurs who were endowed with special traits and creativity. He modified later his argumentation that innovative processes could be more systematically organized and performed by R&D labs within larger firms (Castellacci 2007: 5). This entailed that incremental innovation processes had more relevance than he previously supposed.

How has the work of Schumpeter been discussed further? ‘An Evolutionary Theory of Economic Change’ by Nelson and Winter (1982) is considered as prominent in the neo-Schumpeterian tradition, and is one of the most cited works within the field of organizational studies etc. (Fagerberg 2004). The study criticizes and rejects the equilibrium-seeking and rational-choice models of understanding economic development, described as neoclassical. According to the authors these viewpoints are inadequate in explaining real-life complexity. Their alternative is to develop an evolutionary theory of capabilities and behaviour of business firms and organizations. Although Schumpeter did not reject it, he did not put too much emphasis on the organizational aspect of innovation and collective knowledge interactions. Nelson and Winter elaborated the view on organizational innovation by introducing a theoretical perspective on how firms behave (Fagerberg 2004). In other words, they take into account the social and economic consequences of interactions within populations of heterogeneous actors, thus emphasizing complexity and dynamic factors that are ignored in traditional economic perspectives. Firms have certain capabilities and routines at any given time, but over time these capabilities and routines are modified as a result of both deliberate problem-solving and random events (Nelson and Winter 1982: 9). The *routines* of the firms determines behaviour, together with impulses from the environment, and they are *heritable* as part of the ‘organizational memory’ and *selectable*. Most firms are described as being satisfied with how the things are running, and the main assertion is that firms are resistant to changes of their decision-rules or routines. This has connotations to topics like *path dependency* and *lock-in*, which have been granted attention in the literature of evolutionary theory, especially in association with ‘inertial’ structures and reluctance to employ new solutions. Nevertheless, at some point the organization will be looking for new

and improved manners to organize their routines (Nelson and Winter 1982: 15). The outcome of such a search for new routines is uncertain with no guarantees for finding a more efficient routine than the ones already in place. A firm can engage in a search either by developing a new routine from scratch (innovation) or adapting an already existing routine from elsewhere (imitation). Innovation strategies will in theory render more benefits than imitation strategies, on the long-term. The probability of finding a better routine will depend on how much firm spend on R&D and other search costs. Because of larger companies' relative financial strength to carry out search activities, it likely to assume that they have an advantage on that point (Fagerberg 2002: 53). In Nelson and Winter's perspective, knowledge is often seen as to reside tacitly in the organization, and is therefore not always codified and codifiable.¹⁵ It tends to be embodied in the routines of individuals and organizations, and not necessarily stored in written books or standard procedures. Many times knowledge is characterized as interactive and collective, and rooted in the organizational and institutional context it stems from, which just underscores the dynamics and uncertainty of innovative processes in an evolutionary approach.

In sum, Schumpeter was the first author to apply a broader concept of innovation which encompassed technical as well as organizational changes, and to give it a central role in the explanation of economic development (Castellacci 2007). His perspectives were the foundation of the further elaboration of innovation and economic growth, with the seminal contributions on modern evolutionary economics in the 1980s.

4.1.1 Evolutionary approach vs. New Growth Theory

As mentioned previously, the renewed interest and elaboration of Schumpeterian ideas by many authors has led to many important contributions on building up a broader understanding of the evolutionary approach that we are familiar with today. Schumpeter's aim was to develop a theory about economic evolution that would be regarded as a complement, and not as a substitute, to the static equilibrium theories developed by neoclassical economists (Fagerberg 2002: 11). New growth theory (NGT) is founded on these traditional neoclassical viewpoints of growth, although scholars in NGT have

¹⁵ Nonaka (1994) presented a model on how knowledge processes is understood. This is in particular interesting in how to manage varieties of knowledge and innovation processes within a MNF.

recognized Schumpeter's work as a source of inspiration leading to development and adjustments of many parts of the approach by newer theorists (Castellacci 2007; Verspagen 2004).

The neoclassical line of reasoning describes the economic agent as rational, seeking to maximize utility and profits under given constraints (Castellacci 2007: 588). As a consequence, the firm is assumed to have perfect and complete information and knowledge about the best technology available at any given time. This signifies that they are also able to adopt advanced techniques used by more innovative firms. Since technological knowledge is seen as static, codifiable and independent of the economic situation in which firms make their technological choices, the imitation and adaptation of technology is feasible. Knowledge is also regarded as a public good, thus available to all economic agents without major constraints. These arguments uphold that technological change is perceived as exogenous and unexplained from a neoclassical tradition, whereas evolutionary theory leans towards the endogenous aspects of technological change.

Neoclassical viewpoints are still considered as quite simplistic in their description and not entirely converging with the wave of NGT approaches that emerged in the 1980s. Certain adjustments of the approach have been made, even though the main foundations are valid in many aspects. NGT still perceive technological knowledge as a non-rival partly appropriable economic good, often produced by a separate research sector (Castellacci 2007: 610). Such a view is concurrent with the linear and more static perception of the innovation process, and represents the opposing view of Schumpeter's evolutionary approach. The model is linear because it proposes a set of well-defined set of stages that innovation is set to go through, as illustrated under (Kline and Rosenberg 1986):

Basic research → Applied research → Development → Production and Diffusion

Although the majority today rejects the model due to its 'over-simplistic' description of reality, there is little doubt that this model has been very influential. One cannot ignore its impact on how research and innovation could be applied in real settings in both private and public sector, due to its more reducing nature compared to complexity-embracing models advocated by evolutionary theorists.

Castellacci (2007) seeks to analyze if there are convergences between the two theoretical approaches. NGT models derive from the behaviour of rational and individual economic agents and the subsequent setting up of defined production function frameworks. The neoclassical viewpoints focus on a quantitative modelling that favours stronger analytical consistency, which makes situations more measurable and easier to handle, whereas the evolutionary studies focus on micro and macro levels co-evolve and interact with each other operating with uncertain outcomes. Embracing the complications at the micro level in innovation processes implies a more eclectic approach (Verspagen 2004: 492). This often makes it more difficult to operationalize, and underscored that it is a challenge evolutionary theorists have to overcome. Still the two approaches share the common perception of accepting the importance of innovation in economic growth, as well as the positive role that can be played by government policy for science and technology development.

In sum, evolutionary theories have paved the way for different directions and approaches in the study of innovation, on both policy/macro through the systems of innovation approach, and firm/micro level through behavioural routines within organizations and types of knowledge (Nelson and Winter 1982). NGT and the neoclassical viewpoints have contributed with measurable rational models that have affected decision-makers at different levels in their implementation of innovative processes.

4.2 Systems of innovation

During the 1980s and 90s, many researchers began to embrace that the Schumpeterian ideas on innovation processes and technology diffusion had a strong systemic character (Fagerberg 2002: 38). By expanding the evolutionary theory perspective, the common view is that feedback mechanisms and complex interactions are involved in the creation of technical and organizational innovations. These processes occur between individuals within the same firm, between different firms, between producers and users of new technology, between public and private institutions and so forth. The notion of these interactions lead to a development towards a more systemic approach in the study of innovation, moving away from the linear framework (Castellacci 2007: 605).

The systems of innovation approach have been applied to different perspectives. The first specification was the *national innovation system*, introduced first by Freeman (1987). It

could be defined as a system of interconnected institutions to create, store and transfer the knowledge, skills and artefacts, which defines new technologies. The element of nationality stems from elements of shared language and culture which bind the system together, but also from national focus on other policies, laws and regulations, which conditions the innovative environment (Metcalf 1997: 289). Besides the national level, the system of innovation approach has been utilized on other levels and areas, like sectors, regions or on specific technologies. Gunnarsson and Wallin (2007) argue for more emphasis on the regional level in evolutionary models and systems of innovation thinking. The inclusion of geographical spaces improves the organization-theoretic foundation of the evolutionary model in different ways. Their paper focuses on the production of innovative input within regional systems of innovation, and connects in particular knowledge infrastructures such as universities, R&D facilities and innovative behaviour together. Gunnarsson and Wallin (2007: 13) suggest that cooperative behaviour depends on different factors. The cooperation between the components depends on the degree in which exchange of knowledge is seen as beneficial to all sides involved.

At the same time Lundvall (1992) seeks to add the importance of learning processes to the systemic approach of innovation. It is a widespread perception that learning is a fundamental characteristic of the modern knowledge-based economy. He maintains that the learning processes between the actors happen automatically and as unaware consequences through the interaction between the agents. He distinguishes 'learning' from 'exploring', describing the latter as a deliberate and active effort to search for new solutions, products and processes, inspired by the Nelson and Winter (1982) approach of finding new organizational routines. These activities are directly related to the systematic way of organizing R&D, and the main actors involved in this work such as R&D labs in private firms, research institutions and universities. Regardless, the distinction is useful to have in mind when discussing the implications of innovation systems in a wider context.

Pavitt and Patel (1999) and Keith Pavitt's work in general has focused mainly on the extent of internationalization of the R&D activities of MNEs. The main findings of the studies are concurrent with the notion that innovative activities and know-how which create competitive advantages are less internationalized than other dimensions of corporate activities. As a consequence of this trait, the companies' innovative activities are significantly influenced by the home country's national innovation system, like the quality of the basic research,

workforce skills etc. (Pavitt and Patel 1999: 94). Narula (2002), in a study of Norwegian MNFs, argues for a correlation between the national innovation system and the MNFs degree of internationalization of R&D. The high costs associated with integrating into the host location's systems of innovation, in contrast to the low marginal cost of maintaining its embeddedness in its home location's innovation system, creates an 'inertia' whereby firms are reluctant to expand innovative activities internationally (Criscuolo et al. 2004). These costs must be tempered by supply-side considerations, the development of these technologies benefits from diversity and heterogeneity in the knowledge base, which might derive from competitors and from interactions with customers and from other complementary technologies. A single national innovation system is often unable to offer the full range of inter-related technological assets required for this diversification strategy.

4.3 The Multinational Firm

This section will focus on the organizational themes related to the multinational firm, or the MNF. Contributions on the development of the MNF as an organization will also be introduced. The main objective is to establish a link between the organizational levels (micro-meso) and the systemic approach (macro-meso). This will act as part in creating a foundation for the upcoming section where the contextual prerequisites for internationalization of innovative activities will be introduced.

4.3.1 Definitional issues

Contributors have used multinational corporation, MNC, multinational enterprise (MNE), multinational firm (MNF) (Castellani and Zanfei 2006) and even transnational corporation (TNC) (UNCTAD 2005). Although different terms are employed, they contain more or less equivalent definitions. According to Dunning (1993: 4) a multinational firm is, '*engaged in foreign direct investment (FDI) and owns or controls value-adding activities in more than one country.*' Although the traditional opinion of a MNF as a large and dominant company like IBM, General Motors, Intel and Nike is valid, smaller Norwegian companies in the salmon farming industry like Alvestad Marin and Haug Aqua mentioned in section 2.2, falls under the category of a MNF as well, despite being considered as small and medium sized companies. Bartlett and Ghoshal (1989) add that the MNF need to be engaged in the *active*

management of these offshore activities rather than simply holding them in a passive financial portfolio. This requirement is more of normative character, but still important to bear in mind considering the objectives of the thesis, where we are following the paths of innovative activities. This is because the geographical dispersion of activities entails companies to manage a complex organizational structures and management systems that required control over its product and its functional and geographical diversity, which includes linguistic and cultural aspects (Bartlett and Ghoshal 1989). Furthermore, there are two main components that the MNF consists of in terms of its formal structures. The first component is called *headquarters (HQ)*, which traditionally is located in the home country of the MNF. The other component(s) are the *subsidiaries*, also referred to as affiliates. A MNF could be composed of many subsidiaries or affiliates across the global simultaneously, i.e. that there is not necessarily a one-to-one relation between HQ and subsidiary. The specific connection between HQ-subsidiaries and its implications on innovative activities will be introduced later on.

4.3.2 Towards the established and modern MNF

One of the earliest signs of a development towards a modern understanding of the MNF could be traced back to Chandler (1962) and his view of a replacement of the multifunctional U-form organization towards the multidivisional M-form organization. This change of structure was principally due to geographical expansion, transaction cost issues and problems of control and decision-making in the traditional U-form organization created from diversification. In the multidivisional M-form, administrative efficiency was superior, especially in terms of spreading their organizational innovation. Johnston (2005) asserts that although Chandler's work was not directed at MNFs per se, it could be considered as a forerunner for many conceptualizations that have been developed to date concerning how to organize business activities of firms on the international arena.

The product-cycle theory introduced by Vernon (1966) is often being portrayed as the link between the strategies of the early MNF and those of the established MNF. Vernon proposed that the occurrence of geographical diversification leads to a series of production and distribution phases of the products of a MNF. Shortly described, in the *first stage* the products are manufactured and sold domestically. *Second*, the output is produced domestically and then exported. *Thirdly*, output is both produced and sold abroad. And lastly

the *fourth phase* the products are manufactured abroad and re-exported to the domestic market. This last stage is highly associated with minimization of costs and differentiation strategies. The analysis of Vernon (1966) identified the central role played by different cost factors, in particular labour costs, but also transaction costs in both home and host country of the MNF and how these cost factors caused shifts in the tasks of the subsidiary. He emphasized that coordinating international innovative activities was too costly, due to the difficulties of collecting and controlling relevant information across national borders. The R&D activities were largely limited to the adoption and diffusion of centrally created technology. Traditional approaches to the firm's multinational growth (Vernon 1966) argue that firms going abroad must possess ownership advantages allowing them to overcome their 'liability of foreignness'. From this point of view, learning and transferring of knowledge entails a one-way movement from parent companies to the subsidiaries. These traditional contributions on the MNF are more influenced by classical economic theory of profit maximizing and rational agents, rather than evolutionary streams embracing complexity. Nonetheless, this literature has created framework in which newer streams of development towards a 'modern' MNF emerges from, where evolutionary theory has been given more attention.

