NTNU – Trondheim
Norwegian University of
Science and Technology

Multinational Corporations Investing in the Marine Energy Industry

The process of MNC's investing in the wave and tidal energy industries

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Oppgavetekst/Problembeskrivelse This master thesis will look into how and why investment relationships between multinational corporations (MNCs) and wave- and tidal energy technology firms are initiated, from the perspective of the MNC. The study will be based on case interviews with representatives from both parties, seen in context with relevant literature and previous studies.	
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4. Bedømmelse

Kandidatene skal ha *individuell* bedømmelse ☐
Kandidatene skal ha *felles* bedømmelse ☒

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Preface

This master's thesis was written during the spring of 2014, as a part of the master's program of Industrial Economics and Technology Management at the Norwegian University of Science and Technology (NTNU). Our thesis is an in-depth study as a part of the course TIØ 4912, in the specialization field Strategy and International Business Development. The purpose of this master's thesis is to identify the process of MNCs entering the marine energy industry, and more specifically (i) how and why opportunities in new industries are identified; (ii) how potential technology opportunities are assessed, and why they are selected; and (iii) why a particular entry strategy is chosen, and how this develops over time. The work has been challenging and interesting, and provided the opportunity to gain a deeper understanding on subjects studied in earlier courses of the master's program. The work has given a thorough insight into the wave and tidal energy industries, as well as into the field of strategy and international business development.

We would like to thank our academic supervisors, Professor Roger Sørheim and PhD candidate Øyvind Bjørgum at the Department of Industrial Economics and Technology Management, for guidance and support. We would also like to thank the Norwegian Center for Energy Studies, CenSES program for supporting our research by covering our travel expenses and for providing us with necessary information. Last, we would like to direct our thanks to the case study companies for taking the time to participate in our study and for providing us with valuable empiric information.

Trondheim, June 5th 2014

Abstract

This master thesis explores the process of multinational corporations investing in the wave and tidal stream energy industries in the UK, hereafter referred to as the marine energy industry. Wave and tidal stream energy are renewable sources of energy that are not yet commercially exploitable, and the focus on developing technologies extracting this renewable energy has led to the emergence of the marine energy industry. MNCs have in recent the years started investing, assisting the small technology firms who stand for most of the technology development in building up the industry. By contributing with knowledge, experience and funding the MNCs are considered crucial to ensure the success of the marine energy industry.

An industry review is conducted to introduce the marine energy industry. This review is primarily based on scientific articles and reports from credible sources. In order to further understand the process MNCs go through when investing in the marine energy industry, a literature review has been conducted. A theoretical framework on technology management is introduced and adapted with the intention to elucidate important elements of the process. Six MNCs in the marine energy industry were selected and interviewed, along with four of the investment receiving technology companies. The information extracted from the case companies combined with the literature and industry review, create the basis for a thorough understanding of the process.

The findings establish that the MNCs follow a dynamic iterative process when investing in the marine energy industry. They start by scanning for new business opportunities and identifying new industries for potential investment. The industry is further evaluated according to certain factors of importance and potential for financial profit, and if found interesting the selection of technology is initiated. By assessing existing in-house expertise and prevailing external technological solutions, a choice between in-house development and external acquisition bust be decided on. In the case of external investment, a suiting entry mode is selected with minority equity investment being the most frequent. After the initial entry, the MNCs often reevaluate and increase their investments. The MNCs investing in this emerging industry is found to be resourceful companies with significant experience in similar industries, a long-term perspective and an aim of maintaining a key position in the marine energy industry.

Sammendrag

Denne masteroppgaven utforsker prosessen som multinasjonale selskaper gjennomgår når de investerer i bølge- og tidevannsenergiindustrien i Storbritannia, heretter referert til som havkraftindustrien. Bølge- og tidevannsstrømenergi er fornybare energikilder som ikke er kommersielt utnyttbare med dagens teknologi, og forsøk på å utvikle teknologier for å hente ut denne energien har ført til havkraftindustriens fremtreden. Multinasjonale selskaper har de siste årene begynt å investere i små teknologibedrifter som utvikler slik teknologi, og hjelper med dette å bygge opp industrien. De bidrar med kunnskap, erfaring og kapital, og regnes derfor som kritiske for industriens fremtidige suksessen.

Et industristudie er gjort for å presentere havkraftindustrien, og er basert på vitenskapelige artikler og rapporter fra pålitelige kilder. For å forstå prosessen multinasjonale selskaper gjennomgår når de investerer i havkraftindustrien har det også vært gjort et litteraturstudie. Et teoretisk rammeverk for teknologiledelse introduseres og tilpasses for å belyse viktige elementer i denne prosessen. Seks multinasjonale selskaper i havkraftindustrien ble plukket ut og intervjuet sammen med fire av deres investeringsobjekter. Informasjonen som er hentet ut fra intervjuobjektene utgjør sammen med industri- og litteraturstudiet grunnlaget for en gjennomgående forståelse for prosessen.

Det fremgår av hovedfunnene at multinasjonale selskaper følger en dynamisk og iterativ prosess når de investerer i havkraftindustrien. De begynner med å søke etter nye forretningsmuligheter og å identifisere potensielle nye industrier å investere i. Industrien blir videre vurdert i forhold til potensial for økonomisk fortjeneste og noen andre viktige faktorer. Dersom det ser interessant ut, innledes et valg av teknologi. Først vurderes intern ekspertise og eksterne teknologiske løsninger, deretter blir det valgt en inngangsmåte til industrien; enten intern teknologiutvikling eller ekstern teknologiinvestering. Dersom ekstern teknologiinvestering blir valgt må påfølgende investeringsmåte velges, og kapitalinvestering med minoritetsposisjon er mest brukt. De multinasjonale selskapene gjør ofte en revurdering og øker gjerne investeringen etter hvert. Multinasjonale selskaper er funnet å være ressurssterke selskaper med nevneverdig ekspertise fra liknende industrier, langsiktig perspektiv og et mål om å opprettholde en nøkkelposisjon i havkraftindustrien.

Table of content

List of figures

List of tables

1 Introduction

The focus on renewable energy as a sustainable energy source is increasing worldwide. In 2011, renewable energy covered about 19 percent of the global energy consumption. Over one billion people lack access to modern energy services, proving that there is still a large demand for energy supply. Access to modern energy may improve people's lives by facilitating cooking, lighting, cooling and heating, as well as provide the means for transportation and basic communication. In the light of the climate-change challenges, increasing exploitation of renewable energy resources and introducing more energy efficiency measures are important measures towards meeting these increasing energy demands sustainably. (REN21, 2013)

The oceans carry a big energy reservoir and are considered to have the best potential for renewable energy. The ocean energy potential can be extracted from waves, tides, ocean currents, salinity gradients and temperature differences (REN21, 2013). Commercially installed ocean energy capacity was about 527 MW in 2011, though most of this is due to tidal range power facilities. Although not yet commercial, wave and tidal stream technologies are under development and these seek to exploit the vast global resources. The global exploitable wave energy resource has been estimated at about 2000 TWh/y (WEC, 2010), whereas the tidal resource at about 200 TWh/y (Black & Veatch Ltd., 2005).

1.1 Background

This master's thesis builds on our project thesis on small wave energy converter technology companies, more specifically their partners and the characteristics of these partnerships, conducted during the fall of 2013. In this study we investigate the process multinational corporations (MNCs) go through when investing in small technology firms in the wave and tidal energy industries. Today, the marine energy industry is an emerging industry, characterized by uncertainty and dominated by immature technologies (European Ocean Energy, 2013). The challenge of developing technology to extract energy from the oceans has been taken on by several actors over the last decades. Numerous technological concepts have been developed but no solutions have yet reached a commercial level (REN21, 2013). The tidal stream energy industry has converged to the horizontal axis turbine as the winning design and is currently closer to commercialization than the wave energy industry, where no such convergence has yet taken place (Carbon Trust, 2011).