The Bartlett-Ghoshal Framework

One of the newer contributions that diverge from Vernon (1966) and earlier approaches is Bartlett and Ghoshal (1989). The study provides a further insight of the MNF in a global perspective, where the race of staying competitive due to many pressures is increasing. With the help of the so-called *I-R Framework (Integration-Responsiveness)*, they sought to demonstrate a shift of focus on the MNF internationalization strategies. They argued that firms competing in the global marketplace face two types of competitive pressures, each of which place different demands upon the management of the resources of the firm. The *pressures for global integration (I)* are driven by the response of forces to reduce costs that arise from technological change and changes in the external environment. These factors and pressures often impelled firms towards a strategy based upon factors like scale economies, product standardization and low cost location. On the other side the, *pressures for local responsiveness (R)* to suit unique local tastes in the host market like infrastructure or local government requirements, have an opposing effect. Local pressures demand the MNF to

pursue product differentiation via local production, control of marketing, R&D and so on. The result is the illustrative figure under:

Figure 3.1 Integration - responsiveness framework

High	<i>Global</i>	<i>Transnational</i>
Pressures for Global Integration		
Low	<i>International</i>	<i>Multinational</i>
	Low	High
	Pressures for local responsiveness	

Source: Bartlett and Ghoshal (1989)

As we can observe from the figure, the different strategies are called (a) *international*, (b) *multinational*, (c) *global* and (d) *transnational*. The four strategies vary across higher and lower levels of global integration and local responsiveness pressures. When global integration and responsiveness pressures are both low, the rational choice for the firm would be to prefer an *international strategy* according to the framework. This situation is described as quite centralized, at least from the perspective of the home country. All the main critical functions and knowledge are kept at the HQ and tight control through formal planning systems is kept over marketing and product strategy. In this situation, the subsidiary tends to become an addition to the HQ, as a highly coordinated unit. With high pressures for local responsiveness and relatively low pressures for global integration, the MNF is likely to follow the *multinational strategy*. In a similar manner to the international strategy, home developed skills and products were transferred to foreign markets, but the main dissimilarity

is that marketing and product development approaches are customized to fit local demands of the host market. Though this, the subsidiary is perceived as a relatively independent entity whose objectives are primarily of local character (Johnston 2005: 35). Companies that pursue the *global strategy* aim primarily upon cost reduction by using location advantages and the positive externalities from this experience. The firms primary activities, production, marketing and R&D, are centred in one or a small number of subsidiaries in beneficial locations and the standardized products produced is then distributed and marketed through a worldwide network of subsidiaries (ibid: 36). Still the HQ maintained tight control of the decision-making processes and maintaining significant knowledge centrally. At the same time Bartlett and Ghoshal (1989) argue that competitive pressures required firms to respond simultaneously to both integration and responsiveness. This is in accordance with their argument on that capabilities may reside and emerge in any part of the MNF structure. Thus, the best way to obtain these advantages in generating knowledge across the MNF is by following the *transnational strategy*. Because it focuses on networks along with rapid dissemination of knowledge, it is clear that such a strategy requires a more heterarchical organization, which is congruent with Hedlund's (1986) view on heterarchy and the MNF. Hedlund emphasizes the importance of networks within the MNFs and the subsidiaries role in these networks. The basic notion was that each individual subsidiary in the network brought a unique collection of capabilities to the overall MNF. The essence of Hedlund's notion could be grasped with following citation; *...the main idea is that the foundations of competitive advantage no longer reside in any one country, but in many. New ideas and products may come up in many different countries and later be exploited on a global scale...*Hedlund (1986:21-22). Moreover, the structure of these networks implied a degree of flexibility between the central offices, subsidiaries and outside agents of the MNF. This notion has many things in common with Castellani and Zanfei (2006) and their study of a *double network structure*, where the MNFs act as 'bridging institutions', which we will return to later in the chapter.

Overall, there are connections between the earlier work mentioned in the previous section about development towards the modern MNF. Chandler's (1962) view on geographical diversification into new markets could be related to the international strategy to Vernon's (1966) focus on the pressures of cost-reduction in a classical economic viewpoint. These have obviously impacted the formation of Bartlett and Ghoshal's framework directly and indirectly. Although, the tendencies reveals that networks and complex situations on the

global scene are receiving more attention in the literature. This could indicate that evolutionary approaches have gained ground since they take real-life complexities into consideration in understanding interactions when knowledge and innovation is involved.

4.3.3 Knowledge generation in the MNF

The previous sections have attempted to describe a movement towards a focus on that the diversity of knowledge is becoming more important, because the activities have increasingly global features. As mentioned previously, every organization possesses bundles of knowledge (Nelson and Winter 1982; Nonaka 1994). Of all possible resources a firm might possess, its knowledge base has perhaps the greatest ability to serve as a source of sustainable differentiation and hence competitive advantage (Hedlund 1986). MNFs have the ability to transfer and exploit knowledge more effectively in the intra-corporate context than through external market mechanisms. However, it does not in any way imply that such knowledge transfers actually take place effectively and efficiently on a routine basis (Gupta and Govindarajan 2001). Factors like absorptive capacity (Cohen and Levinthal 1990), transaction costs (Vernon 1966), different knowledge types (Nonaka 1994) affect the ability of knowledge interaction between the components of the MNF. The Gupta and Govindarajan (2001) study focuses on the transfer of knowledge that exists in the form of “know-how” rather than on the transfer of knowledge that exists in the form of “operational information”, or strictly codified knowledge. They examine the degree of knowledge inflows and outflows between the headquarters and subsidiaries. They share the assertion of Bartlett and Ghoshal (1989) and Hedlund (1986) that knowledge transfers within the MNF take place within the context of an inter-organizational “network” of differentiated units. This is because MNFs are complex multi-dimensional entities, knowledge flows within such enterprises occur not only along multiple directions but also across multiple dimensions. Johanson and Vahlne (1977) proposed that firms acquired knowledge about international operations by the mere fact of beginning to operate in a new market. Since firm learns incrementally and manage to gradually reduce uncertainty risks. Over time the firms would learn to carry out its international operations with increasing effectiveness. The increased experience of operations in a host market brings increasing knowledge concerning many social, cultural, legal and other characteristics of that particular market and its environment. This is

congruent with Lundvall (1992) and the view of learning in a system of innovation approach.

How do these notions on the role of knowledge affect the internal structures of the MNF? The *Headquarters (HQ) and Subsidiary relationship* is described as important in many empirical studies in the knowledge generation processes within MNFs. The relationship was primarily concerned about the control of subsidiaries and maximizing the potential of HQ. As the field developed, it began to move away from formal restrictions of autonomy toward more flexible cultural control (Paterson and Brock 2002: 153). A *subsidiary's autonomy* influences many aspects of the MNF and its activities. Johnston (2005) affirms the importance of autonomy in the organization functions as a stimulant to the creation, adoption and diffusion of knowledge and innovation processes, also partly because the autonomy allows subsidiaries to become fully integrated into their local environment. In contrast, traditional viewpoints put emphasis on efficiency and tight control from the headquarters. Yet, autonomy might create opposing effects to innovative generation processes of the organization. Zanfei (2000) put emphasis on *centripetal* and *centrifugal forces* that affect processes. Centripetal forces is described as enabling internal cohesion of the MNF, through communication and cooperation, due to growing competitive pressures in global markets. The centrifugal forces lead to disintegration of the internal knowledge creation processes. As an example, subsidiaries with a large degree of autonomy might acquire constraints to contribute to the internal processes by not wanting to adopt new technology stemming from outside of their environment. This is particularly known as a cultural resistance, or the 'Not Invented Here' Syndrome. There is obviously a trade-off involved in allowing autonomy or not to the subsidiaries. That is why new *coordination and control mechanisms* must be designed to determine an appropriate balance between the two effects (Zanfei 2000: 527).

Following the earlier notion of different inputs to innovation generation, Zanfei (2000: 526) dedicates the non-formalized innovative activities a specific role in knowledge and innovation generation processes. These non-formalized activities, which often are carried out by manufacturing and sales units abroad within the MNF; do not receive the proper attention they deserve according to the author. Important learning processes also occur thanks to the abilities and sensitiveness of manufacturing and marketing employees, who are most likely to have a continuous perception of the challenges and opportunities that characterise everyday life in the specific context where the firm is active (ibid: 534). He further asserts

that a local R&D unit in the affiliate country of the MNF will more easily capture the innovative ideas stemming from employees in the manufacturing and marketing units, compared to a situation where the local unit must submit their ideas to a R&D centre located somewhere else, often far away geographically. The local R&D labs could therefore act as 'listening posts' in the local environment for the MNF, with the intention of absorbing movements locally.

How should the different elements in the multinational organization interact internally and its environment? This is a perfectly legitimate and essential question, unfortunately without a clear-cut answer. As with many other issues in this context, one has to take many aspects and factors into consideration with the intention to reduce the degree of complexity when trying to formulate solutions to the problems and challenges. Therefore, it is required to go in depth on how internationalization strategies are recognized.

4.4 Internationalization of Innovative activities

Castellani and Zanfei (2006) argue heavily for a two-way link between innovation and internationalization. On one hand, innovation is seen as a key engine for internationalization since it contributes to profitability in the competition of foreign markets, as stated by Schumpeter and evolutionary theory. On the other hand, internationalization is a key factor in creating new opportunities for further innovation.

The introduction touched briefly upon some of the tendencies within the discussion concerning internationalization of innovative activities in general and specifically R&D. Since the trend has rather been to maintain most of these innovative activities at home, close to the central offices, while production activities which are not regarded as equally knowledge-intensive, are much more exposed to degrees of internationalization (UNCTAD 2005). Criscuolo et al. (2004) assert that there has been considerable inertia in the internationalization of R&D, meaning that firms have not internationalized their innovative activities proportionally to their growth in their overall production activities. But due to competition and complexity in local markets this tendency is changing. It has lead companies to acquire more available knowledge in local and affiliate markets, although studies confirm that there are firm- and sector-specific differences on these issues (Zanfei

2000, Narula and Zanfei 2004, UNCTAD 2005, Maskell et al. 2006). We have observed in the literature concerning the development of the MNF, it has become increasingly accepted to consider the global aspect of knowledge and innovation generation processes. Hedlund's (1986) heterarchy and Gupta and Govindarajan (2000) knowledge flows, are two studies that confirm this tendency. The global network approaches are emerging concurrently with the development of empirical evidence of internationalization of innovative activities.

As it was indicated under section 3.1 and the evolutionary tradition, innovation is a multi-faceted concept, as it was attempted to demonstrate earlier in the theoretical section concerning evolutionary economics and the definition of innovation. Kline and Rosenberg (1986) stressed three aspects of innovation worth repeating to this context.

- Innovation is not a sequential (linear) process but one involving many interactions and feedbacks in knowledge creation.
- Innovation is a learning process involving multiple units.
- Innovation does not depend on invention processes, and such processes (involving formal R&D) tend to be undertaken as problem-solving within an ongoing innovation process rather than an initiating factor.

These aspects highlight a need for input indicators that reflect the diversity characterizing innovative activities, also non-R&D inputs to innovation. Nonetheless, the objective is not to initiate a wider discussion concerning R&D and its applications in this work. The aspects are meant to clarify that innovative activities can comprise of more than R&D and patent-statistics as the main innovation indicators.

R&D has traditionally been understood in relation to levels of technological sophistication and therefore been classified in three different levels: 'high-tech', 'medium-tech' and 'low-tech'. The levels are defined by the ratio between R&D expenditures to some measure of total output (sales/production/GDP). OECD's operating statistical manual for R&D data collection, the *Frascati Manual* has been very influential on the measuring R&D activities, especially on the national level. But one challenge concerning R&D is that it is often difficult to draw the dividing line between what should be counted as R&D and what should be excluded (Smith 2004). While organized R&D performance is an important source of innovation in modern industries, it is not the only source. A focus on R&D alone as the main

innovative input might lead one to overlook important innovative activities based on other sources and inputs. These sources could be skilled personnel, learning by doing, using, interacting and other 'know-how', commonly defined as tacit knowledge (Fagerberg 2004). Cohen and Levinthal (1989, 1990) suggest a dual role of R&D. R&D does not only entail generation of new information, but it also enhances the firm's ability to assimilate and exploit existing information. This latter notion involves an aspect of learning processes, closely related to spillovers and the idea of absorptive capacity, which the same authors are most recognized for. Absorptive capacity is considered to be very important, particularly for assessing the effective contribution by spillovers from others. It also includes the firm's ability to exploit outside knowledge of a more intermediate sort, such as basic research findings that provide the basis for further applied research and development.

Recent publications have introduced terms like knowledge-intensive activities, perhaps as an alternative to comprehend and grasp the complexity in measuring and defining what really could be considered as innovation. Hirsch-Kreinsen et al. (2003: 26) focus on R&D in so-called low-medium tech industries (LMT). Although aquaculture and salmon farming is increasingly dependent and driven by advanced technology, it is not perceived as a high-tech industry, partly because the lower scores on R&D statistics relative to other industries. It would therefore fall into the low-medium tech industry, especially since it is dependent on natural resources and living biological organisms. Traditionally, LMT industries imply a higher degree of tacitness in the knowledge bases (Nonaka 1994), which does not denote a lower degree of complexity and skills, a statement Ørstavik (2004) also underscores about the salmon farming industry. These viewpoints could provide a basis of a further discussion in the upcoming chapter.

4.4.1 Globalization of innovation

Archibugi and Michie (1995) analyze the role of MNFs in a global setting and the trends of internationalization and innovative activities. The authors present a classification of how multinational firms choose to organize their innovative activities, in search of a comprehensible overview of the literature. They identify three categories of how the globalization of innovative activities in multinational firms could be perceived; (1) the international exploitation technology produced on a national basis; (2) the global generation of innovations; (3) global technological collaborations. Unsurprisingly, the authors withhold

that these categories cannot be regarded mutually exclusive, rather they should be seen as complementary to each other at both country and firm level. This taxonomy has served as a framework for further elaboration of internationalization models and strategies MNFs engage in concerning innovative in general and R&D in particular. For instance von Zedtwitz and Gassmann (2002) present different types of R&D activities. The establishment of new R&D units is influenced by two principal factors: access and support of local markets, and access to local science and technology, like Narula (2002) mentioned. They give rise to four archetypical forms of R&D organization: *National-treasure R&D*, *Technology driven R&D*, *Market driven R&D*, and *Global R&D*.

Narula (2002) examines Norwegian MNFs and the scope of their innovative activities internationally. The paper enquires why firms tend to concentrate their R&D activities at home, using a system of innovation (SI) approach. It questions further why firms have greater reluctance to expand or relocate their R&D operations abroad than their other value adding activities such as manufacturing, sales and marketing. Godø and Gulbrandsen (2007) seek to analyze eight different Norwegian MNFs and their motives for and experiences with internationalization of R&D. The study applies the R&D types above in their analysis of what kind of internationalisation strategy Norwegian companies are following when it comes to R&D. Their findings argue that historical antecedents of a firm's development obviously matter in the identity, culture and power structure of a firm. Both studies conclude with that many companies tend to be closely associated with the innovation system in the home country and public R&D policy, as Pavitt and Patel (1999) has asserted. It has lead in many cases to a situation of inertia or lock-in for many Norwegian MNFs.

4.4.2 Asset exploiting vs. asset seeking activities

Based on Dunning (1993), the eclectic OLI-paradigm¹⁶ and other contributions, it has been asserted that firms traditionally engaged in international value-added activities in order to exploit their home-based competitive advantages. Dunning (1993) distinguishes between

¹⁶ The eclectic paradigm asserts that these patterns must be seen in the light of three different forces and the configuration of them, which are; the combination between the competitive, or ownership (O) specific advantages of firms and the competitive, or location (L) specific advantages of countries. In light of these advantages, the organizational modes a firm seeks to acquire and organize their resources and capabilities, is related to choices of internalizing (I) these assets (Dunning 1993).

four different FDI strategies; *resource seeking*, *market seeking*, *efficiency seeking* and *asset seeking strategies*. Since the first three strategies represent different modes of extracting economic values that the firms already are endowed at home, he argues that these strategies can be parts of a broader category of *asset exploiting* FDI. When firms pursue resource or efficiency seeking objectives, their assets are traditionally combined with low cost production available locally. In contrast the *asset-seeking* FDI are aimed at gaining access to specific competences which reinforce firms' ability to compete in foreign markets (Castellani and Zanfei 2006: 13). The perception of asset exploiting strategies corresponds with the more traditional views of organizing innovative activities within the multinational firm. Earlier in section 3.2.2 some of the most important contributions of understanding the MNF development were presented. The asset exploiting strategies bears connotations in particular to Vernon (1966) the descriptions of a 'quasi-colonial' relationship between the parent company and the foreign subsidiaries (Castellani and Zanfei 2006: 13). A situation where the MNF generally sought to exploit advantages created at home through their host countries' markets by continuously seeking to reduce costs.

As already stated, asset-seeking strategies leads firms to improve their existing assets, or acquire (and internalize) or create completely new assets through foreign-located activities. Zanfei (2000) claims that access to local complementary technological assets can occur through learning at the plant level, and not necessarily through formal units like R&D. Potential outcomes might be embodied into improved goods and processes, into blueprints such as user manuals or codified practices, or into routines and tacit competences. Zanfei (2000) clearly utilizes a quite broad understanding of how knowledge and innovation may be generated. If we apply the I-R grid as advocated by Bartlett and Ghoshal (1989) on these internationalization strategies, it seems coherent that the transnational strategy with high pressures for global integration and local responsiveness, corresponds to the asset-seeking strategy.

Even though these pressures have led to a focus on asset-augmenting strategies, there are no suggestions of a substitution of asset-exploiting strategies. Instead the two sets of arranging international activities appear to overlap and co-exist in reality (Castellani and Zanfei 2006: 17). When asset-augmenting investments are undertaken, new technological opportunities are opened and explored. The exploitation of these opportunities will often require complementary assets that are not necessarily available locally. This calls for investments

and activities that are more exploiting in nature. Thus, it is one reason for why firms engage in both exploiting and augmenting activities at the same time (ibid: 22).

Double-Network Structure

According to Castellani and Zanfei (2006) and Zanfei (2000), the emphasis on asset-seeking internationalization strategies is due to different underlying dynamic factors that affect the trend. They identify five sets of evolutionary pressures, based on the extensive work by the already mentioned Dunning (1993) and others. *Firstly*, technical change has raised fixed costs of manufacturing and services activities; *secondly* it has increased interdependencies between distinctive technologies; *thirdly* it has enhanced the importance of multipurpose, flexible technologies, such as information processing and transmission, and biotechnology; *fourthly*, it has often determined a reduction in product-life cycles (Vernon 1966); *and fifthly*, partly due to the previous changes, it has forced firms to upgrade their core competences and improving competitive advantages. Moreover, the combination of these evolutionary pressures with more asset-exploiting activities entails for a transition of MNFs towards the so-called *double network structure*. It derives from the notion that subsidiaries make use of the internal network of knowledge of MNFs through interaction processes, with the purpose of creating and using new knowledge. At the same time internal units in network of the MNF tend to develop external connections with institutions and actors located outside the boundaries of the MNF, in order to increasingly develop the potential for use and generation of knowledge.

4.4.3 Local contexts in innovation processes

Local contexts and context-specific knowledge has become more decisive in the internationalization processes of MNFs and in particular in knowledge generation and transfer. The pressures for local responsiveness for MNF activities in the Bartlett and Ghoshal (1989) framework, illustrates the importance of local conditions for the MNF's activities.

The changing nature of scientific and technological progress enhances the role local contexts as a source of economic value for innovating firms. In other words, context-specific knowledge often makes the difference and determines the competitive advantage of firms. Context-specific knowledge is seen as highly complementary to the development of general

and codified knowledge (Castellani and Zanfei 2006: 21). Information processing and communication technologies advances, the incentives for firms to codify knowledge and lower the costs of exchanging information between different and distant nodes of the MNF's internal network (ibid: 22). Zanfei (2000) asserts that the setting up of manufacturing and sales subsidiaries outside of the home country functions as a fundamental instrument for the assimilation of the local culture, objectives, norms and conventions. In turn, assimilating local habits and values improves MNFs' abilities to: understand and anticipate the behaviour of host countries' firms and institutions; explore user needs and technical competencies; absorb locally generated innovative ideas; and, last but not least, select partners and increase the effectiveness of external networks with indigenous counterparts (ibid: 517). This has to be viewed with the perception of decentralized R&D units in local context and their role of absorbing the necessities in their environment effectively. Such views are influenced by literature that recognizes the importance of asset-seeking strategies and Hedlund's (1986) heterarchical notion of knowledge generating networks. Foreign subsidiaries possess valuable connections with local firms, government agencies, universities and research institutes, thus allowing them to be exposed to new ideas, knowledge and innovations of local systems. Through the interactions with those unique and idiosyncratic external network linkages, subsidiaries develop their own specific knowledge.

Katz (2007) examines how the initiation of new production activities has affected economic, institutional and technological forces in various countries and industries in the Latin American region. One of the cases is the Chilean salmon farming sector. He raises an interesting question related to industries dependent on natural resources in "developing countries" and their local context; how much 'location-specific' R&D efforts are needed as a result of the idiosyncrasy of local production circumstances? Even though considerable parts of the required scientific knowledge and technical know-how could be obtained from international sources, he claims that is important to understand that there is often a great deal of "country-specificity" attached to natural resources and that such specificity demands that there must be processes of domestic knowledge generation and adaptation. Katz underscores this by asserting that local production environments tend to differ, whether those are ecological, biological or physical conditions. In the framework of developing a sustainable and rational exploitation of domestic natural resources, he maintains that it is not sufficient to adhere on the notion that "ready-available" production and environmental control technologies will automatically solve the subsidiaries' challenges, as opposed to the

centralized viewpoints asserted by Vernon (1966). Thus, he argues that domestic R&D seems to be required to such a purpose of securing a sustainable development.

Simultaneously, this process has to be coordinated with the external environments consisting of public R&D institutions, university-based research labs and the authorities. However, the study emphasizes that Latin-American firms has until now not shown many signs of an increasing interest of developing 'in-house' R&D activities or strengthening their links with local universities, public sector labs or engineering firms with the purpose of developing new product designs or new process technologies (Katz 2007 :18).

Evolutionary pressures and complexity have affected the perception of innovation and one of the main 'engines' for conducting internationalization processes of it, the MNF. Various approaches and aspects related to these processes have been displayed with the intention of providing an ample, yet specific framework, which may allow us to understand the context of the salmon farming and innovative activities.

5. Discussing the Empirical Findings

The theoretical section has provided a relevant and competent tool to confront the empirical findings of this study by introducing a fruitful discussion around the topics in the best possible manner. Before continuing with presenting the outcomes of the data collection process, it is worthwhile to recall the research questions.

The main research question seeks to discuss and explore if it is pertinent to talk about a change of focus from activities based on production towards innovative activities for Norwegian companies engaged in Chilean salmon farming. The question is asked in relation to a growing amount of literature that asserts that MNFs are slowly becoming more engaged in innovative activities internationally speaking.

The second research question relates to how such possible change of focus on internationalization of innovative activities affects the organizational implications of the MNFs. One of the objectives under this question will be to locate which specific issues and challenges the actors are bound to take into consideration concerning the theme. Issues related to internal knowledge transfers processes and coordination, are two examples that might be important under this section.

The last research question is concerned about the contextual prerequisites for the internationalization of innovative activities. Which preconditions are important for establishing these structures of innovative activities in new areas outside of the home country, in this case in the Chilean industry? Which are the main barriers and drivers for enabling conditions for internationalization of innovative activities?

5.1 Changes towards innovative activities

What are the findings that indicate a change of focus among the contributors of data in this work? As we know, this is a question endorsed by a growing amount of contributors who claim that there are indications of increasing internationalization of innovative activities in MNFs (Narula and Zanfei 2004, UNCTAD 2005). As a result of these alternations in standpoints of the development, questions related to issues like technological development,

intensification of knowledge and the demand for research were addressed to various interviewees and spokespersons in the salmon farming industry.

The first plausible signal of an internationalization pattern is related to the establishment of local R&D units as part of the MNF structure in a host country. How is the status among the companies? *Feed Company 2* is probably the MNF in the data set that exhibits the most obvious indication of undertaking a focus on internationalization of innovative activities, because they have established a local R&D in the Chilean market. *Feed Company 1*, the *Equipment Company* and the *Farming Company* have all decided not to establish a local R&D unit in Chile. The *Farming Company* has stated that they perform ‘more development than research’ in the R&D perspective, while the two others have R&D facilities located in Norway. Given that technological transfers and the relative successful outcomes of them have been the main internationalization strategy within the salmon farming industry, it could corroborate why few companies have internationalized innovative activities. However, we will return to the specifics about the local R&D units and the MNFs reasoning for organizing these innovative activities.

The Research Company is in a slightly different situation than the more commercial actors in the data set, because it is not equally dependent on production and other activities based on profitability. Nevertheless, the company plays a significant role in the innovation system perspective as an important contributor of applied research and knowledge to the aquaculture industry through its owner companies in Norway. This makes the company relevant to include in this work. That fact that the owner companies in Norway decided to outsource part of their research activity by establishing a R&D unit in Chile, indicate that there are good prospects in the internationalization of research to the Chilean salmon farming industry. Given that another Norwegian research institute recently decided to establish a unit in Chile as well, underscores this impression further.

I received general inputs about the topic of internationalization at the seminars in both Norway and Chile. The aquaculture seminar in Norway was set up in relation to the inauguration of the *Research Company*, while the aquaculture seminar in Chile followed up on several topics from the first seminar. Most of the important representatives from the public and private sector in Chile and Norway were present at both seminars. The topics were centred on how research and technological development could face common future

challenges in the salmon farming industry. The main assertion from the majority of the speakers was that increasing the cooperation between the countries could be mutually beneficial, due to the joint challenges the industry is facing and will face in a globally. More cooperation and focus on research and other innovative work between the two countries appeared to be vital according to the contributors at the seminar. These initiatives signal a 'breeze of change' in how industrial players stemming from Norway perceive how innovative work could be performed internationally, in relation to their Chilean counterparts. Still it will be interesting to examine more in depth how these ideas, wishes and fresh initiatives actually affect the MNFs and other companies' performances in reality.

Technological change and *knowledge complexity* are two dimensions that deserve more attention in grasping the development towards an increased focus on innovative work.

5.1.1 Technological change

Technological change and development have put pressures on actors to reduce their costs, since costs of manufacturing and services has increased steadily (Dunning 1993). Bartlett and Ghoshal (1989) maintain that the need for global integration is driven by pressures of cost reduction arising from technological development and changes in external environments. It has led the MNF to outsource activities in low cost location and standardizing their products. How do the interviewees perceive that the technological development has affected the salmon farming industry, in particular in Chile? Comparing the current situation in the Chilean industry to the situation for 10 years ago, all of the interviewees claimed that there have been several drastic changes, especially in terms of the use of technology. It has been a tremendous intensification concerning the usage of products that have been developed by highly specified knowledge. This is in line with previous statements on the development of utilization of technology in the industry (Aslesen et al. 2002, Ørstavik 2004). One interviewee in the subsidiary of the *Farming Company* comments how the technological development has influenced the Chilean reality:

...Around 10 years ago we witnessed some changes. They [Chilean companies] started to incorporate themselves in issues like feed automatization, the issue of cages. They started to think about water recirculation. The past 5 years there has been a boom, and other types of technology related to filters...the massification of UV...started to come(...). Everything that used to be static has now taken off and become more advanced, which is good, and still there is more to come.. In that way I have experienced the innovative process in Chile...

Manager, Farming Company, Chile

This comment exemplifies a representative perception among of the interviewees in the Chilean subsidiaries. The majority of the actors are becoming more preoccupied with applying new technology. This concerns especially the *Farming Company*, since they are very much involved in the various activities on the industrial value-added production. This coincides with Iizuka (2006) and the notion that collective capabilities in Chilean salmon farming has lead to a rapid development and expansion.

The race of staying competitive is positively correlated with the application of technological solutions. While the Norwegian industry has been considered as the frontrunners in applying new technological solutions, the Chilean industry has not experienced the same levels of technological solutions in use. This is partly explained through the higher use of manual labour in Chile compared to the Norwegian industry. As a consequence the necessity of applying technological solutions in Chile has not been as crucial as in Norway. Interview objects in Chilean companies assert that this has changed in current times, and will probably change increasingly in the future, especially in view of the fact that the future growth and expansion is expected to occur in the southernmost, remote and sparsely populated Region XII. The *Equipment Company* is very conscious about this development, and is in preparing the company's engagement in those regions in the future. Mainly because an expansion further south will require a different approach, in terms of automatization of technology.

...In Chile it has been said: 'copyright: the right to copy'

Director, Farming Company, Norway

The background chapter familiarized us with the development of the Chilean industry and its dependence on foreign-developed technology and solutions. The adaptation of foreign technology has enabled the industry's progress of reaching high levels of production and growth at a global scale. The downside of this reality is the aspect of copying technology at a

lower cost, and obviously lower quality. The citation above underscores that the problems associated to copying technology have been extensive in Chile. The majority of the interview objects, Chilean and Norwegian, mention the prevalence of a culture that focuses primarily on costs and not the quality of products in Chilean salmon farming. Aslesen et al. (2002) pointed out that many of the actors in Chile from early on became more productive on the short-term, through copying for instance technological equipment like steel cages and barges. Employees in central and local offices in the *Equipment Company* are clear about the problematic tradition of copying, although they express that the magnitude is lesser for each year, probably because of the varying quality of the copy-products. Since the *Equipment Company* provides high-quality post-sales services to their customers, assists probably to the decrease of copying. Nevertheless, a more current issue of copying is related to pharmaceutical products. It must be seen in concordance with the vast biological challenges the Chilean industry is facing today, which were described in the background chapter. Despite of not able to receive data directly from one of the Norwegian pharmaceutical companies engaged in Chile, other persons in the data selection addressed the issue of using pharmaceutical generics stemming principally from China. According to interviewees in both countries, the Chilean companies' motivation for purchasing these products is entirely due to the low costs of the products. In comparison, products based on well documented research have higher costs associated to its development. After years of copying, many of the contributors claim that there is now an increased consciousness among the industrial actors to invest more in technological products and solutions that possess adequate quality and documentation. This following quote brings one particular example to light:

... A specific example of this is the challenges of sea lice, where there is a positive development with less sea lice pr. kilo fish than before. This has to do with the use of a new remedy called AlphaMax. In that case the actors are willing to pay the price for the product developed by the pharmaceutical Pharmaq. In that sense they are being paid for the research fundament in developing the products and enormous costs with getting the product registered in Chile. That seems to work out very good now, creating a change of atmosphere...