The ocean energy industry may be viewed as an international industry with development happening all over the globe (Appleyard, 2009). However, national differences due to the development's dependence on governmental regulations and facilitation. The UK is the leading nation in regard to facilitating ocean power technology development, with relatively high levels of governmental support to this sector. The main challenge facing the industry today is to reduce the cost levels of the development of viable technological solutions. Further development of the industry is also threatened by sceptic investors hesitant to invest due to a history of failures, where large amounts have been invested with little or no return (European Ocean Energy, 2013). However, in recent years, large industrial MNCs have entered the industry as investors. These are creating a more optimistic attitude and are assisting the technology development. Being large and resourceful, these can assist small marine energy technology firms with resources such as capital, technology development and similar industry competence (Loock, 2012). The MNCs see the entry as a way of gaining access to the opportunities available in emerging industries (Hitt, Hoskisson, Johnson, & Moesel, 1996; Vapola, Paukku, & Gabrielsson, 2010). The MNCs' entry into the marine energy industry may be a critical step towards the commercialization of the technologies.

1.2 Research questions

Large MNCs are resourceful companies, and several emerging industries are in dire need for additional resources and support in order to reach a commercial state. Therefore, studying how and why MNCs are investing in the emerging ocean energy can be a step towards understanding what attracts such large corporations towards new industries, and what means that need to be in place for them to become interested. Subjects that are motivating to study are: why these firms are interested in the ocean energy industry; which contributions they believe they can assist with; as well as their expectations to the ocean energy industry. This paper seeks to describe the process behind MNCs investing in companies in the marine energy industry, from the identification, selection and through to the acquisition stage. The research question for this master's thesis is the following:

How is the process of MNCs investing in the emerging marine energy industry?

More specifically:

i. How are opportunities in new industries identified, and why do some MNCs choose the marine energy industry?

ii. How are potential technological opportunities assessed, and why are they selected?

iii. Why is a particular entry strategy chosen, and how does this develop over time?

Based on the main research question and the more specific sub questions, this master thesis will look into how and why investment relationships between multinational corporations and wave and tidal energy technology firms are initiated and pursued, from the perspective of the MNC. During the course of this study, the focus has been slightly shifted from looking at the strategy and motivation to looking at the investment process as a whole. Therefore, the subtitle of the cover page rather than that on the master's contracts is to be taken into consideration. The study is based on case interviews with representatives from six MNCs, and interviews with four of the technology firms in which the MNCs have invested. These findings are further seen in context with relevant literature and previous studies.

1.3 Structure

The paper is based on a linear-analytic structure, and the following parts are included:

- An *industry review*, which illustrates the current status of the wave and tidal energy industries
- A *literature review* that seek to describe; i) firm motivation for entering new industries; ii) the processes behind identifying, selecting, acquiring, and protecting new technology; and iii) understanding the concept of emerging industries. Last, we propose a framework for applying the literature to the emerging ocean energy industry.
- A *methodology* chapter presenting the research methods.
- A chapter on *summaries of interviews with the case companies*, where we present six summaries based on the 13 interviews performed in order to answer the research questions.
- A *findings* chapter summarizing the main findings from the case company interviews.
- A *discussion* chapter discussing the main findings.
- A *conclusion* chapter presenting our main findings, implications and future research.

2 Industry Review

The wave and tidal energy industries present a large untapped source of renewable energy. The magnitude of the practically exploitable resources indicates that marine energy has the potential to make a significant contribution to the world energy production. The industry has also the potential to create economic growth and contribute to a more sustainable development, energy security and carbon savings. However, the development of these industries face large challenges related to high development costs and high levels of uncertainties.

This chapter provides an introduction to the wave and tidal energy industries. First, some general information about the industries is presented, followed by a section on the global potential and possibilities of the industries. Third, a part on the road to commercialization explains which factors that are important in order for the wave and tidal energy industries to reach commercialization. A model that illustrates three dimensions that are key to the industry development is presented. The last section presents the current status of the marine energy industry development in terms of the current status of technology development, the policy and support schemes, the active actors in the industry and the installed capacity of wave and tidal energy devices.

2.1 Introduction to wave and tidal energy

The idea of exploiting the energy from oceans has existed for hundreds of years. In recent time, the initial boost for the development of an ocean energy industry was the increase in oil prices in 1973, which led to an intensified R&D study on ocean energy in Europe (Clément et al., 2002). Already by the 1980s there were issued over one thousand patents on technologies with the intent of extracting energy from the ocean (Falcão, 2010). Over the years, this has evolved into an emerging industry consisting of many small technology companies. The majority of the wave and tidal industry activity is found in the UK, which is considered the leading nation of this industry development (Carbon Trust, 2011).

The term *marine energy* or *ocean energy*, covers six different ways the ocean carries energy, including ocean waves, tidal ranges, tidal currents or streams, ocean currents, salinity gradients and ocean temperature differences (IPCC, 2012). Tidal ranges and barrages are today commercially available, however in later years, increasing environmental concerns related to vulnerable ecosystems have limited the growth of these particular technologies (WEC, 2010). Tidal stream energy converters have taken impressive strides towards commercialization and is at the time being the leading marine technology (WEC, 2013b). The wave energy technologies are lagging slightly behind the tidal stream developers (IHS EER, 2010), while the remaining three technologies are currently further from commercialization. The focus of this thesis is the wave and tidal stream energy industries, and the following sections will therefore only concern these two energy industries. Hence, the terms marine and ocean energy will be used interchangeably throughout this paper and refer to wave and tidal stream specifically.

Similarly, the tidal stream energy industry will be referred to as the tidal industry throughout.

2.2 Industry attractiveness

The ocean energy industry presents several advantages, and the large global potential is perhaps the most attractive factor. Along with the huge energy potential, it also represents a large possibility for economic growth, being a source of both revenue and employment. Wave and tidal energy are further renewable sources of energy, and are considered predictable and fairly stable. Furthermore, converting ocean energy into electricity for consumption can contribute to reduce carbon emissions and increase energy security.

2.2.1 Increasing focus on energy from renewable sources

The global demand for renewable energy is continually rising, causing an increased focus on renewable energy industry development. Renewable energy markets, industries, and policy frameworks have evolved rapidly (REN21, 2013), partly thanks to the governments' increasing awareness of climate change and greenhouse gas emissions (IEA, 2012). This can be observed by the fact that 138 countries had policy targets for renewable energy in 2012 (the latest year with available numbers), an increase from 118 the year before. This demonstrates the increasing awareness of the importance of renewable energy development (REN21, 2013).

2.2.2 Global potential of the wave and tidal stream energy

The magnitude of most estimates made of ocean energy potential indicates that the sector can contribute significantly to the world's electricity production given that the technologies mature and are commercialized. The wave and tidal resources in the UK could cover 20 % of the UK electricity demand if fully developed (Carbon Trust, 2012). It is important to note that estimates are made with high levels of uncertainties as all wave and tidal stream sites need site-dependent considerations (WEC, 2010). Such resource assessments are therefore very time consuming and expensive. Accurate and reliable estimates are therefore only available for a limited number of sites. Estimates for larger regions do, however, exist, but these should be considered as guiding figures only.

Different estimates include various sets of factors, and are therefore not always directly comparable. The theoretical potential is the actual resource, which in theory could be extracted without considering any constraints. The technical potential is the subsection of the theoretical potential that can be extracted using available technologies. This figure is therefore particularly sensitive to technology developments. The practical resource potential is further a subsection of the technical potential, after taking into consideration external constraints such as grid accessibility, competing use (e.g. shipping, fishing) and environmental concerns. (WEC, 2010)

2.2.2.1 Tidal stream energy potential

Estimates of the global tidal stream energy potential vary, however, it has been estimated that energy from tidal stream could theoretically supply more than 150 TWh per annum (Atlantis Resources Ltd., 2013). The global distribution of this potential is displayed in

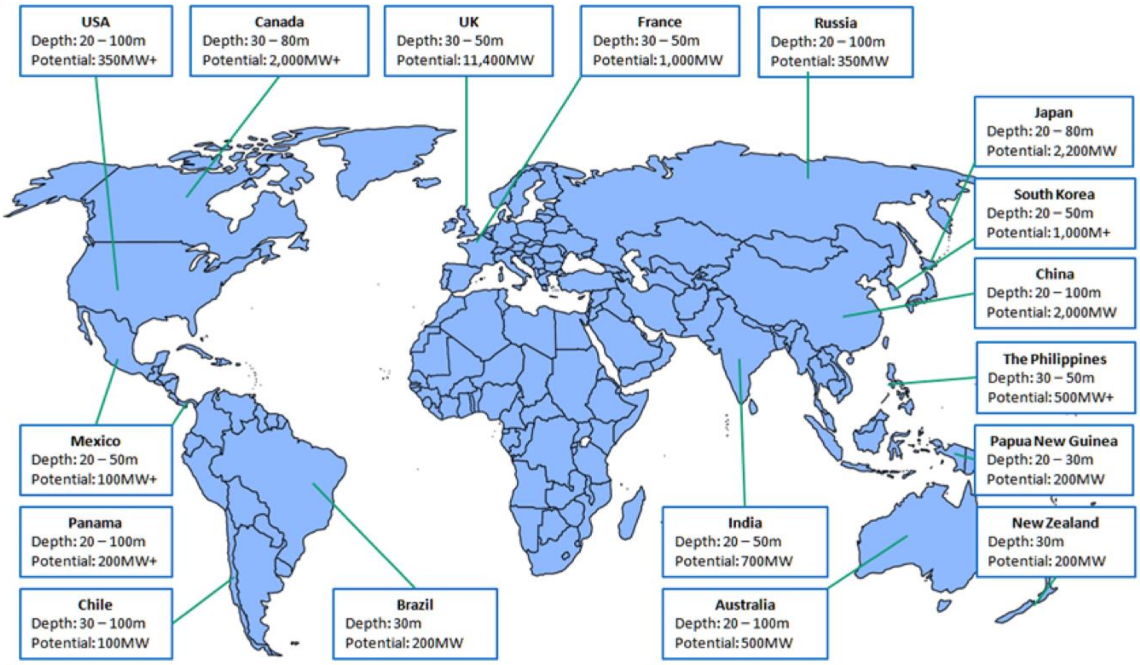

Figure 1: Global resources of tidal stream energy. (Atlantis Resources Ltd., 2013)

Figure 1. Although the figure illustrates the potential in MWs, it shows how the resources are distributed across the globe.

The UK technical tidal stream potential has been estimated to be about 29 TWh/y (Black & Veatch Ltd., 2011), while the practical potential is 20.6 TWh/y (Carbon Trust, 2011). This makes up about half of the European resources and about 10-15 % of the global resources (Black & Veatch Ltd., 2005).

2.2.2.2 Wave energy potential

The global wave energy resource is estimated to be at least one order of magnitude greater than that of tidal stream (WEC, 2013b). The global theoretical potential is estimated to be somewhere between 8 000 - 80 000 TWh (WEC, 2010). In recent years, the estimated values of practically exploitable resources have generally increased with the technologies improving. Some estimates made in the latter half of the 2000s claim the practically exploitable levels to be about 2000 TWh/y (WEC, 2010). The main sites of global wave energy resources are presented in Figure 2 below.

A UK report done by Amec for Carbon Trust (2012) estimates the UK theoretically exploitable nearshore (133 TWh/y) and offshore (146 TWh/y) resources to sum up to 279 TWh/y. The practically exploitable nearshore (5.7 TWh/y) and offshore (70 TWh/y) resources adds up to 75.7 TWh/y. A different report from RenewableUK, BVG Associates, and GL Garrad Hassan (2013), however, estimates the practically exploitable wave energy resource in the UK and Irish waters to be 50 TWh/y.

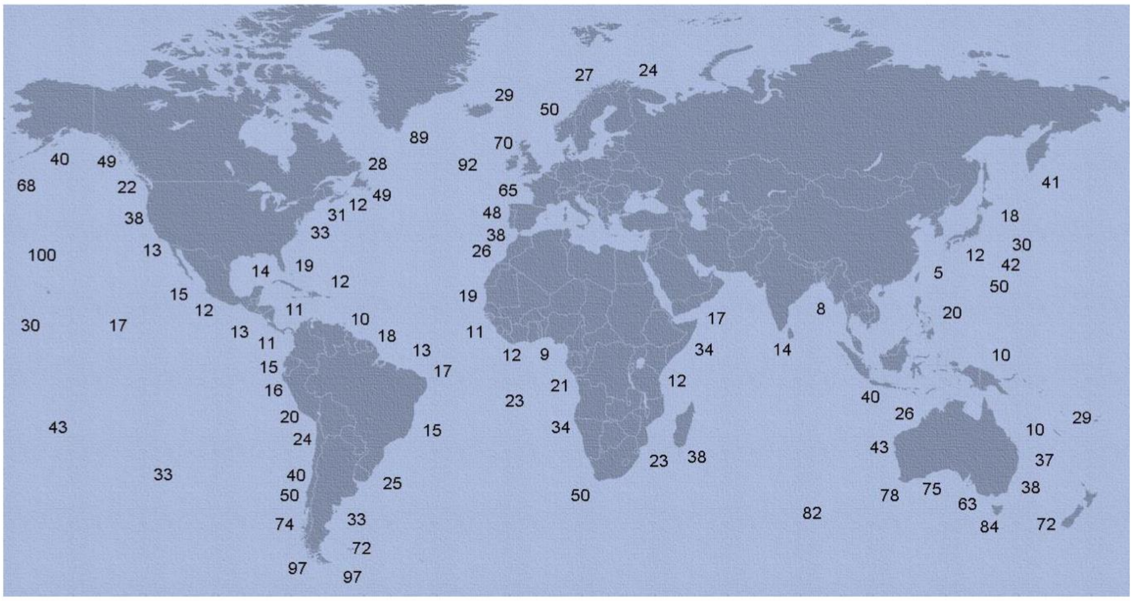

Figure 2: Average annual wave power levels as kW/m of wave front (Pelamis Wave Power, 2013).

2.2.3 Economic potential of marine industry

The large wave and tidal stream resources create the foundation for economic development. According to Carbon Trust (2012), it has been estimated that the creation of the wave and tidal industries combined can create about 26 000 jobs in the UK alone. In addition, it will generate £3 billion annually to the UK economy, and the global market size is estimated to be about £8 billion.

2.2.4 Energy security and carbon savings

By including energy from wave and tidal stream sources, utilities and nations can diversify their energy mix and thereby improve their energy security (EUOEA, 2013b). As with all renewables, there is no possibility that these energy resources will ever "run out" or disappear in the future. Tidal stream energy is a predictable cyclic energy resource with a linear flow which is easily converted to electricity (NVE, 2007). Wave energy is not cyclic, and can be considered a stable energy form able to predict about one week in advance (EUOEA, 2013b). The natural seasonal variability of wave energy correlates with the electricity demand in temperate climates (Clément et al., 2002). Developing these marine energy industries will further contribute to significant carbon savings due to the renewable nature (Carbon Trust, 2012).