CEO, Feed Company, Norway

This specific example illustrates that there are positive tendencies regarding the purchases of 'original' products. The severe biological situation has influenced many actors in the industry, from the authorities to small suppliers, to focus more on behaviour that may

generate efficient outcomes and longevity for the salmon industry. Although such behavioural patterns could be an indication of indirectly supporting an environment for innovative activities in Chile, it underscores the significance of questioning if these preconditions are present. Such preconditions for innovation are advocated by for instance theorists of the *innovation system approach* (Lundvall 1992) and the *double network structure approach* (Castellani and Zanfei 2006). A community that is reluctant to utilize well-documented products stemming from research and other innovative activities do not contribute to a fruitful environment for innovative work. However, later in the chapter we will return to specific themes in relation to these rationales for decisions and preconditions for innovative activities in different contexts, manifested through for instance components within the innovation system thinking in Chile and local R&D units.

Another specific subject the interviewees in Chile put emphasis on, was the maturity levels of the Chilean industry compared to the Norwegian industry. Spokespersons in the subsidiaries feel that it is not reasonable to compare the industries on every aspect, in particular on research and innovation performances, especially because of the experience of the Norwegian industry and the structures upholding these features. Until recently, there has not been a clear focus on further development of the industrial capabilities in research and innovation in Chile. Instead of entering in a debate about who perform better, the interviewees mention that there are different assets and strengths in the industrial realities. Therefore, the important issue is how these assets complement each other to facilitate efficient learning and cooperation across national borders. Despite the viewpoints of Norwegian dominance on research and innovation, two interesting comments are presented:

... The majority of technology comes unfortunately from outside of Chile, but Chile has been innovative in the aspect wanting to use this technology. Compared to Norway, in spite of all its knowledge, I see that there are still some resistances for instance to fully use system of water recirculation and make other more profound changes in Norway. I see it like they feel 'they have a system that works so why change it.' They seem more resistant to changes, which I find peculiar when there is a lot more R&D (...) despite that I see them as a little reluctant to change. And Chile seems more open to change, that is peculiar to me...

Manager, Farming Company Chile

...I am convinced that it is equally important for Norwegian MNFs and the Norwegian industry to be open to learn outside the home country, because we cannot manage to learn everything. We have a tendency to become a little complacent, but we have a lot to learn...

Manager, Research Company, Chile

The viewpoints of the manager in the *Farming Company* on the Chilean industry's openness towards external changes reflect Chile's position as adapters of technologies in the aquaculture industry. This is technology that often stems from Norway. Still, the interviewee regards Norwegian companies as somewhat reluctant to make changes in area. The manager in the *Research Company* maintains that there is no need to become complacent in the Norwegian industry, because there are things to learn from other realities. These comments make us to contemplate whether the argument of Nelson and Winter (1982) and organizations being resistant to changing their routines, is relevant. Can Narula's (2002) study of Norwegian companies in a 'lock-in' situation, due to their strong relations to the national innovation system, help explain why Norwegian salmon farming companies are generally centralizing innovative activities? The manager in the *Research Company* does not agree to the notion that there is a one-way transmission of knowledge and experiences from Norway to Chile, but there is great potential to increase these processes between the industries. Gupta and Govindarajan (2000) are some authors that give importance to knowledge flows in MNFs. The statements about learning more from one another could be seen in relation potential differences in the knowledge bases and experiences in each industry. Chile's position as technology adapters implies a more tacit or practical type of experience in their approach. Nelson and Winter (1982) assert the significance of tacit knowledge in improving organizational routines, while Hirsch-Kreinsen et al. (2003) maintain that practical knowledge plays an important role in innovation processes of low-medium tech industries (LMT). Some viewpoints from people working in the *Equipment Company* could shed some light on this matter in the upcoming section concerning the complexity of knowledge within innovation processes.

The widespread use of technological transfer from central offices to the affiliate countries the salmon farming industry, leads us to perceive that neoclassical perceptions on technological change as exogenous and that technology imitation and adaptation is feasible at any given time, is relevant to the industrial reality. Technological changes force companies to reduce their costs, and Chilean companies has on many occasions decided to

reduce the costs through copying technology, instead of focusing on innovation of products and processes. At the same time, the technological development and application of technology has led to a maturity of the industrial reality. Interviewees claim that this has resulted in country-specific features that require more focus on the local contexts. This will be emphasized further in how the MNFs have decided to internationalize innovative activities.

It remains to see if evolutionary approaches have some influence, some issues concerning complexity of knowledge and other related industrial challenges will be introduced.

5.1.2 Complexity of knowledge and innovation processes

...Knowledge is power...

Director, Farming Company, Norway

This short quotation underscores an extremely important viewpoint on how knowledge is utilized in a variety of settings. Evolutionary approaches enable us to perceive that innovation processes are dynamic and complex, since it undertakes a broader view when examining the interactions between the components in those processes (Kline and Rosenberg 1986, Lundvall 1992). The Nelson and Winter (1982) analysis of the role of routines, skills, 'organizational memory' and tacit and codified knowledge in firms, is recognized as an important contribution for further work related to firm behaviour, particularly the role of knowledge in firms. Nonaka (1994) argues that organizational knowledge, thus innovation, is created through a continuous dialogue between tacit and explicit knowledge. What kind of relevance do these arguments have for the salmon farming industry? One citation under is fitting in terms of the challenges related to knowledge in organizations:

...Perhaps the most important issue is being able to manage the enormous base of knowledge the organization possesses(...)Knowledge is not only what an individual has in his/her mind, but also how the whole organization can make use and sense of that knowledge. It is not that easy, it is very complex....

Development Manager, Feed Company 1, Norway

According to the statement, knowledge is not always straightforward and easy to grasp, just as the theoretical contributors above maintain. The manager adds importance to the degree of complexity in knowledge handling does not diminish since the company has operations in

different countries, markets and cultures across the world, like Johansson and Vahlne (1977) express. Nelson and Winter's (1982) assertion of that knowledge is rooted in different organizational and institutional contexts, is valid here. Furthermore, the notion is in harmony with Ørstavik (2004) and the assertion of that the underlying knowledge bases of fish farming activities in reality are complex and heterogeneous. The emphasis that was put on industrial innovation challenges like fish health in section 2.3, illustrates that there are complex and knowledge-intensive structures in the industry as well (Aslesen 2004). The comment under is particularly interesting since it brings a different dimension into the process of understanding innovation and knowledge generation:

...knowledge flows through an organization is very important...whereas in a hierarchical structure it is not that common (...) it does not matter if the others in higher levels have this knowledge. They often have codified knowledge. A lot of the practical knowledge resides tacitly, therefore you need systems in order to develop this knowledge...we are talking about different types of knowledge, we have to accept and tolerate that we[Norway and Chile] are "kings on different areas" and we have different roles, so that is probably a bigger challenge here(Chile) given the hierarchical structures...

Manager, Research Company, Chile

The interviewee in the *Research Company* mentions features in the organizational structures as challenging. One challenge is the hierarchical structures in Chilean corporate culture, compared to more egalitarian and 'flat' structures in Norwegian organizations. The manager refers also to the importance of having adequate systems that enables knowledge generation processes to occur in a company, especially when the knowledge resides tacitly within the individuals. It leads us to mention the tacit-codified dimension in understanding innovative processes (Nonaka 1994). Because aspects of the salmon farming industry could be characterized as LMT, Hirsch-Kreinsen et al. (2003) assert that practical knowledge plays an important role in innovation processes of LMT industries. Companies classified as LMTs combine often existing codified knowledge with practical knowledge in a competitive way. Two managers in the subsidiary of the *Equipment Company* mentioned that their closeness to customers, compared to their Norwegian colleagues, could be understood and used as an attribute in the innovative processes of the MNF. Due to a high degree of services offered from the subsidiary to farming sites and other locations where their products are utilized, entail that they are very familiar with the usage of the technological products. A feasible

assertion is that this contact endows the Chilean unit with important knowledge of tacit description. One of the managers explains the situation like this:

... We have an advantage in the customer-relationship area. (...) we could provide some input and practical knowledge in that area, namely how the technical equipment functions in the market...

Manager, Equipment Company Chile

Employees of the same company in the Norwegian unit confirm that the closeness the Chilean unit has to the market, is often perceived as an asset they increasingly try to take advantage of through different internal mechanisms. This is in consistent with Zanfei (2000) and the notion that non-formalized innovative activities performed by manufacturing or similar units in local markets, could support knowledge generation processes within the MNF. Zanfei (2000) points out that empirical evidence has demonstrated that innovative activities in a MNF are increasingly the result of exchange of know-how between different units connected through an internal network of knowledge. Additionally to the key role of local knowledge input generated by R&D units close to the market, the evidence focuses on the role played by improvement activities that are not institutionalized at any research plant. This supports the argument that the technical department in the *Equipment Company* can contribute with relevant inputs to the innovative processes, with the intention to continuously improve the products of the MNF.

Moreover, the manager in the *Research Company* expresses a general observation about the Norwegian salmon farming industry, concerning the low degree of processed products compared to the Chilean industry. It implies fewer relations to the end consumer on the value added chain.

...Because we [Norway] are not involved in these processes with the consumer, we are therefore not involved in this type of knowledge...so the closer contact, the more power you have...

Manager, Research Company, Chile

Once more, the interviewee underlines the importance of complementary experiences in the Norwegian and Chilean reality which both parties can benefit from. The Chilean industry's knowledge on markets and customer-relations are examples he puts forward.

Even so, such processes require that certain routines for communication and interaction between the units should be in place, in order to fully exploit the potential gains. Employees both in the Norwegian central offices and Chilean subsidiaries' maintain that there have been established channels for communication flows and needs between the two units, in order to confront common objectives for the MNF. This is done mainly through software tools, but also through direct meetings and face-to-face contact once in a while. These issues are associated to the upcoming section which focuses on organizational implications.

The technological developments in salmon farming have lead to an increased focus on knowledge and demand for higher competences. The role of knowledge appears to have become more complex than earlier, which is in accordance with the increasing maturity of the industry and technological development in general. Therefore it has been suggested by different interviewees that in order to fully make use of the possible advantages, there is a need for create systems and structures that support these processes to happen. These links between understanding the complexity in knowledge and innovation processes and organizational structures reveal the importance of the second research question that follows in the forthcoming section.

5.2 Organizational implications of innovative activities

After becoming more familiar with viewpoints of changes in the industry, we will subsequently follow up the analysis around the second research question. It questions the implications a focus on internationalization of innovative activities has on the MNF and its structures.

Can the organizational structure enable innovative processes to occur, and which are the barriers in the structure that impede efficiency and deny individual and collective capabilities to be utilized? This question is particularly interesting regarding an indication presented previously by interviewees in the *Equipment Company* about the close contact the Chilean actors have with customers in the market. As a result of these different realities, the individual and organizational knowledge bases tend to consist of different foundations. It leads one to think about how these organizational knowledge creation processes Nonaka (1994) describes are handled in the companies. Could the *I-R Framework* of Bartlett and

Ghoshal (1989) and its pressures of global integration and local responsiveness and subsequent strategies of innovative activities uncover some interesting aspects of Norwegian companies' way of organizing their innovative work internationally in the industry? Unsurprisingly clear-cut answers are difficult to define, especially when the topics tend to be interrelated and difficult to separate, as in this case. A starting point is to examine how the topic diverges around dimensions of *centralization vs. decentralization* in organizing innovative activities, the *structures in HQ-subsidiary relationships*, and the possibilities of *reverse knowledge transfers* in the MNF.

5.2.1 Centralizing or decentralizing

Contributions introduced previously from Bartlett and Ghoshal (1989) I-R framework; Archibugi and Michie (1995) taxonomy of organizing innovative activities, and Von Zedtwitz and Gassmann (2002) differentiation of R&D types, are some examples of studies that are preoccupied with the issue of centralizing vs. decentralizing innovative activities. In the salmon farming industry, the innovative activities are in general closely connected to the R&D department located in the home country. Narula (2002) maintains that the closeness to and the relevance of the national innovation system is one important reason for this feature. Among the companies which I have received information from, the feed companies stand out as being more engaged in internal R&D investments. We also know that *Feed Company 2* has established a local R&D unit in Chile. Spokespersons for the feed companies admit that there is a substantive amount of resources dedicated to find substitutes for fish meal and fish oil, as the primary raw materials. That being the case, it is of interest to introduce the line of reasoning by a representative for the company that has chosen to locate their R&D department in Norway:

...It's important to have a central milieu. In some way we are creating a centre of excellence, where you gather the most important functions like R&D, doctorates, specialists etc. It is better that these specialists can work easier and closer in one environment in order to obtain development. You need this type of critical mass. We believe that if we disperse the competences all over the world, you will not receive the same positive effects...

CEO, Feed Company 1, Norway

As we can observe from this comment, the CEO gives importance to the necessity of locating the so-called ‘critical mass’ of R&D close to other administrative units in their organization. The CEO also presents some viewpoints on local activities:

...But we are very clear about that ‘businesses’ must be run locally. [Chilean subsidiary] Therefore you need an adequate management and administration unit, as well as sales, marketing and production units locally. The trick is to find the right balance...

CEO, Feed Company 1, Norway

How can these two comments be understood in accordance to the conceptual perspectives the thesis have presented? Judging by the first impression it seems as if these statements of the CEO are in line to a certain degree with a more traditional view of understanding the MNF, presented in section 3.2. Vernon (1966) theorized a relationship between the parent company and the subsidiaries, wherein R&D and innovative activities are being localized in the home country, like the finding above demonstrate through the statement of ‘centralizing the critical mass at home.’

According to the framework of Bartlett and Ghoshal (1989) on the rationales of centralizing innovative activities, *Feed Company 1*’s strategy is similar to the second strategy described as *multinational*. We recall that in this strategy the solutions and products developed in the home country are transferred to foreign markets, while the subsidiary stands free to meet their local needs through marketing and product development departments. This is underscored in the second quote by establishing sales, marketing and production units. However, the local responsiveness has not been considered as far as locating a R&D unit in the subsidiary. Although this is one particular example, it is reason to assume that this is a representative perspective for most of the Norwegian MNFs in salmon farming. The *Equipment* and *Farming Company* expressed the necessity of creating strong central units in the home country, due to the core competences available in Norway. Empirical studies by Gulbrandsen and Godø (2007), Maurseth (2006) and Narula (2002) demonstrate that the degree of internationalization of innovative activities, like R&D, is still being predominantly kept at home among Norwegian companies. In that sense, the rationales for centralizing in the feed company do not represent a deviation from the general perceptions.