2.3 The path to commercialization

Much has happened within the wave and tidal energy industries over the past few decades. However, the industries face several challenges to overcome on the path to commercialization, and the advantages mentioned in the foregoing sections are only attainable given these energy industries succeed. However, the path to commercialization might be long and cumbersome. Both the market and the technology must mature for an industry to be successful. Figure 3 below is adapted from Enova (2007) and illustrates the path different industries must take to become successful.

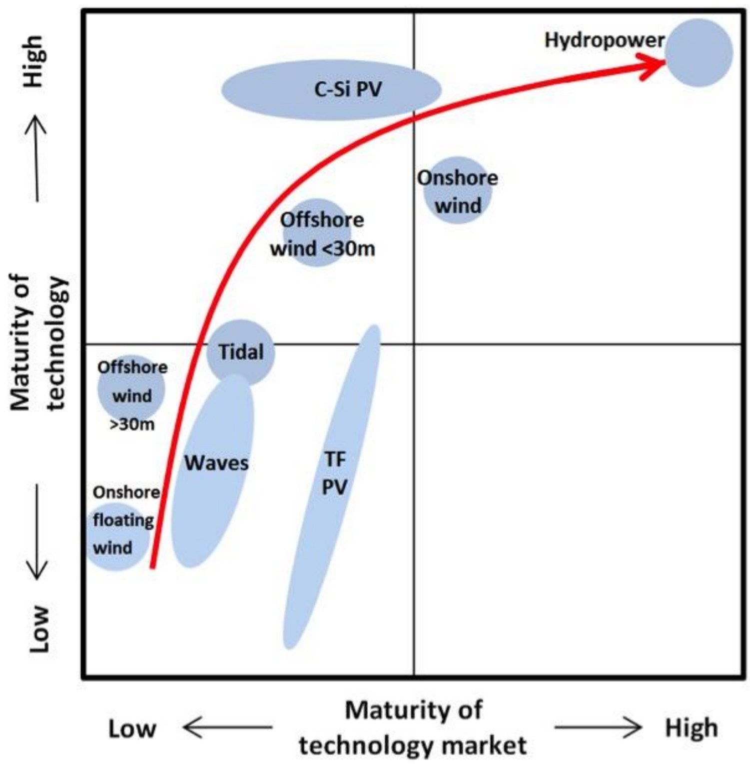

Figure 3: Road to commercialization. Adapted from Enova (2007).

The horizontal axis illustrates the *maturity of the technology market* and refers to which degree there exists a market for the technology. The vertical axis shows the *maturity of the technology* itself, in other words, to what degree the technology is optimal, reliable and predictable. The further to the left an industry is situated in the matrix, the more means and support is required to develop the market. The further down on the vertical axis an industry is situated, the more R&D support is necessary to reach commercialization. The red arrow represents the path a typical industry takes from idea phase to commercial products. Not all industries and products reach the end of the arrow, but stagnate or fail along the way. As seen in Figure 3, wave energy is situated in the lower left quadrant; far down on the vertical axis and far to the left. Thus, the wave energy industry represents immature technologies in immature markets. Furthermore, tidal energy is situated between the lower and higher left quadrant; in the middle of the vertical axis and far to the left. This shows that the tidal energy industry represent a bit more mature technologies in immature markets. Hence, in order for both the wave and tidal energy industries to succeed, sufficient R&D funding and a high level of support are necessary to ensure market development. With wave and tidal energy located at their current positions, it is hard to predict the technological and economic characteristics of a fully developed technology.

Note that the representation in Figure 3 was created based on the Norwegian industry in 2007. Arguments can be made that particularly the marine industries have emerged further in the UK than they had in Norway in 2007. In general, developments have happened since 2007 and the relative positions of the different renewable energy sources have most likely changed. However, the global wave and tidal energy industries are still dominated by relatively immature technologies in immature markets (European Ocean Energy, 2013), placing them far to the left. Consequently, the model with respect to wave and tidal energy is still valid, and will be used further for evaluating the industries' path to commercialization.

2.3.1 Important drivers for commercialization of the wave and tidal industry

Several factors are important in order for both the market and technology to mature as depicted in the previous section. Enova (2007) has identified three dimensions and seven drivers that are important to the ocean energy industry's success level; these are portrayed in Figure 4. In order to nurture the industry, all three dimensions and seven drivers must develop together to ensure a stimulating growth environment; the three dimensions are technology, economy and other framework conditions. The complexity and extent of these dimensions show that there is a need for cooperation or coordination among the different actors within the industry to help the industry emerge. Enova (2007) highlights that one unfavorable condition could be enough to altogether stop the development.

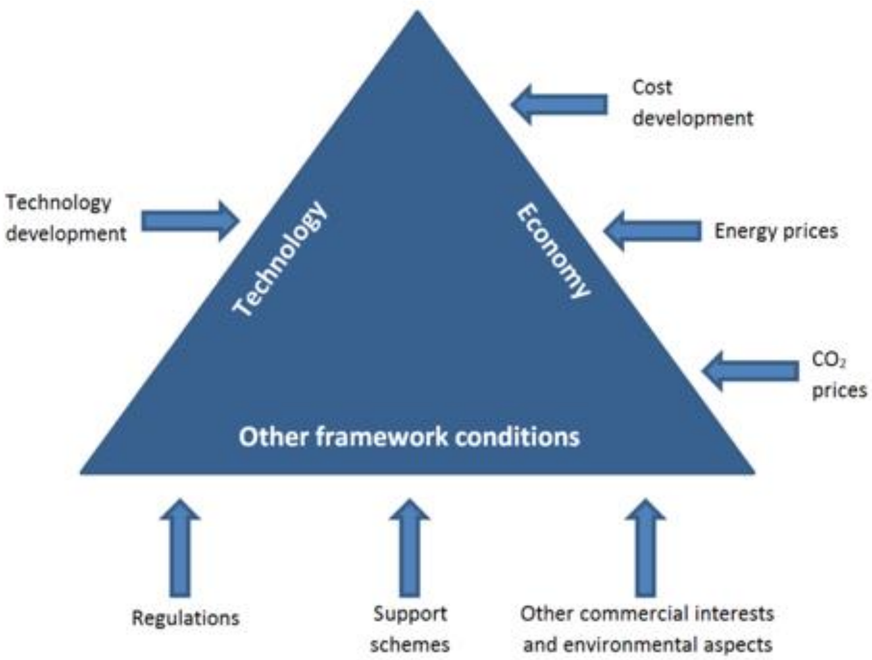

Figure 4: Key drivers behind the ocean energy industry development. Adapted from Enova (2007, p. 61).

The technology itself plays a key role as to whether the industry reaches a commercial scale. There is a need for *technology development* that takes the technology to a stage where it is reliable, efficient and self-financing (Enova, 2007).

The primary focus in commercializing the industry is to reduce the costs of the technology through *cost development*. There are in general three ways to contribute to cost reduction, namely R&D, learning-by-doing and economies of scale. These reductions will occur as the technologies mature (Enova, 2007). The current cost of wave and tidal energy lies well above competing renewable sources (EUOEA, 2013b). R&D and learning-by-doing are already focal areas among marine energy technology developers today (EUOEA, 2013a). The need for R&D support is also illustrated in the low technology maturity level in Figure 3. Cost reductions through economies of scale are likely to be more eminent when the technology reaches maturity and is ready for mass production. In addition to the cost development of the technology, other economic drivers must be favorable. The market and the regulatory bodies set the *energy prices* and the *CO2 prices*. These prices will affect whether the marine energy technologies are financially viable or not. Because this paper is not concerned with the relationship with regulatory bodies, these two factors fall outside the scope of this paper and will not be considered further.

The regulatory bodies are also in charge of general *regulations* as well as the *support schemes* for the marine energy industry. Good support mechanisms are crucial for the success of this industry, for instance because they influence MNCs investment decisions by creating incentives to invest (Bürer & Wüstenhagen, 2009). This makes it important to work with these governmental actors. The regulatory bodies involved in creating the conditions stretches from local authorities (e.g. the Scottish Government) to cross-country authorities (e.g. European Commission). Trade organizations are typically used as a middle link to promote the needs of an industry to governmental institutions (EUOEA, 2013b). The driver *other commercial interests* indicates that the marine energy industry can benefit from collaborating with actors outside of the wave energy industry in areas where they share mutual interests (Enova, 2007). Examples can be other marine industries such as fishing, oil and gas, aquaculture and sea transport (Enova, 2007). Cooperation across a number of industries is crucial for the development of the wave and tidal industry (EUOEA, 2013b). These three drivers are outside the scope of this paper, and will not be elaborated on further.

2.3.2 A complex and challenging environment

Figure 4 illustrates the need for all drivers to create a favorable and supportive environment together. This is necessary to overcome the challenges facing the industry development. The marine energy industry is capital intensive, putting high pressure on technology developers to secure funding (IEA, 2013). Furthermore, the future of the industry is uncertain due to high levels of technology, market and policy risks, high costs and the long-term perspective. In addition, previous ocean energy projects have failed to deliver on set objectives, and thereby reduced the credibility and damaged the reputation of the industry (McIvor, 2008; Schulze, Brochard, Wragg, & Anderson, 2013). Many investors are therefore skeptical to this industry and hesitate to invest in it (European Ocean Energy, 2013).

Of all the uncertainties, the policy uncertainty dominates as the main risk (IEA, 2013). The competitiveness of new renewable energy sources is highly dependent on the market and the current policy framework. Even projects with low technology costs and otherwise favorable conditions may become unviable due to unfavorable policies or market conditions. The short term marginal pricing of electricity makes capital-intensive investments risky unless other financial incentives are in place (IEA, 2013). It is therefore important to influence the government and other regulatory bodies to ensure favorable regulations and stimulating support schemes (IEA, 2013).

2.4 The current status of the industry

This section presents the current status of the industry by first identifying the UK as the leading nation, thereafter presenting the current status of the technology development, the actors currently involved in the industry and finally the currently installed capacity of ocean energy devices around the world.

2.4.1 Ocean energy technology development

The idea of ocean energy technologies was what initially started the emerging of this industry. However, the path from idea to full-scale commercial technology proves to be long. In order to categorize the maturity level of a technology the ocean energy industry has adopted a systematic measurement system from NASA; the Technology Readiness Level (TRL) (Holmes & Nielsen, 2010; Mankins, 1995). The model below is adapted from SI Ocean (2012) and illustrates the nine levels of the TRL scale.

Table 1: The Technology Readiness Level framework.

TRL	Description
1	Basic principles observed and reported
2	Technology concept and/or application formulated
3	Analytical and experimental critical function and/or characteristic proof of concept
4	Component and/or partial system validation in a laboratory environment
5	Component and/or partial system validation in a relevant environment
6	System/subsystem model validation in a relevant environment
7	System prototype demonstration in an operational environment
8	Actual system completed and service qualified through test and demonstration
9	Actual system proven through successful mission operation

The tidal industry has seen a technology convergence towards the horizontal axis turbines, which tightened the competition among the technology developers. The remaining actors in this industry are now those with the winning technologies (Carbon Trust, 2011). Their current focus is on gaining the required consents and developing array projects to prove the feasibility of the technologies. The most advanced tidal stream technologies are at level 7 and 8 on the TRL scale (SI Ocean, 2012). The wave energy industry has yet to see an equivalent technology convergence, and is approximately where the wind energy technologies were in the 1980s; dominated by a number of different technologies (by Carbon Trust, 2005, in (IPCC, 2007)). An estimation claims there are about 100 different wave energy technologies (SI Ocean, 2012). A half dozen of these technologies are currently leading the technology development, but with no declared winner (WEC, 2013a). The current focus of this industry is hence to develop the technology to reach the final steps of the technology readiness level scale. The main issue is to improve the wave energy converter technologies so that they are designed for the average wave while built to sustain extreme weather conditions (WEC, 2013a). The most advanced wave energy devices are at level 6 and 7 of the TRL scale (SI Ocean, 2012). The study done by SI Ocean (2012) show that both wave and tidal technologies are close to a commercial level. Furthermore, some technologies might even have developed past their 2012 level.

2.4.2 The UK is leading the industry development

The wave and tidal energy industry is developing on an international scale. The complex system of drivers presented in Figure 4 by Enova (2007) above makes up a tangled web of interdependent factors. As this presentation of the key drivers indicates, the future of this industry has high levels of uncertainties and is hard to predict. Europe is currently leading the race towards commercialization, with the UK in front (EUOEA, 2013b). The involvement of several large multinational companies such as original equipment manufacturers (OEMs) and utilities, along with international organizations such as the European Ocean Energy Association (EUOEA) and the Renewable Energy Policy Network for the 21st Century (REN21) also indicate that this industry development crosses country borders (EUOEA, 2013b).

2.4.3 Current policy and support schemes

In most of the world, ocean energy is not a priority, and the supporting mechanisms are too weak to bring the industry forward. The UK is an important exception, where the government is aiming to make the ocean energy industry a UK success story. Their support system has made them the leading nation in the development of this energy industry (RenewableUK et al., 2013). The UK holds several advantages within this sector as they have a strong academic research and development capacity, a high concentration of technology development companies and the ability to exploit knowledge and skills in traditional maritime and offshore industries (Carbon Trust, 2012).

2.4.4 Actors in the ocean energy industry

As already emphasized, a supporting government and stimulating support system is crucial for the industry success. However, the governments are depending on investments from the private sector to aid the industry forward (REN21, 2013). Traditionally, several small technology-developing firms made up the industry, and these companies are by their number still dominating the industry. The ocean energy industry is a capital-intensive industry, implying large needs for capital to reach the last few levels of the TRL scale (REN21, 2013). A common way for small technology firms to access the necessary capital is through partnerships or joint ventures, or through capital injections via acquisitions by major companies (REN21, 2013, p. 40). Lately, larger actors, e.g. OEMs and utilities, have entered the industry (EUOEA, 2013b).. By providing their resources (e.g. know how, production facilities, capital, workforce) they have accelerated the speed of the technology development and reduced the costs of immature technologies They are also contributing to improving the learning curve and facilitating learning-by-doing (EUOEA, 2013b). These large companies acknowledge the potential of the industry and are making investments into a future supply chain (Carbon Trust, 2011). Table 2 provides examples of such industrial actors. Some utilities were previously involved as shareholders in marine energy technology firms. However, most of these no longer consider marine energy as a core capability (WEC, 2013a), and have changed their focus by exiting as shareholders and rather reinvesting in individual developing projects in the UK waters (RenewableUK et al., 2013). Most of the investments made by such large companies have been into tidal stream technologies, although there have recently also been a few examples of investments made into wave energy.

Table 2: Examples of involved industrial actors.

Examples of involved industrial actors		
• ABB	• Fred. Olsen	• Siemens AG
• Alstom	• Hyundai	• Total
• Andritz Hydro	• Kawasaki	• Vattenfall
• AWE Innogy	• Scottish Southern Energy (SSE)	• Voith Hydro
• DCNS SA	• Scottishpower Renewables	• Iberdrola
• EDF		
• Eon		

2.4.5 Installed ocean energy capacity

Due to the pre commercial stage of the technology development, there is hardly any installed wave and tidal stream capacity at the time being. When including tidal ranges, the globally installed capacity reached 527 MW in December 2012, with tidal ranges contributing with the big majority of this (REN21, 2013). The UK is by far the leading nation of the wave and tidal stream energy industry, and the devices installed in the UK waters sums up to about 9 MW installed capacity, and with still more in the pipeline (REN21, 2013).