Moving the focus to the subsidiaries’ point of view; how are the rationales for organizing these innovative activities centrally received in the affiliates?

...R&D has been very centralized; personally I think that is a weakness. I understand that the company does not want to split resources and probably repeat the work in different places in the world (...) I feel that every single operating company and every single market has their own needs and their own realities. Sometimes it is not easy to focus on the real problems in a country when all researcher and all facilities are far away in a completely different environment... in a different culture...

Manager, Feed Company 1 Chile

The manager is aware of the risk that dispersing resources across different locations could lead to a situation of not obtaining cost-effectiveness from the investments, which has been labelled as decisive by the CEO. As we indicated earlier, the manager considers that the degree of maturity of the Chilean industry has made the industry require products and solutions that fit their demands better, and therefore emphasizes the importance of differences in local contexts. These viewpoints are shared by other interviewees in the *Farming* and to some extent the *Equipment* subsidiaries, that also have a centralized structure in terms of innovative activities in the MNF.

How do the central offices respond to the wishes of increased decentralization from the subsidiary's point of view, in particular because of the necessity of taking local differences into consideration, as the manager in Chile puts forward?

....We have come to the conclusion that it is most viable to centralize our R&D. But nevertheless, it is relevant to have some local R&D resources related to the documentation of research, in order to sufficiently document the findings of the central R&D to work out to the local product environment...

Manager, Feed Company 1, Norway

...It has traditionally always been like this [centralized] and it will probably continue in the future for a while, but we are working on increasing these activities [innovative] in the other units as well, in particular Chile...

Director, Farming Company, Norway

Although centralizing most of the formalized innovative activities, like R&D, is essential for the Norwegian companies, there are signs of increasing importance of decentralization within the MNFs. It could derive from a notion of that there are contextual differences that are worthwhile to assume. Nevertheless, the main purpose for the MNF is to be fully able to exploit the potential in their local markets. The concern about sufficiently documenting

research performed centrally to the local markets creates connotations to the asset-exploiting vs. asset-seeking dimension of internationalization strategies (Dunning 1993, Castellani and Zanfei 2006). The focus on improving local documentation in the subsidiary is perceived as an approach to augment local capabilities, which in the end could assist exploiting the firm-advantages more efficiently. This confirms that MNFs in reality combine the two types of strategies as Castellani and Zanfei (2006) uphold.

We observe that innovative structures are predominantly defined as centralized, except a few examples of decentralization. The costs of outsourcing, and the available competences and quality are perceived as the main explanations for the tendency of centralizing innovative activities, according to the interviewees in the central offices in Norway. However, interviewees in subsidiaries uphold that processes of decentralization are desirable because of the increasing ‘country-specific’ features in Chilean salmon farming, which is essential in understanding the local contexts. Later on we will return to more specific findings that bring the importance of local context into light, both viewed from the central offices and local environments.

5.2.2 Headquarters and Subsidiaries

As the previous sections have demonstrated, the HQ-subsidiary relationship is important in grasping the structures of the MNF and the justifications for organizing innovative activities. Therefore, it can be useful to ask how the structures within the company may facilitate these processes to run as smoothly as possible. In the absence of local innovative activities conducted by the MNFs in the Chilean context, some of the interviewees in the subsidiaries express their desires of developing more formal work and routines in the Chilean subsidiaries context, as we have touched briefly upon in section 5.1.2.

...I am not talking about completely separate organizations. I am talking about people reporting to the central R&D in Norway. These facilities here in Chile should be part of this central organization in Norway, like a satellite organization. Of course they need to work very well coordinated with the central organization, so to me it is kind of an "arm" from the HQ in Norway coming into Chile...

Manager, Feed Company 1, Chile

...That is why it would be good for every unit [of the MNF] to have its own research, but sufficiently coordinated from someone higher up in the system that is in charge of this knowledge and transfer processes between them...

Manager, Farming Company, Chile

...The main thing about local R&D in Chile is that it would be extremely important that the unit would be managed, administrated and be a formal part of the Central R&D. They are the ones that have the competences to build the unit and to form it as a future unit with adequate knowledge and competences...

Manager, Feed Company 1, Norway

The citations confirm that there is an agreement among employees in both central and local offices of that *control and coordination mechanisms* are fundamental in the eventuality of creating local R&D units in Chile. This is obviously related to the high demands of documentation and quality of research, as mentioned previously. In the *Equipment Company*, an interviewee expressed the following about establishing a more formalized R&D unit in Chile:

..A R&D department in Chile would make a great impact, but at the same time create an imbalance(...)We are at the first stage at the moment, first we need to develop and improve our internal work task processes and knowledge sharing processes with Norway/HQ...

Manager, Equipment Company, Chile

The interviewee refers to the significance of establishing R&D units in Chile and the positive effects it might generate. Still the manager is aware of the reality and limitations of a MNF, namely the pressure of staying productive and competitive. That implies a continuous balance between costs and capabilities, which Maskell et al. (2006) highlight. The comment about creating an imbalance between the HQ and subsidiary, stems from the need for a justification from Chile towards Norway in order to internationalize R&D. Especially since the Chilean subsidiary *depend 100% entirely on central offices in Norway*, according to manager. Thus, to begin a process of internationalization there is a necessity of improving the internal structure through documentation of written information and as well as communication routines. The particular issue of improving certain internal routines like communication coincides with the challenges the interviewees in the *Farming Company* in

Chile and Norway mentioned. Even though the *Farming Company* has not developed an equally formal internal R&D unit as the *feed* and *equipment suppliers*, they still assert the necessity of having adequate internal structures in place in order to generate knowledge process and innovative outcomes. This was also underscored earlier by the manager in the *Research Company*, namely the necessity of creating internal systems that facilitate knowledge flows and allowing these processes to happen. The manager of the *Farming Company* in Chile disapprove of the lack of formalized internal routines and interaction between the units in the company as a whole. At the moment he feels that the development is too dependent on individual initiatives, rather than results of collectively organized knowledge generation processes. Internal transfers of knowledge or 'best-practice benchmarking' has been mentioned as a strategy the *Farming Company* will undertake more seriously in the near future to confront internal routine challenges.

Zanfei (2000) mentions that centripetal and centrifugal forces related to processes of decentralization of innovative activities oblige the MNFs to create new coordination mechanisms to determine an appropriate balance between the two forces. These coordination procedures and mechanisms, are made for enhancing the generation, circulation and use of knowledge. Although centripetal and centrifugal forces arise as consequences of the *subsidiary autonomy*, it does not seem to be of a problematic issue among the companies. It could be seen in relation to the relatively low degree of decentralization when it comes to innovative activities in the companies. The interviewees in Chile agree that they have the adequate autonomy to acquire contacts with their local environment, but feel at that it is decisive to work over some standards since they are selling the same product globally. The manager in *Farming Company* highlights: *one thing is independency, having contact is another thing*. This was stated in relation to what he perceives as lack of inter-communication between the units. Once again, it underscores that certain coordinated structures must be in place before it is fruitful to discuss autonomy, centripetal and centrifugal forces in the HQ-Subsidiary relationship, topics Zanfei (2000) labels as significant.

Judging by the findings, it appears that the Norwegian MNFs in the salmon farming industry have followed a more traditional path when it comes to organizing their activities that could be characterized as innovative. The paths are in accordance with more traditional modes of understanding the MNF, and do not necessarily share the heterarchic ideas Hedlund (1986)

presents for the MNF. Instead they seem to coincide with the strategies in the lower quadrants of the I-R framework of Bartlett and Ghoshal (1989).

Internal structures in the companies have to be in place to support the HQ-subsidary relationship and the possible knowledge generation processes. One suggested step by the interviewees is that the subsidiaries must focus more on documentation of their activities. That will assist the creation of a local environment in the subsidiary that is capable of handling innovative work.

5.2.3 Reverse knowledge transfers

...the purpose is to build up a research company that could generate new knowledge for the development and strengthening of the industry in Chile, but at the same time strengthening the owner/home companies...

Manager, Research Company, Chile

Feedback and interaction mechanisms between the home and host country were mentioned as a potential drivers for increasing the efficiency in the relationship between HQ and the subsidiary. Interaction between the components of the innovation systems is fundamental in the evolutionary theory approach (Lundvall 1992, Fagerberg 2002). Reverse knowledge transfers are understood as how knowledge is transferred within the MNF. That includes not only knowledge inflows from HQ to the subsidiary, but also knowledge outflows from the subsidiaries to the MNF (Gupta and Govindarajan 2000). The quote above from the manager in the *Research Company* proves that the company's objectives are embedded in understanding how the two worlds can mutually learn from each other, meaning that local responsiveness is influential in their strategy of internationalization. Having said this, a viewpoint from *Feed Company 2* on how their local R&D unit coordinates its work with the central unit in Norway is presented.

...The majority of the research projects we perform in Chile are in accordance, decided and approved by the central R&D unit. At the same time we are also involved in the research programs that are running in Norway. In my case, I travel to Norway every two months, where we revise the projects that are being performed both here and there. In that sense, the truth is that their opinion and our opinion are equally valid. Everything is done in association with each other...

The R&D unit in Chile is an integrated part of the internal knowledge generation processes of the MNF, interpreting the manager's statement. He underlines that the degree of autonomy and independency in their unit allows the unit to establish agreements and undertake projects with external actors, such as universities and research institutes in Chile. They have currently 6 research projects running in collaboration with universities. In this perspective the *double network structure* (Castellani and Zanfei 2006) is an applicable framework in describing this subsidiary's situation, since it contributes to both internal and external knowledge networks of the MNF (Gupta and Govindarajan 2000). However, there is a need to highlight other aspects that could clarify the different viewpoints of the significance of local R&D. More will follow in section of *contextual prerequisites*, associated to the third research question.

The next evidence deviates somewhat from the other contributions, but it portrays an interesting scenario for many actors involved in Norwegian and Chilean salmon farming. It derives from a Norwegian company that I was able to come in contact with during my stay in Chile. The company has developed a new technology of treating raw materials from salmon. As a result of this technology, they are able to produce and supply by-products like oils and minerals stemming from the raw material of salmons. In the company's preparations of entering the Chilean market, it approached an experienced actor in the Chilean industry, Fundación Chile. Fundación Chile's importance in the establishment of the Chilean industry has already been described in *chapter two*. A representative of the company commented that the collaboration between the two parties began through informal meetings in Norway. Since then, the cooperation has intensified and Fundación Chile acts now as a facilitator and partner in the process of launching the company's products in the Chilean market.

...The research performed by Fundación Chile is in many ways based on our capabilities and knowledge. As a result of this, the process could be characterized as a transfer of knowledge or competences from us to them. But at the same time it is also an augmentation of knowledge for both parties since their starting point is related to our technology and the continuous improvement of it. One should not forget that the world today is perceived as very global that it leads one to think 'competent heads', rather than their country of origin. Fundación Chile has some of these 'competent heads' available, which are required for our processes of self-improvement...

Employee, Norwegian SME

This statement underscores a divergence from the more traditional way of perceiving innovative activities, like asset-exploiting strategies (Dunning 1993) or the *international* strategy in I-R Framework presented by Ghoshal and Bartlett (1989). It appears as the company pursues a strategy that is both asset-exploiting and augmenting at the same time. Hedlund (1986) and his notion of that *new ideas and products may come up in many different countries*, is also a viable point of view on their internationalization strategy.

Another relevant practice to this context derives from a Norwegian equipment supplier outside of the data set. An individual in this company mentioned that the company exchanges human resources for a couple of months of the year as part of the company policy of building internal competences. This happens because there are differences in the peak seasons in Chile and Norway. When there is a lower degree of activities in the southern hemisphere in Chile, the manpower can be better exploited and utilized in the northern hemisphere in Norway, and vice versa. This inter-exchange of labour might function well as a strategy of learning from each others contexts, while it also serves to formalize a company's innovative work internally.

These illustrations are examples, potentially relevant for any kind of actors engaged in salmon farming. The examples are in accordance with 'modern' approaches on internationalization processes in the MNF. Knowledge is perceived as dispersed and complex, and not easily transmittable between different contexts, as Hedlund (1986) advocates. One counterargument is that the other companies in the data selection are larger in scope and scale, thus making the examples difficult to apply in their context. Nevertheless, the examples illustrate a change in the perception on how a firm wishes to perform activities defined as innovative outside the company's country of origin. This underscores the notion of an increased focus on internationalization of innovative activities, and not only internationalization of production.

Albeit the focus in this section has been on internal organizing of innovation, it does not indicate that the external environment and structures are irrelevant, as the example with Fundación Chile acting as facilitators demonstrated. On the contrary it signifies a great deal when MNFs decide to develop their innovative doings. In particular since innovation processes are perceived as collective and embedded in contexts (Nelson and Winter 1982). The same contributors, who are advocating more local research and innovation in Chile, are

simultaneously revealing deficiencies in the external environments for innovative work, which will be highlighted in the upcoming section.

5.3 Contextual prerequisites for innovation

...we seek to be that engine that secures an actual diffusion of knowledge from both countries, a two-way connection...

Research Company in Chile

The comment above grasps the essence of how innovative activities ideally could function at a global scale where potential sources for innovation could reside anywhere in the network (Hedlund 1986, Castellani and Zanfei 2006), which was exemplified earlier in reverse knowledge transfers. It originates from the newly established *Research Company* in Chile, operating as a subsidiary of renowned research institutes in Norway. This type of outsourcing of research activities marks a departure from earlier initiatives and modes of formalizing innovative work. Thus, it leads us to ask, what drives companies to outsource knowledge-intensive activities to foreign markets? What are barriers and drivers for internationalizing innovative activities in the salmon farming industry? If we consider the empirical evidence collected from the contributors, there are different dimensions to examine in order to highlight some drivers and barriers. First we will go through the importance of *local contexts* and the establishment of local R&D unit. Further we will look at the *infrastructure and surroundings* upholding innovative activities. And lastly the *idiosyncratic or cultural features* are to be discussed.

5.3.1 Understanding the local context

... With the passing of the years I feel that those concepts made in Norway are more and more difficult to apply here in Chile...

Manager, Feed Company 1, Chile

The citation above and other similar examples portrayed in section 5.2.1, accentuates how the local Chilean environments are being perceived by individuals in subsidiaries of the MNFs. The recurrence of this particular theme is related to how the Chilean salmon industry has traditionally been adopting foreign-created technology and solutions, often developed by

Norwegian actors. Whereas in recent times there are situations that make it more and more difficult to apply these foreign solutions, according to interviewees. Earlier it was discussed how technological development and change has enabled the salmon farming industry to mature and knowledge bases to become more advanced and complex. Interviewees have asserted that as a consequence there are specific qualities in the local environment that complicate matters more than before. The remaining question is whether these differences are accepted by the units in both in the Norwegian and Chilean units of the MNF.