3 Literature review

The wave and tidal industries are at an early stage of development, and consist of firms with different technologies at various readiness levels. In the last few years, large external industry actors have started to take a presence in these industries as well. This chapter presents various literatures on the background of firms' engagement in new and emerging business fields, and the processes they go through when managing technology development. The literature will be used as a foundation when analyzing and evaluating the findings in the preceding sections. More accurately, the theory is divided into the following parts:

- First, *companies operating in the ocean energy industry* is presented. Firm *motives for entering a new industry* is also included and describe what drives firms towards looking into new business fields.
- The next section defines an *emerging industry* and tries to explain why such industries can be of interest to large corporations. Last, it explains why the marine energy industry is considered emerging.
- The final section considers an adapted *technology management process framework,* which can explain the processes firms go through when entering an emerging industry.
    - First the original, and then an *adapted process framework* is presented.
    - The first process is *identification*, and this section presents literature on how firms can scan for new technologies.
    - The second process is *selection*. This section presents how firms can approach innovation, based on a self-assessment of core competences and capabilities.
    - The third process, *acquisition*, presents literature on which entry modes firms can apply when entering a new industry.
    - The last process, *protection,* briefly considers how firms can protect their technology and knowledge base.

3.1 Companies in the marine energy industry

In order to understand the ocean energy industry it is important to consider the various firms acting in this industry, and what drives them. Two different types of companies – small technology firms and multinational corporations (MNCs), dominate the marine energy industry. The main motive of these two types of firms is to achieve growth or economic profitability, the MNC as an investor or developer and the small technology firm as an innovator and developer. This will be further elaborated on in the following sections.

3.1.1 Multinational corporations and small technology firms

An *MNC* is defined as a large multinational firm with important tangible and intangible resources, which has the capacity to operate widely across the globe (Vapola, Tossavainen, & Gabrielsson, 2008). These companies carry out important activities such as R&D, procurement, manufacturing and marketing in large and often rigid processes wherever it is most advantageous (Cavusgil, Knight, & Riesenberger, 2008). Global learning is among critical sources of competitive advantages for MNCs (Vapola et al., 2008). *Small technology firms* are often involved in creating and developing new technological opportunities (Crick & Jones, 2000). These companies are assumed to be unaffected by established routines and processes (Miles, Preece, & Baetz, 1999) and are thus more capable of technological change. They also have a greater rate of success in the innovative application of new technology (Miles et al., 1999).

The technology development in the marine energy industry is mostly carried out by small technology firms, which often lack experience and resources. In order to access extended technological and economic resources, these firms seek investors with more experience, such as multinational corporations (MNCs). MNCs, on the other hand, are often interested in innovation and new technological opportunities but might lack the necessary knowledge or resources to develop new technology themselves. They are therefore often willing to invest in or acquire these technology firms to access new innovation more effectively (Vapola et al., 2010). This creates an opportunity of mutual interest for the small technology firm and the MNC.

3.1.2 MNC's motives for investing in new industries

There are motivating factors behind companies' decision to invest in new industries and business fields. The main motivation is to achieve growth and profitability, and therefore saturated markets and competitive turbulence can lead firms to seeking growth through new business opportunities in new industries. Furthermore, a firm's position in the market and history determine the technology path and into which new business fields it is logic to expand. Other factors such as global pressure and trends might encourage investors to enter certain industries.

3.1.2.1 Increasing profitability and creating competitive advantage

Although a company may have several objectives, the primary goal of a profit-seeking company or corporation is by definition to be profitable. According to Penrose, the growth of a firm is considered an evolutionary process driven by the need to possess, acquire and build upon a scarce, unique and sustainable competitive advantage (Scott-Kennel & Akoorie, 2004, p. 340). Leading MNCs are increasingly using alliances to keep a competitive edge in the global marketplace, and frequently decide to partner with other firms, rather than developing new technology in-house (Vapola et al., 2010). Vapola et al. (2010) list some of the most mentioned objectives for MNCs to form alliances with other firms. These objectives are; economies of scale and scope, getting access to unique and valuable complementary resources, learning, gaining market power, gaining market access, managing and sharing risks, creating options for future investments and competitive responses. Gregory (1995) also points out that production and product development are important sources of firm competitive advantage. In addition, sustaining competitive advantage is a motive for firms to seek new business fields, which can be caused by saturated markets or constantly changing competitive landscape.

Saturated markets

Firms that have survived the first growth stages in an industry and moved into the mature stage of the lifecycle are often well established and enjoying a constant but slowly growing demand for their products (Scott-Kennel & Akoorie, 2004). However, mature markets will for some industries eventually reach a stage of saturation. MNCs operating in these industries may then find motivation in seeking new products, engage in innovation or enter into new markets or business fields to sustain their competitive advantage. A common way to revive a business in a mature stage is for example by seeking growth or redevelopment through acquisition (see 3.3.4). When a market reaches a saturated state, the MNCs operating in this market must decide whether to maintain their current positions or find alternative or additional ways to keep growing. Large MNCs are however often rigid organizations, which typically resist changes, so a possible innovation process will not come without challenges (see 3.3.3). (Scott-Kennel & Akoorie, 2004)

Constantly changing competitive landscape

Today, the competitive landscape is constantly changing, forcing the companies to continuously evolve and adapt in order to stay competitive, remain profitable and grow (Hitt et al., 1996; Hitt, Keats, & DeMarie, 1998). Leading multinational companies are constantly at risk for being overtaken by new, flexible, and fast-moving entrants, such as born globals or other small technology entrants (Christensen & Snyder, 1997). The reasons for this are the elimination of industry boundaries, fewer distinctions between industrial and service businesses, major advances in logistics, communication, and opening of global markets (Cavusgil et al., 2008; Hitt et al., 1998). The increased globalization of industries and the shift towards open approaches to international trade and foreign investment (see 3.3.2.1) have encouraged and pushed forward new technological development, as well as new techniques for processing and integrating information (Hitt et al., 1998). This has further accelerated the pace of technology development, intensified the competition and encouraged companies to compete at an international level (Scott-Kennel & Akoorie, 2004).

There are several ways to tap into new opportunities of the rapidly changing global business environment; examples are growing through extension of the product/technology portfolios (Hitt et al., 1998), or expanding the geographic scope by entering new markets (Scott-Kennel & Akoorie, 2004). For companies operating in this competitive landscape, it is particularly important to continuously rethink their strategic plans and activities. Investment strategies are specifically mentioned (Hitt et al., 1998) and are also considered important in order to create competitive advantage (Bürer & Wüstenhagen, 2009). Identifying new opportunities and organizing an efficient way to meet these opportunities through investment activities or reconfiguration, are in general important for firm performance (Teece, Pisano, & Shuen, 1997).

3.1.2.2 Global pressure and trends

The sources of firm motivation to enter into new industries discussed above, merely explain why companies continuously seek new opportunities. When narrowing the scope to why companies seek to invest in specific industries, other elements become important. For instance, the world and the MNCs with it are facing increasingly important *global environmental issues* demanding coordinated strategic responses. Although 'global pressure' and 'trends' are not direct sources of motivation, they both create motives to engage in more environmental sustainable activities (Kolk & van Tulder, 2010; Levy & Kolk, 2002). MNCs are in fact, due to their international nature and global influence, expected to play a role in saving the planet and fighting global issues, such as climate change and poverty. These expectations might create motives to invest in non-governmental organizations (NGOs) or environmental friendly industries, such as the renewable energy industries. (Kolk & van Tulder, 2010)

3.2 The marine energy industry as an emerging industry

Emerging industries are industries in an *early stage of development*, which have not yet reached the commercial market place (Forbes & Kirsch, 2011; Low & Abrahamson, 1997). An emerging industry has not established a marketing standard, and is lacking a standard technology design. In order to understand the concept of emerging, growing and mature stages of an industry evolution, an industry is first defined as a group of firms with the same organizational form. Industry evolution is further the diffusion of an organizational form, where the stages correspond to the creation, exploitation and erosion of competitive advantage. (Low & Abrahamson, 1997)

An emerging industry typically has a period of intense experimentation and learning, where several different technology concepts compete (Kapoor & Furr, 2014). At this stage, no dominant design has yet been established, and there is a *high level of technological uncertainty* as well as opportunity. Recognizing the most successful and competitive approach may be very challenging (Harrigan, 1988), as embryonic and emerging industries do not have well-established product and marketing standards, or supplier customer relationships (Low & Abrahamson, 1997). As the industry keeps emerging, some technologies will over time outperform others. This might either be because the technology solution is superior, or simply because it has the best support system and foundation for success. Still, when MNCs invest in external technology in an emerging industry they automatically seek for the highest performing technology with the most key complementary assets, as they will stand for the support system. (Kapoor & Furr, 2014)

Emerging industries are attractive to MNCs, as they propose a way for MNCs to achieve and sustain a competitiveness in the marketplace (Hitt et al., 1996). Small technology firms still pose a threat to the MNCs' competitive advantage, through their new and innovative products and technology (Alvarez & Barney, 2001; Vapola et al., 2008). Therefore, in industries where technology is changing rapidly and markets are uncertain MNCs may actually benefit from establishing relationships with the smaller innovative firms (Gabrielsson & Kirpalani, 2004). *Cooperative agreements* between large and small companies can influence the development in young industries, for example "through permitting firms to enter, creating technological standards, establishing relationships with distribution channels, developing new suppliers, or making other changes" (Harrigan, 1988, p. 152).

Many contextual actors have incentives to take part in the creation and commercialization of new technology innovations, because new technologies create economic potential and thus have a major influence on the behavior of the economy and society (Möller & Svahn, 2009). Company innovative behavior is important to educational institutions, social actors, government and other political actors. These often have an important role in the emergence and shaping of new business sectors and industries. Supporters of *government involvement* claim that some emerging industries have a special potential, and that without the help from government efforts, "new technologies will go undiscovered, downstream industries will not receive the needed stimulus from the emerging industries, other countries may pre-empt the field and economic growth will suffer" (Carliner, 1998b, p. 147). Therefore government involvement is necessary. There is, however, a discussion to whether government support is more effective in developing high-tech industries and whether such support actually improves economic performance. Some critics claim that government involvement often fails to help emerging industries, because market forces are better than politicians at "picking winners". Also, development of successful technological solutions demand an appreciation of market demands, thorough knowledge of scientific possibilities and a good sense of timing.

Although the marine energy industry is not completely new, it can be regarded an emerging industry as it has still not reached a commercial state. Neither the wave nor the tidal industry has any readily commercial products for sale (SI Ocean, 2012). Further, in accordance with what was stated by Kapoor and Furr (2014), the marine energy industry have several technological concepts and has not yet adapted a winning design (Enova, 2007; European Ocean Energy, 2013). Nor are there any well-established product and marketing standards in the this industry, which are typical traits of emerging industries (Low & Abrahamson, 1997).

3.3 A framework on MNCs investing in the marine energy industry

The focus of this paper is to explore and understand the process MNCs go through when entering the emerging marine energy industry, more specifically, the identification, selection and entry processes. The existing literature on this topic is limited, diverse and fragmented (Gregory, 1995; Tschirky, 1991), and there does not exist a standardized model for the process. In order to achieve a better understanding of this process an attempt is made to create a framework, which systemizes the elements and activities important when MNC enter an emerging industry.

3.3.1 A technology management framework

Gregory (1995) has developed a process model that seeks to describe the elements and activities revolving technology management for R&D intense firms in mature industries.

The model is based on traditional activities of technology management, which are further systemized in five the processes: Identification, Selection, Acquisition, Exploitation and Protection, as presented in Figure 5.

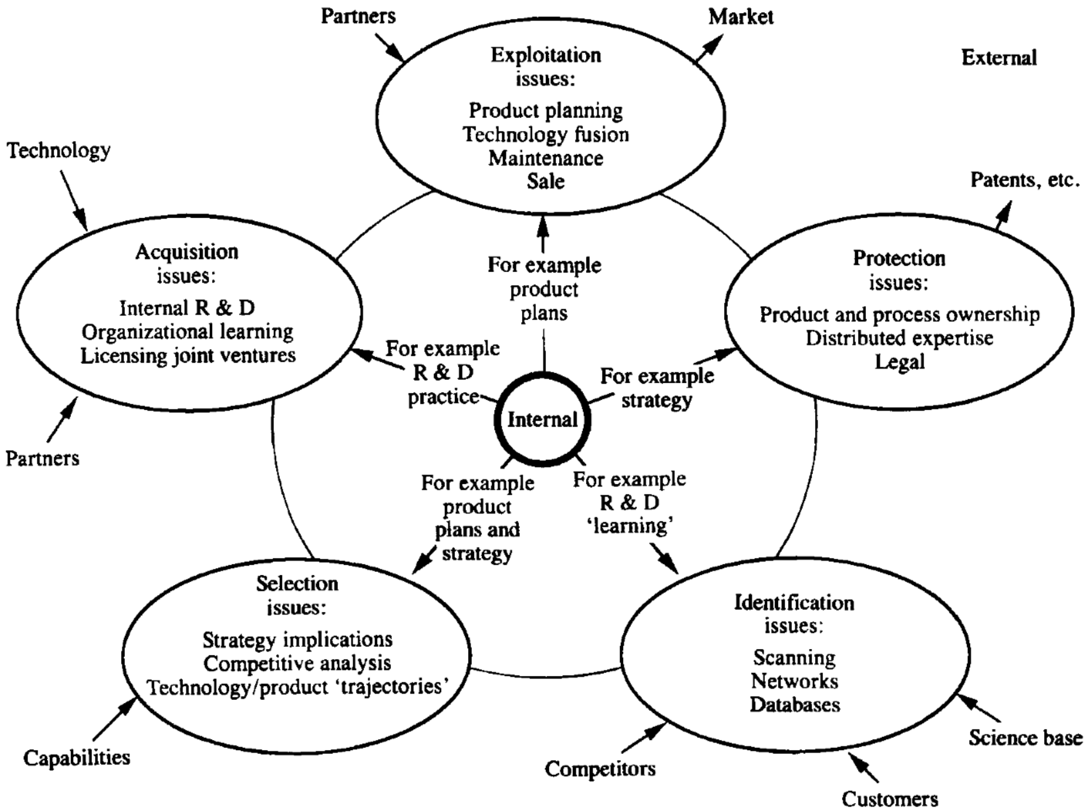

Figure 5 The technology management process model, as adopted from Gregory (1995, p. 350)

The first element *identification* concerns the process of identifying new technological opportunities (Gregory, 1995). Furthermore, *selection* concerns an assessment of core capabilities, opportunities for internal innovation and possibilities for external technology investments. The third element, *acquisition* regards which governance mode the firm should use when investing in new external technology, and how it should be embedded within the organization. *Exploitation* concerns activities on how to extract value from the technology or product through commercialization, such as planning, sale and maintenance. While, *protection* regards how the knowledge and expertise associated with new technology is optimally protected, to avoid exploitation by others. The model can be seen as a linearly process, starting with the 'Identification' and ending with 'Protection'. However, it is better seen as a circular set of processes operating in parallel or through iterations of the processes (Gregory, 1995).