A R&D manager in *Feed Company 1* express that there has been examples reluctance to acquire solutions developed in Norway. We have touched upon centripetal and centrifugal forces that affect innovative work when subsidiaries are given too much autonomy (Zanfei 2000). The R&D manager feels that this reluctance from the Chilean unit could be characterized as the ‘Not Invented Here’ Syndrome (NIH). NIH is understood as unwillingness to adopt an idea or product because it originates from another culture or reality, and is concretely described as a centrifugal force that may weaken internal cohesion in the MNF by Zanfei (2000). Employees in the Norwegian offices do not instantly share the view of the significance of local contexts in forming R&D and innovative work as their Chilean colleagues tends to believe. An employee in the R&D unit of *Feed Company 1* expressed that in their specific research “90% could be characterized as common matters, while 10% derive from local needs”. There are other issues that are considered as more important in performing R&D in the MNF. The closeness to the innovation system is considered as decisive (Pavitt and Patel 1999, Narula 2002). Additionally, the access to highly qualified personnel and centralizing the critical mass, are two factors that matters more than local differences.

...But there must be an increased focus on performing more local benchmarking to really find out what works locally...

Director, Farming Company, Norway

Despite the differences of how local context has been or is perceived by various actors in the industry, there are some general viewpoints that most of the interviewees agree on. The citation above from the director in the *Farming Company* illustrates what the industry seeks in the future, namely more documentation and focus on the practices that functions adequately in the Chilean context. With the course of time, the advancements in the industry have demonstrated that there are increased requirements to knowledge bases and

competences for international actors, whether they are located in Norway or Chile. That elucidates the statement from the director in the *Farming Company* and his emphasis on local benchmarking and local necessities. Katz's (2007) analysis of local context in industries based on natural resources provides some relevant aspects for this discussion. The study points out that there are external factors, like *university-industry* relations that need to be improved in favour of that local needs should be taken more into consideration in the MNF.

Unsurprisingly, the companies are bound to take several factors into account, whether those are related to costs, competences or contexts. Even so it is interesting to examine how Norwegian MNFs relate themselves to the dynamic description of the local contexts in knowledge generation processes presented by Zanfei (2000). The setting up of local activities from sales to R&D, functions as an instrument for the assimilation of the local culture, objectives, norms and conventions, which fits their industrial reality. Such a focus on the local context can partly explain why *Feed Company 2* and the *Research Company* decided to outsource innovative activities to Chile.

R&D units in Chile

Although R&D is not the only source for performing innovative activities, applying an evolutionary understanding of innovation, one cannot disregard the importance of conducting formal R&D in the industrial reality, also for salmon farming. The leading companies in the industry have established R&D departments in Norway, with the main purpose of staying competitive with quality products and solutions. Maintaining a stable level of innovation and research performance can probably confront the pressures to reduce costs in the long run, as one of the evolutionary pressures Dunning (1993) presents. According to the OECD (2007), R&D in the Chilean industry is carried out by individual firms with intentions to generate competitive advantages. Estimates from 2004 indicate that approximately 12 million US Dollars were spent on salmon culture R&D (OECD 2007), a figure that can hardly compare to the Norwegian situation. Recent news has revealed that the public sector is planning to increase substantially the amount of public financed R&D, and

also having a focus on the aquaculture sector.¹⁷ We will return shortly to arguments about financial support to innovative investments.

Viewpoints on internationalization of innovative activities, or local R&D units, were described section in 5.3.1 about centralization vs. decentralization. According to von Zedtwitz and Gassmann (2002) and their four archetypical forms of R&D, it looks as if the Norwegian MNFs are predominantly operating in accordance to the first type: *national treasure R&D*. This is a situation described as R&D being mainly kept at home, which is the main tendency in the industry. The study claim that relative low degree of internationalization of R&D is due to two reasons, either the companies are in are in strong position at home, or their principal markets are domestic. In this case the reason is the first one, because Norway possesses the experience and traditions in the development. This finding is underscored by the studies of Narula (2002) and Godø and Gulbrandsen (2007) on Norwegian MNFs internationalization of innovative activities. Having said this, it would be simplistic to assume that strategies of organizing R&D in MNFs are solely dependant on one variable or motivation. The strategies tend to be formed as a result of different factors, which are constantly evolving as the evolutionary approach promotes. Therefore it is likely that the other three types of R&D presented by von Zedtwitz and Gassmann (2002) influence the salmon farming MNFs in their internationalization approaches, seeking to augment competences and knowledge about their host country context, while the technological development is advancing.

We commence the section by presenting viewpoints from *Feed Company 2*, since their perspectives could reveal some relevant insights for the discussion.

¹⁷ 'Chile innovation investment 'may hit US\$200 million' Published 05/02/2008

<http://www.scidev.net/en/news/chile-innovation-investment-may-hit-us-200-million.html>

...First of all, it is important to develop research activities that could be applied to the Chilean reality. Previously, the research was performed in Norway with the purpose to apply it in Chile. Many times, that was not possible...because the lack of information or simply that the customers of the company, in this case the salmon producers, did not fully accept it, because they were developed outside the local context and conditions, which are quite different from the Norwegian context. Therefore, one of the most important objectives of establishing the department in Chile was to really to be able to perform research under Chilean conditions and reality, applying the challenges that are present here. I guess that was the most important objective...

Manager, Feed Company 2, Chile

The local necessities and differences in the Chilean context played an important role in the company's decision of establishing the R&D unit in Chile. Zanfei's (2000) assertion of that a local R&D unit serves as receptors for local innovative ideas internally in the company and from external environments; and Katz's (2007) notion of 'country-specificities' in natural resource industries, illuminate the rationales for the strategies of the *Feed Company 2*. The manager maintains additionally that there were competent human resources available in Chile to undertake research activities for the MNF. The size and significance of the Chilean market permitted the establishment of the R&D unit as well. Lastly he argues that *the costs of performing research in Chile are relatively lower than Norway. Therefore it became also an issue of optimizing the available resources*. This is novel to the discussion since it according to the company also is a question about cost reduction, which is important in Bartlett and Ghoshal (1989) explanations of the trade-off between pressures for global integration and local responsiveness. The comment about not fully accepting the foreign developed solutions, underscores the relevance of the 'Not Invented Here' Syndrome asserted earlier as an organizational challenge by the R&D manager in *Feed Company 1*. Furthermore, the manager in *Feed Company 2* mentions that in order to conduct research, the salmon farming industry has to be generally profitable. The profitability is crucial, since it allows a financial surplus and stability to create an environment where research could be performed effectively. He also agrees that there are general deficiencies in the relations between academic institutions and the commercial companies in Chile, an issue that was addressed in the OECD (2007) report of the Chilean innovation system. One possible explanation according to the R&D manager is that the private companies lack intermediaries or 'middlemen'. These intermediaries may facilitate the contact between the academic world and the companies themselves, and it is essential that these intermediaries possess a

scientific background in order to understand the connection between the different realities. He feels that the local R&D unit has these intermediaries, which allows the unit to collaborate easier with externals. Many processes at the universities move slower than in the commercial companies, but the intermediaries' role makes you aware of *a different time set when it comes to research and investigation*. This assertion is in line with Cohen and Levinthal (1990) notion that a R&D unit enhances a firm's ability to absorb and exploit available information and knowledge in their surroundings. This notion is supported by the statement underneath.

...I rather believe that feed companies who perform own R&D activities also increase the volumes for us. Because you really need to have knowledge about research and understand the nature of research, in order to believe that research is worthwhile to carry out since research is generic in its nature. It is very seldom that we see the big improvements and steps in one project. It is the small steps over time, which enables you to see the results. It is therefore an activity that should be performed continuously...

Manager, Research Company, Chile

The viewpoints from the *feed* and *research* company accentuate that local innovative activities has to be seen in relation to its surroundings and links to other actors, inspired of the *system of innovation approach*, as well really seizing what research and innovative activities entail if conducted effectively.

However, it is appropriate to introduce aspects uttered by the contributors that have not established a R&D unit in Chile. There are some diverging viewpoints on the fact whether it is profitable to establish a local unit, and whether the unit of *Feed Company 2* could be characterized as a R&D unit per se. These uncertainties are principally related to the lack of access to adequate research facilities, and the support of a community founded on research that surrounds the industry in Chile.

...I mean it's good with local R&D, but if the same foundation in unilateral cost-focus is in demand, then what can the R&D solve, even if it is developed locally?

CEO, Feed Company, Norway

... What we are missing out by not having R&D unit in Chile is that we are missing out on facilitating the opportunity on being a part of the future Chilean aquaculture academic research milieu...

Manager, Feed Company, Norway

The first comment questions important aspects of local innovative activities, namely how the surroundings sustain a research environment. As mentioned previously, the tradition of copying technology in the Chilean salmon farming industry acts as a barrier for internationalization of innovative activities. Consequently, there is reason to presume that idiosyncrasy and culture play a significant part in this matter, which will be addressed presently. The second statement focuses on the possible positive externalities a local R&D unit of the MNF could generate on long-term, by forming a future viable scientific community. Although the creation of innovative structures in the local external environment are perceived time consuming and expensive, the marginal costs are significantly lower once the structures are established, as asserted by Criscuolo et al. (2004). It helps to clarify why the Norwegian MNFs in the salmon farming traditionally have not outsourced much of their innovative activities.

The *Equipment Company* expressed through their CEO in Chile that they have had a previous experience with a R&D unit in Chile. The purpose of it was to develop the software for a product, designed for the Chilean context. According to the CEO, the initiative did not work out the way they planned, not necessarily because of lack of local capabilities or human resources, but rather because of management difficulties and other practical challenges. He mentions as well that communication and language are important barriers to overcome in these research projects, especially due to the demands and necessity of documenting and formalizing research activities. In sum, the project was not thought-out well enough before they decided to establish the unit. Despite this experience, the CEO still asserts that the possibility of locating R&D activities in Chile in the future cannot be ruled out:

... This is something we are continuously evaluating (...) through the process of allocating resources through the company...

CEO, Equipment Company, Chile

Finally, the CEO explains that the Chilean subsidiary has contributed significantly to the development of MNF, especially financially. This has led to a gradual focus on formalizing internal communication routines, with the intention of grasping the local needs and differences through these structures. This is done for instance by building their worker's capacities about the technology and equipment, meaning the tacit knowledge base. Nevertheless, the interviewee feels that there are some structural issues in Chile that impede the development of further innovative activities, like culture issues and hierarchical corporate structures.

In this setting, how can *Feed Company 3* provide insights to the discussion on local R&D units in Chile? The interviewee tells us that the company used to have a R&D department. After years with it, they reached the conclusion that it was too costly to run.

*...Rather than R&D, we want C&D, 'Connecting and Development' (...)
networking gives us more time, and our size, smaller than the biggest
companies, forces us to develop our network with external actors...*

Manage, Feed Company 3, Chile

Forming strategic research alliances and network development could create the same effects and advantages for the company as a R&D department at this particular moment could manage. However, he reveals that in the long-term perspective they seek to re-establish a R&D department. It underscores the importance of creating an environment where actors, public and private, may establish relationships through innovative projects.

That local contexts are not considered as particularly specific and relevant in different situations for companies, underscores the notion presented earlier about the feasibility of transferring and adapting technology between the contexts as relative unproblematic. This coincides with neoclassical economic theory which regards technological knowledge as codifiable and independent from contexts firms operate in. This enables the imitation and adaptation of technology. However, taking more consideration to particulars in local context, like *Feed Company 2* and the *Research Company* have done, are indications of that ideas from the evolutionary approach are relevant, like Nelson and Winter (1982) and others sustain.

The issue of setting up local R&D units in the MNFs is still in its earliest stages of development. The conclusive argument is that establishing local R&D at this particular stage

still is too costly and too risky, not including the initiatives of *Feed Company 2* and *the Research Company*.

Feed Company 2 addressed the same cultural and infrastructural challenges as the rest, but mentioned that their unit possessed some different attributes that allowed them to interact better with their local environments engaged in research and innovation, like academic institutions. The next section will namely focus more on the specific challenges in the external environment that affect the salmon industry and its participants. There are obviously different opinions on how the local context matter and finally could contribute to knowledge generation processes for the entire company, in both home and host country. In order to predict outcomes, it is required to examine more details on how external structures and surroundings affect the subsidiaries' environments.

5.3.2 External environments and Innovative infrastructures

The evolutionary approach sustain that companies do not innovate in isolation, but in interaction with others. The approach focuses on the relationships between actors in both public and private sector, like for instance authorities, academic institutions and R&D departments within commercial companies (Metcalf 1997, Lundvall 1992). The findings presented until now reveal that this is also the case in the salmon farming industry.

Fundación Chile and other research institutes who support development exemplify this in the Chilean industry, while the innovation system and extensive culture for cooperation in research in the Norwegian industry demonstrate this claim.

The role of the authorities

Throughout the data collection process, especially in Chile, I received many remarks formally and informally, that the Chilean authorities' participation in the industry will be more decisive in the future than ever. As mentioned in *chapter two*, Chilean economic policies have the last decades been quite liberal and free of governmental intervention at most levels. The policies have created good conditions for market mechanisms to act freely and spurring foreign investments, causing principally stable structures and growth for the industry. It is likely that the rationales of these liberal policies was founded on neoclassical economic perspectives, where the actors are described as rational agents seeking maximize profits, like Castellacci (2007) introduced.

As a consequence of the complicated biological situation of the Chilean industry today, the call for more regulations and coordination from the authorities is crucial. Two citations under exemplifies the challenges on these issues.

...The best would be if the actors/companies themselves would change the manner of doing things, because fundamentally in Chile the actors do not seem to believe very much in the cooperation and interaction with the authorities. But at the same time, if the problems and challenges reach a certain magnitude they would probably think different...

CEO, Feed Company, Norway

...the authorities have to be more involved [in Chile] with a clearer standpoint and by developing a legal framework that is accepted and respected by the industry and the actors. And there must be a discipline among the fish farmers to follow the rules, which today is not working that well...

Director, Farming Company, Norway

Although these comments are expressed by employees in Norway, there is a growing consensus among Chilean industrial actors that the role of the authorities must change in the future. The active role of the authorities in establishing a framework to facilitate innovative work is also asserted by Katz (2007) and the OECD (2007) report. The same persons quoted above, described a couple of recent positive examples on how they have witnessed that the Chilean authorities, through SERNAPESCA¹⁸ and SalmonChile¹⁹, have taken measures to confront problems related to the ISA outbreaks and sea lice treatments, in cooperation with farming companies. The severe situation seems to have affected the decision-makers to undertake collective procedures for the industry as a whole.

¹⁸ Sernapesca (The National Fisheries Service) is a regulatory body part of the institutional subsystem. The body has among other responsibilities, a part of granting commercial farming concessions.

¹⁹ SalmonChile (The Association of Producers of Salmon and Trout) plays a key role in linking entrepreneurs and national authorities. The association submits proposals to the authorities on ways to improve regulations. It also provides trade information to its members and cooperates with other international salmon-farming firms and authorities (UNCTAD 2006).

...Both the industry and the authorities are in favour of more investments in R&D. CORFO has several incentives for increased investments in R&D. Recently also a tax-incentive was created...

Manager, Research Company, Chile

Another aspect of enabling conditions for innovative activities in Chile is associated to the available financial arrangements, especially since both interviewees in *Feed Company 1* and *Feed Company 3* expressed the importance of costs related to having local research units and also performing research in general. Throughout the data collection period, the contributors have put emphasis on the initiatives from the governmental institutions to provide funding for research and innovative projects in the Chilean salmon cluster, as the citation above highlights. *CORFO, the Chilean Economic Development Agency*, has taken the role of organizing and coordinating much of the investments related to innovation in Chilean salmon farming. At both seminars, CORFO presented their proposals for governmental funding and simultaneously encouraged all actors, national and international, to become more engaged in these knowledge-intensive activities. A tax reduction scheme for innovative investments is also a novel initiative.²⁰ The general aim for the public institutions according to CORFO is to further assist the development of a receptive salmon farming community in Chile to become more engaged in innovative work. The interviewees were unanimously positive to the initiatives from the public sector to provide incentives for the private sector's engagement in innovative activities. They consider that public funding is something that will be even more fruitful and decisive in the future, given that innovative activities are taken seriously by the actors.

... What I see in Chile is lack of cooperation between the universities and the industry...

Manager, Farming Company, Chile

...The contact points are very weak or few (...) there is a lukewarm contact ...

Manager, Feed Company 1, Chile

²⁰ "Chile law will enable private sector to invest in R&D" Published 23/01/2008
<http://www.scidev.net/en/news/chile-law-will-enable-private-sector-to-invest-in.html>

The interactions between *universities and industries*²¹ is considered as fundamental in the evolutionary perspective of innovation systems and the double network structure of MNFs, in which subsidiaries in host countries develop relationships with external actors in their environment (Castellani and Zanfei 2006). The comments above illustrate that the contact between the industry and universities is problematic and challenging for many companies. Interviewees in *Feed Company 1* and the *Farming Company* concur on that the universities on many occasions lack the proper knowledge of the industrial reality, especially concerning the scale and scope. The again, the companies emphasize that they sometimes lack the time and focus required to cultivate the contact with their academic environments in Chile. There was also expressed some discontent and concern about the availability of applicable research projects from the Chilean academic milieu, as a result of the lack of contact between the realities. Incidentally, this notion harmonizes with the OECD (2007) report of the Chilean innovation system. The report asserts that there are barriers and challenges to overcome in order to fully enjoy an innovative and interactive environment in many Chilean industries.

On the other hand, it was asserted earlier that the local R&D unit of *Feed Company 2* has created a better foundation for cooperation between the universities and the company, because of ‘intermediaries’ in the local R&D unit that facilitates these interactions to occur. This is a claim that a R&D manager in *Feed Company 1* agree with. The remaining question on this topic is whether the formation of an R&D unit that possibly allows a better contact between the industry and universities, as *Feed Company 2* claims, is worthwhile to establish in terms of the costs and risks associated to it. Until now, both costs and risks have been considered as too high in internationalization of R&D, by the majority of the MNFs.

The Chilean salmon industry seems to have a few challenges in this area. Concrete examples that was mentioned by the interviewees were the lack of research facilities, but nevertheless that there are certain good examples of new research centres and the important role Fundación Chile has in the industry.

²¹ I define ‘Universities’ broadly to also include actors like private and public research institutes, and other academic institutions that are engaged in development of the salmon farming industry.

5.3.3 Chilean idiosyncrasy

First of all, *idiosyncrasy* in this context is perceived as certain ways of behaviour that is particular to individuals or a group. It could be understood as peculiarities that serve to distinguish or identify why certain things are done differently in the salmon farming industry.

We have been preoccupied with the internal dimension of the MNF and the innovative infrastructures that surrounds the actors in discussing the grounds for internationalization of innovative activities. According to the viewpoints above and general comments from almost every interviewee, the cultural aspect has to be taken seriously.

...Interviewer: Is there a custom for performing these innovative processes?

...Not that much in Chile...due to idiosyncrasy or cultural factors (...) we do not have that patience. We tend to have a shorter- perspective, compared to a long-term perspective in some European countries...

Manager, Farming Company, Chile

...Because, the Chilean culture is not a R&D culture...we are used to buy things that are already done. (...) we are not really good in research, so we do not have the history, the culture of research like some European countries, or like North America and Japan. So we are accustomed to purchase technology, not create technology. We are in a process of changing that, but for sure it will take some years...

Manager, Feed Company 1, Chile

After finishing the process of gathering information from the contributors, the impression is that idiosyncratic questions play an important part. Whether the interviewees were based in Norway or Chile, they all put emphasis on cultural factors when describing shortcomings in the structures of an innovative environment in Chilean salmon farming. According to Chilean and Norwegian interviewees, cultural factors matters in many different aspects of the business. The focus on cost and revenues and short-term thinking has not allowed long-term innovative initiative to fully blossom in the Chilean context, since it has been considered more as an expense rather than an investment, as a manager in the *Farming Company* explains. When it comes to performing innovation activities, there must be an acceptance of 'trial-and-error'. Many contributors are convinced that there is a *fear of failure* that exists in the Chilean reality does not facilitate incremental processes of learning and

knowledge generation, which are vital for conducting innovative activities. The wide tradition of generics and other copy-products is perceived as a challenge for the further internationalization of innovative activities in Chilean salmon farming.

A plausible explaining factor to these deficiencies of a congregation around innovation and other knowledge-intensive activities in Chilean salmon farming is related to the foundations of the economic and industrial policies of the country, that were mentioned under section 2.1.2 concerning the liberal economic policies adopted under the dictatorship of Pinochet. The obsession of openness towards external capital and foreign technology, has contributed to the lower awareness of developing own capabilities and setting to facilitate innovative activities in their own environment.

...Chile is one of the most liberal economies in the world. These structures were created during the Pinochet regime, and are still relevant to this date. This is very difficult to change, even if they have had a leftist- orientated government the last decades...

Director, Farming Company Norway

This statement was uttered in relation to why there has traditionally been a little focus on long-term perspectives from the Chilean actors, manifested through the investments in innovation and research. The director, who has worked in Chile over longer periods of time, thinks that the absence of active authorities, focus on costs over quality and not learning from ‘negative knowledge’ like fish disease outbreaks in Norway and Scotland, are potential explanations for the current challenges in Chilean salmon farming. These features can partly be traced back to the economic liberal foundations and other socio-cultural aspects in the society. It remains to see whether the organization that are accustomed to these structures, are able to change their behaviour, or internal routines as Nelson and Winter (1982) depict. It is reasonable to presume that it has led to an inertial state for many actors, but these changes in the industrial environment requires the organizations to change.

Others indicated that Chile is still a developing country on many areas, and mentioned substantial levels of economic and social inequalities in the population that in one way or another affect the performances. One particular example was expressed by the *Equipment Company*, namely the division between those who have a degree from public universities vs. those who have one from the private universities. According to the interviewee, such

structures often impede good resources being efficiently exploited, whether those are human or economic resources.

It leads us to ask how the MNFs can confront these barriers. Although the objective is not to analyze cultural differences in particular, it is relevant to address some aspects related to the theme of culture and idiosyncratic differences in understanding innovative processes.

Bartlett and Ghoshal (1989) uphold that the MNF are more exposed to challenges due to geographical and cultural distances in their activities, especially when it comes to cross-cultural knowledge transfers, while Johanson and Vahlne (1976) maintain that firms learn incrementally and manages to reduce risks with time, by being engaged in host markets.

Zanfei (2000) asserts that setting up local subsidiaries is a fundamental instrument for the assimilation of the local culture. In the end, the passing of time and increasing international experience will determine if the cultural barriers are confronted adequately. The starting point in the Chilean case is that the MNFs and other actors really focus on long-term strategies and sustainability in the industry through innovative performance.

5.4 Future for industrial innovation

The last three sections have gone through different aspects associated with innovative activities in the companies that have been part of the data set, and some companies outside of it. Consequently, it remains to examine the outlook of how innovative activities could confront different challenges MNFs and other actors in the salmon farming industry are up against in the future. Which specific decisions are important to undertake today, with the intention of creating more viable structures for innovative activities of tomorrow's salmon farming industry?

Figure 5.1: Possible future outcomes for Chilean salmon farming

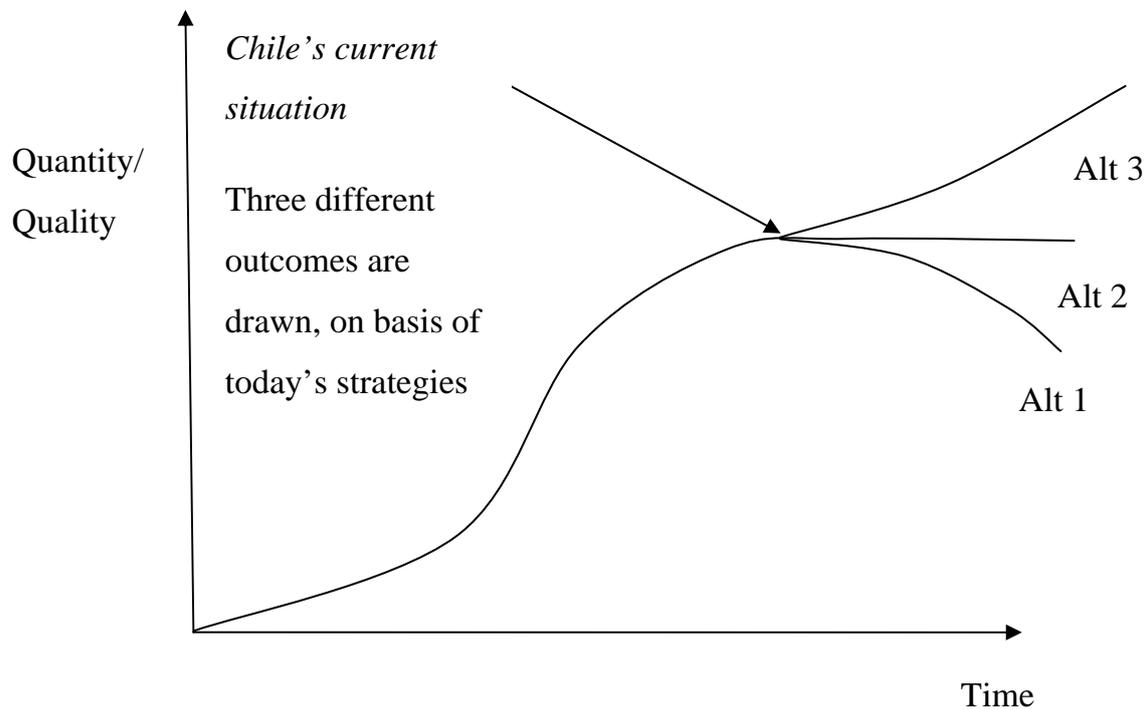


Figure 5.1 was drawn in relation to some perspectives exposed by the technical manager in *Feed Company 3*. Although it is quite simplistic, it attempts to illustrate a 'crossroad-situation' the Chilean industry appears to have entered. He predicts three possible alternatives in terms of strategic decisions founded on innovation the actors in the industry would undertake in the near future. *Alternative 1* represents a strategy based on not taking the right measures for the future in the Chilean industry, non-innovation based. According to the manager such a choice will lead to a total decline for the industry. *Alternative 2* symbolizes a strategy based on few deviations from the current situation. This means a continuing short-term perspective for growth and development, where the focus on costs plays an essential role in decision-making processes. Such a choice will lead to little growth. *Alternative 3* stands for a significant movement away from many of the current strategies. He claims that in this scenario the long-term perspectives of the investments are prevailing to a larger degree among the actors, whether those are the authorities, industrial actors or universities and research institutes. If these actors undertake the adequate decisions today, by for instance engaging more in research and innovative collaboration across company, sectoral, or national frontiers, he predicts a brighter future on the medium/long-term perspectives for the industry.

Moreover, which viewpoints do the companies express for the future development of the Chilean industry, and the salmon farming industry as a whole?

Interviewer: Research and innovation activities are traditionally being performed in the home country of the MNFs, in this case feed producers. In what degree has this been a successful strategy?

... Well, I think it has been a good strategy for the feed producers until now. They have been able to decrease their costs and locating their activities home, generating knowledge and spreading it out to their units. At the same time, I am pretty sure that this will have to change in the future. More research is needed to be performed locally. More has to be done in Chile, it includes us as fish farmers, we have to carry out more R&D and simultaneously put pressures on for instance fish feed producers to carry out more of these activities, for instance in Chile (...) We need to a larger extent to put pressures on them [R&D performers] to carry out more research in Chile. One can say that 90% is similar or 80%. But still the dissimilarities could be quite important...

Director, Farming Company, Norway

This employee in the top-management of the *Farming Company* regards the *local context* as important for the future of innovative activities, an issue previously put forward. He made it clear that the transferring of knowledge and technology from Norway to Chile has in most cases been characterized as successful, but at the same time there may emerge certain limitations for the MNFs in the industry by not considering the country-specific' assets (Katz 2007). Once again it underscores that evolutionary pressures, like local responsiveness (Bartlett and Ghoshal 1989), have gained ground in recent times. The reducing nature of exogenous growth models of technological development has become more difficult to apply in reality, while the evolutionary approach of 'context-embedded' knowledge has become more relevant than before (Nelson and Winter 1982). Therefore, the interviewee urges for more focus and emphasis on research in the industry, especially in the research communities in Chile. He also accentuates the role MNFs have in this development. Seeing as they are such important actors, the companies' need to augment the recognition and focus on research- and knowledge-based solutions in unison, which is imperative for the intention of creating innovation and development for the entire sector.

...I don't see a drastic change in the way R&D and innovation will be performed. Rather I see slow changes of processes, but obviously increasing with time with advantages. Nevertheless, I am optimistic of the development...

Manager, Feed Company 2, Chile

...I think that is part of the future successes, and I think that is what we are witnessing. We are not copying anymore. We are starting to develop our own solutions, in terms of machinery, nets, cages and vaccines. We have started to produce our own solutions. Why? Because our requirements, our culture, our environments are different. We should do the same with R&D...I think that is the tendency. You asked me about the time...?... It would take 10 years, but it will happen....

Manager, Feed Company 1, Chile

The representatives from the feed companies share a common belief on that research and innovative activities can gradually create a positive impact on the industrial development. Due to the time-set of research performances, they realize that the development and changes will probably occur incrementally instead of radically. These are important features which are well supported by the evolutionary understanding of innovative processes, and denote a deviation from the notion of purely focusing on a one-way technology and knowledge transfer.

...Looking at the Chilean context in particular, perhaps there is an issue that we should strengthen the inputs during a period of time, due to the enormous biological challenges that are present. So we may allocate some more resources down to the Chilean market, but this is something I would consider as a temporary situation with a length from 3 to 5 years. On a whole this would be dependent on the company's total size, but there are some functions that need to be covered locally, in production and also innovation like you are referring to. So you will get far with 3 to 5 year's work along with a receptive local apparatus that could be working into the market, in that way function as a link between central R&D and the local environment. Obviously, if there are extraordinary problems, it could be reasonable to invest more, which is the case in Chile today...

CEO, Feed Company 1, Norway

The quotation reaffirms the importance of formalizing R&D internationally and the possibilities of creating a local R&D in Chile. Once again, the issue about decentralization in combination with exogenous factors, like the difficulties in the biological situation,

characterized as a change in external environment (Bartlett and Ghoshal 1989), which has forced the MNF to reduce its costs. The CEO maintains that it could be done through allocating more resources to formalize innovative activities in the subsidiary. For that reason, it is likely that the presumption of asset-seeking strategies (Dunning 1993, Castellani and Zanfei 2006) provide important stances in the future of the salmon farming industry and confronting challenges to stay competitive as commercial actors.

Are there any positive externalities associated to formalizing innovative activities in Chile for the Norwegian companies? A possible effect is the image a MNF creates by investing more resources into research and knowledge generation

...Concerning the company's image, I believe the outcome has been positive [establishing local R&D in Chile]. (...)But we believe that it is not financially feasible to do this alone. We rather perform such activities in cooperation with others, so that is mainly a cost-issue...

CEO, Feed Company 1, Norway

...It's important to allocate the right amount of money and resources, but again, very well distributed all around the world. It is also about an image, not only about profits (...) so it is a mix of things...

Manager, Feed Company 1, Chile

Creating a local R&D unit may also provide a further signal of that the company focuses on innovation and research globally, and not just in certain areas. Therefore it could create a positive consequence in terms of the MNFs image to the external environments, as a future innovation system in the host country contexts. However, trade-offs consists of an important part of the commercial companies' reality. The main trade-off in this case is between costs and the possible externalities. Therefore the main conclusion from *Feed Company 1* is that costs at this moment matter more than creating a local R&D unit

Confronting idiosyncrasy and culture

... Since we are within a global company, we absorb this long-term thinking. So therefore I think that these long-term processes could be done, at least it is easier in a global company...

Manager, Farming Company, Chile

We have seen that there are signs of cultural barriers to internationalization of innovative activities in the industry. Since it is presumed that these challenges are more complex to grasp and handle, are there any suggestions on how idiosyncratic challenges could be met in the future? The manager in the farming subsidiary, propose that the organizational structure of the MNF itself could react positively on the local deficiencies in Chile concerning innovative work. Although cultural differences are a complex matter, it does not change the fact that the Chilean subsidiaries form a vital part of the MNF structure. The earlier sections demonstrated that the Chilean industry is accustomed to adapting rapidly to foreign developed technological solutions and general volatile changes, like ownership structures through consolidations, mergers and acquisitions. This could be an indication of willingness and experiences to learn and therefore provide to the knowledge generation processes of MNFs. At the same it can function as a strategy of changing routines within the organization (Nelson and Winter 1982).

The Research Company's initiative

...we should not primarily transfer our Norwegian solutions to other countries. Rather to use our more fundamental knowledge and expertise to develop Chilean solutions that fit this context...in cooperation with Chilean industry and authorities (...) There are enough of those that can provide the industry with Norwegian solutions, but we are taking it further by contributing to develop Chilean solutions the industry requires. Therefore, we are creating and building a knowledge base that is different from the one in Norway, since our knowledge is generated in a different reality and viewpoint, which makes slightly different. Therefore, it would make us a contributor also to the Norwegian industry and scientific community with knowledge (...) because having a larger absorption of knowledge that is based in contexts and realities that differ from the ones we are used to back home .It will be important in an innovation system perspective since the horizon is wider...

Manager, Research Company, Chile

The creation of a Norwegian-owned *Research Company* in Chile represent a new manner of considering innovative work and research in the industry. This could be claimed mainly because they appear to take the perceived differences in the local context a step further, by outsourcing innovative activities. Nonetheless, the initiatives from the Norwegian research companies of outsourcing research activities to local markets could be considered as an important step of increasing the awareness of the establishing formal and adequate innovative structures locally. In order words, there are certain location-specific attributes

that could augment and assist the quality of the knowledge-bases in the home countries (Castellani and Zanfei 2006). The establishment of the *Research Company* underscore the previous statement of the company of that the Norwegian actors have more to learn from realities that are different from the Norwegian. Because the *Research Company* is highly embedded in the innovation system through its owner companies in Norway, the creation of the *Research Company* is perceived as an internationalization of the Norwegian innovation system (Pavitt and Patel 1999).

Cross-Sectoral learning

Finally, it was mentioned early that salmon farming has possibilities to share its knowledge experience with other sectors. What is missing in the aquaculture industry today is the interaction between and across the activities, especially with other sectors, and to learn from different experiences.

As mentioned, Chile is engaged in many industries based on natural resources. Recently it was expressed the country is aiming to become one of the major producers of foods in the world, including all types of agricultural products. This underscores the fertile ground for commencing to cooperation across borders, national and industrial, for the international actors. There is an increased potential to learn from other industries. Whether those industries are petroleum-based in Norway, or agricultural in Chile, there are no predefined limitations from where one could learn and share experiences. This requires knowledge and scientific formation and possibilities for interaction, as in a system of innovation perspective. Therefore by establishing stable and efficient relationships for innovation, are the first steps of improving the possibilities of enabling knowledge generation processes across sectors.

6. Conclusive Remarks

This case study of Norwegian companies in the Chilean salmon farming industry has demonstrated that there are several dimensions that have a say in grasping the structures of industry.

The *first research question* sought to discuss whether there is a change of focus from more traditional production activities towards innovative activities in the salmon farming industry. Considering streams from different contributions in the literature, to what extent has this thesis presented pertinent indications of a possible movement resulting in a focus on innovative activities among MNFs in the salmon farming industry?

The question was approached by two dimensions, *technological change* and *knowledge complexity*. The general empirical findings have demonstrated that levels of technological development and complexity of knowledge has affected decision-making processes of the MNF, insofar as to not internationalize much of the innovative activities. Additionally, the technological development has increased the role of knowledge generation processes. Technological transfers have been considered as a relatively successful strategy in the salmon farming industry. The technology transfer strategy stands as an example of a non-evolutionary understanding of how technology and competences can be dispersed in the salmon farming industry.

The tradition of copying technology in the Chilean industry was highlighted as an important barrier to innovation. The fact that many Chilean companies, have decided to undertake strategies of copying technology, as a response to the competitive pressures of reducing costs (Dunning 1993, Castellani and Zanfei 2006), witness of a type of short-sightedness that have not supported the development of an innovative community, in terms of formal activities like R&D, in the Chilean salmon farming industry.

However, as the Chilean industry undergoes maturing processes, it is likely that 'firm-specific' or 'country-specific' attributes will emerge, as evolutionary approaches claim (Nelson and Winter 1982). These differences derive from the development of the industrial knowledge bases and experiences, additionally to changes in external environments. This underscores the general assertions from spokespersons in the subsidiaries, namely that it is

becoming increasingly difficult to apply technological solutions that are created outside of the Chilean environment. The increasing perception of local differences is not instantly shared by all interviewees in the Norwegian units. Some of these interviewees maintain that instead of it necessarily being an issue about local differences, it is rather a question of not fully wanting to adapt technological solutions due to cultural resistance, also defined as the 'Not Invented Here' syndrome. This has important implications for questions surrounding *centralization/decentralization* of innovative activities and creating *local R&D units* in the MNF.

Interviewees in the *Equipment Company* their practical knowledge could be perceived as complementary assets to the knowledge in the Norwegian units. The non-formalized activities performed in the manufacturing unit, could function as an important asset to the internal innovative processes of the MNF. Another asset mentioned by the *Research Company* is the closeness the Chilean industry has to its markets in terms of engagement in value-added activities. This is an area that complements Norway's lack of engagement in value-added activities, according to the manager. However, to manage technological development and knowledge complexity requires systems that adequately take these factors into account, in order to fully obtain the potential of the outcomes of these processes.

The *second research question* about the organizational implications of a shift of focus had an empirical focus on the rationales the MNF has for *centralizing* or *decentralizing* innovative activities. The pattern is centralizing the activities close to the most important functions of the MNF in Norway. This is mainly justified through gaining adequate quality, efficiency and saving costs. Nevertheless, there is an increasing concentration on achieving local documentation in the subsidiaries, which is needed to fully exploit the advantages created at home (Castellani and Zanfei 2006). Improving the internal structures in the MNF through *coordination and control mechanisms* is perceived as important to the majority of the interviewees in both Norway and Chile. With time, the objective is to generate efficient knowledge processes, whether those are considered as knowledge inflows or outflows (Gupta and Govindarajan 2000). This was labelled as *reverse knowledge transfers*. These processes are strongly related to the ability the local unit has to collaborate with external environments, in particular the ones that possess genuine competences, such as Fundación Chile within Chilean salmon farming.

It remains to see whether the conditions in the environment allows further engagement in innovative activities, as the *third research question* sought to discuss. Coming closer to an answer obliges one to examine the *local context* and possibilities of establishing local R&D units in Chile as part of the MNF structure. *Feed Company 2* and the *Research Company* deviate from the majority of the MNFs. The companies have dispersed innovative activities because they consider the Chilean context relevant to the extent of establishing a R&D unit that can fit the local environment better. Additionally, the unit functions as an ‘arm’ or ‘listening post’ (Zanfei 2000) for the central R&D and entire company per se. Especially since *Feed Company 2* asserts that the local R&D unit enables cooperative relations with academic communities through intermediaries working in the local R&D unit, providing grounds for a *double network structure* (Castellani and Zanfei 2006). Furthermore, interviewees in the *Farming Company* and *Feed Company 1* described the interactions between the *industry* and *universities* as sporadic and distant, contrary to what *Feed Company 2* expressed. Even so, the local context depends on the external environments and its innovative infrastructure, as Lundvall (1992) and other evolutionary theorists assert. The role of the authorities is seen as essential, both in applying a regulatory framework and providing financial incentives for innovative activities. This has been intensified in recent times through the active role of CORFO and tax reduction scheme.

Since the Chilean corporate culture has not been too preoccupied with investments in research and innovation locally enables the understanding of why the levels of internationalization of innovative activities are relatively low in the industry. An intricate explanation of this low awareness is due to the *idiosyncratic rationales*. The majority of the contributors made it clear that there are cultural and behavioural aspects which have until now impeded more formalized innovation to be generated in Chile. The liberal economic policies both nationally and industrially were suggested to help understand why short-term perspectives and traditions for copying technology have prevailed in the salmon farming industry in Chile.

Therefore, are there grounds to corroborate a shift towards internationalization of innovative activities?

To a certain degree, there is no doubt that there is a considerable movement of perceptions on how innovative activities should be organized internationally compared to earlier among

the Norwegian MNFs. Examples from *Feed Company 2*, *Research Company*, financial incentives from Chilean authorities and the general discussion in the MNFs verify this notion.

On the other hand, the structural deficiencies to conduct research and innovation, whether those are due to the culture copying technology, modest interaction between industries and universities or lack of local research facilities in Chile, denote that there are important barriers that do not support the notion of a change towards internationalization of innovative activities within the MNF. The industrial reality is driven heavily by the focus on costs, i.e. the minimization of them. Statements presented in the paper underscore the significance that costs play on decisions concerning internationalization of their activities.

Although they support some interesting examples in this case, the 'modern' viewpoints of the MNF as globally dispersed when it comes to innovation and knowledge processes (Hedlund 1986, Bartlett and Ghoshal 1989) need more elaboration and development when it comes to the salmon farming industry. Internationalization of innovative activities is still in its nascent stages.

Final remarks and Future research

Although the MNFs in the data set varies to some degree on how they approach innovative activities and internal R&D performance, they agree on the fact these issues will play a more important role in the future of the industry. What seems clear is that the demand for applied research in forms of different projects and alliances between a few component actors is the foreseeable future. Seeing the MNFs establish more formal R&D units in Chile does not seem like the most feasible alternative at the moment for the majority of the actors. Lack of research facilities, uncertainty of outcomes and benefits of local R&D units, costs, fear of duplicating innovative work already done in the central units, are all possible explanations for why Norwegian MNFs are reluctant to internationalize innovative activities, in particular R&D units. In this sense the *Research Company's* approach to the Chilean market, represent a new way of thinking about organizing innovative work internationally.

What is clear is that the biological crisis in Chile has forced the entire industry and its actors to reconsider its past strategies and behaviour. This includes both Norwegian and Chilean companies. The major issue when this situation will settle down, the focus must be on

undertaking preventive measures and sustainable structures. The sustainability will not only apply to environmental standards, but also industrial and cultural features of managing the industry. It is assumed that innovation and the cooperation will play an essential role in this scenario, as pointed out by the manager in *Feed Company 3*. Nevertheless, the MNFs will contribute significantly in these processes. The director in the *Farming Company* revealed that they as salmon farmers need to apply more pressure on other MNFs to allocate more resources on research and innovative work in general and locally in Chile.

Although the Norwegian industry has established themselves as the world's leading producer and probably leading country of technological development within salmon farming and aquaculture, it is unrealistic to presume that all major future advancements in salmon farming will stem from Norway. Increased cooperation with competitors and actors from other industrial sectors, both nationally and internationally, is imperative for securing levels of growth and development. Different types of knowledge bases, learning across sectoral limits, and the mere fact that innovation processes are considered as continuous and interactive, underscore the importance of focusing on internationalization of innovative activities in the salmon farming industry.

Streams influenced by evolutionary theory and approaches have been important throughout this work. A broader perspective on innovation by including more facets in the analysis shows that there are many complex structures and processes surrounding the industry, than previously presumed. Evolutionary theory and its related subjects have become more important in understanding the development of the salmon farming industry. At the same time the neoclassical traditions and linear understanding of innovation has influence on this industry as in many others. Traditional approaches like transaction costs and centralization (Vernon 1966) underscores the relevance of it through viewpoints expressed by interviewees. In accordance to Schumpeter's view of evolutionary theory acting as a supplement and not a substitute to neoclassical perspectives, there is no reason to assume that neoclassical standpoints have not affected the industry.

Having both theoretical approaches in mind when entering the field, there is a need to focus more concretely on what specific differences are important to take into consideration in performing innovative activities in the salmon farming industry in future research approaches.

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