3.3.1.1 The modified framework

The technology management process model developed by Gregory (1995), is not explicitly made for firms entering new industries. However, since these firms will either have to develop or somehow manage new technology, the model is also suitable for describing the process an MNC goes through when entering an emerging, and thereby the marine energy industry, only some minor adjustment is needed. As mentioned above exploitation concerns how to extract value from a product or technology once it has reached the marked. This is only relevant for a commercial industry, thus this process will not be considered further in this paper and has not been included in the modified framework. Furthermore, the acquisition element will be renamed *entry mode* in order to clarify that all entry modes are considered, and as this paper seeks to describe the process of firms entering new business fields. Figure 6 below shows the framework as adapted to *MNCs entering an emerging industry*, with the four relevant processes. The following will present each process element with literature.

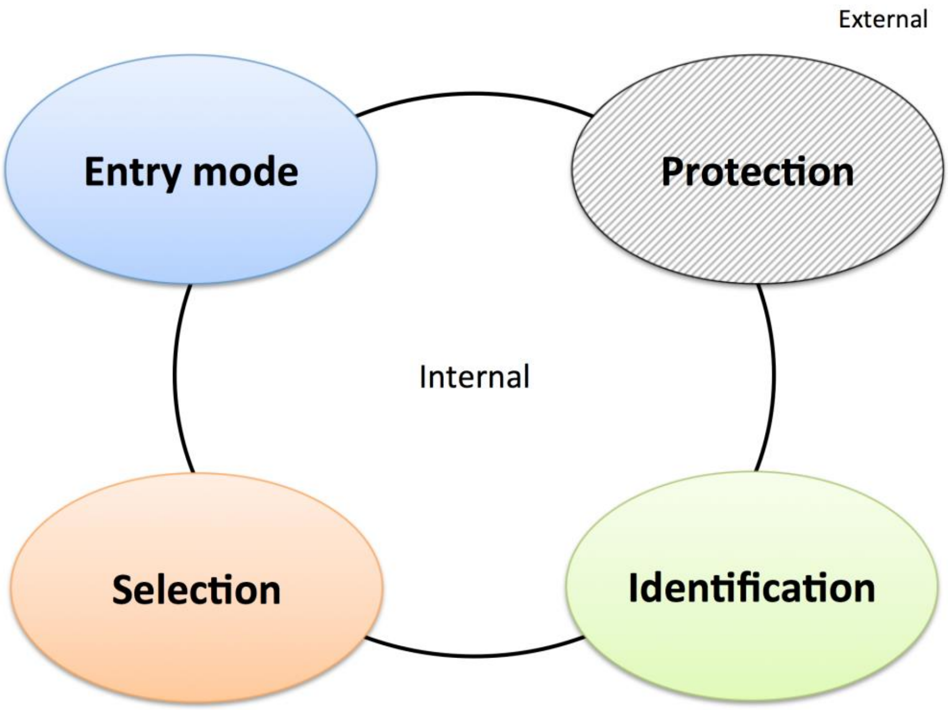

Figure 6: The modified model framework as adopted from Gregory (1995). The process element exploitation has been excluded.

3.3.2 Identification: Recognizing opportunities for value-creation

In order to for companies to survive and stay competitive in an ever-changing global industry it is important to be innovative and constantly scan for new opportunities in the market (Hitt et al., 1996). Still, continuous product innovation can be challenging for companies with rigid and stable processes and operations (Dougherty & Hardy, 1996). In addition, new technological ideas are often vague, with an ambiguity about how to pursue the idea (Scharmer (2000) as cited in Möller and Rajala (2007)). A key challenge is thus to capture and apprehend the value of dispersed technological ideas (Doz et. al (2001) as cited in Möller and Rajala (2007)). Companies therefore establish an identification process to systemize, comprehend and grasp existing opportunities for innovation and value creation (Gregory, 1995; Håkansson & Ford, 2002; Möller & Rajala, 2007). This section will present how networks and technology trajectories are important aspects of this process.

3.3.2.1 Networks

Networks are often used to stay alert and up to date on technological innovations (Håkansson & Ford, 2002; Leonard-Barton, 1992; Möller & Rajala, 2007). A network as a "research constellation" creates a firm basis of human and physical resources from which knowledge can be gained, and developments can take place (Håkansson & Ford, 2002). However, the importance of using resources already available in existing relationships and networks may create inertia and 'heaviness', and thus limit innovation. According to Doz, Santos & Williamson (2001) large corporations are to a growing extent involved in professional networks called *innovation networks*, which are loose science and technology-based research networks (Laursen & Salter, 2006; Möller & Rajala, 2007). It appears that businesses engaged in such networks have a better chance of recognizing emerging technology and business opportunities than those who are not (Laursen & Salter, 2006). Similarly, Leonard-Barton (1992) suggests that expanding the traditional R&D organization to involve more individuals, disciplines and functions (both internally and externally), will broaden the knowledge base. By creating "a virtual research organization through extensive networking and alliances", outside knowledge and information becomes available and rapidly incorporated into the company (Leonard-Barton, 1992).

3.3.2.2 Technology trajectory

In the analysis of Arthur (1989) it was indicated that MNCs tend to stick to certain technological paths or trajectories when searching for new innovations. This means that their technology developments and choice of investments to an extent are linked to their previous and current activities. The findings of Hagedoorn and Duysters (2002) further show that companies often prefer one particular process for adoption of external technologies, and tend to stick to this preference in future transactions. This process has typically evolved with experience throughout the history of the firm and thus shaped a technology trajectory – the path it has followed and the path ahead (Teece et al., 1997). This does not necessarily mean that the companies are unaware and never consider alternative options. Hagedoorn and Duysters (2002) rather believe that the companies simply are satisfied with their approach and that it already is being a part of a routine that fits their overall innovation strategy. Further, a process characterized by routines and experiences also give MNCs a certain competitive advantage. (Hagedoorn & Duysters, 2002)

Different organizational processes directly influence the technology trajectory in several ways. According to Teece et al. (1997) these processes have three important roles: coordination and integration; learning; and reconfiguration. Thorough *coordination and integration* of external activities and technologies is crucial to obtain a smooth adaption and transmission process. These are driven by organizational routines and are required to gain strategic advantages. Such routines are firm specific and largely dependent on the firms' previous history. Therefore, they are also hard to replicate or imitate. *Learning* is perhaps even more important than integration, and is a process, which enables activities to be performed faster and better, as well as it enables new opportunities to be identified.

Collaborations and partnerships can also be a source of new organizational learning. *Reconfiguration* of the firm's asset structure has value in rapidly changing environments, and comprises scanning and monitoring markets and technologies with the willingness to adapt to the best practice. Being able to quickly reconfigure and adjust to changes in environments and markets, before the competitors do, is of course of great value to MNCs. (Teece et al., 1997)

3.3.3 Selection: Self-assessment and choosing innovation

When an MNC has gone through the identification process and established a thorough awareness of the existing technologies, they can start the process of selecting the most promising and suitable case of investment. In order to make the right decision on whether to develop new technology in-house or search for external resources through M&A, joint ventures, etc. it is also important to be aware of the company's own core capabilities and competences (Gregory, 1995).

3.3.3.1 Core capabilities and competences

A competence and capability analysis aims to identify the strengths and weaknesses within the business, gain a fuller understanding of their knowledge assets and capture some of the more intangible aspects of the company (Gregory, 1995). It also attempts to explore ways in which their strengths can be developed and 'leveraged' into new opportunities (Hamel and Prahalad (1993) as cited in Gregory (1995)). According to Kessler, Bierly, and Gopalakrishnan (2000) the success of a company depends on how well it can enhance, integrate and apply its knowledge, either through internal or external learning. When the company has a full understanding of their core capabilities and competences, they can start looking at their options for innovation (Gregory, 1995).

3.3.3.2 Innovation

A central part of innovation revolves around the search for ideas with commercial potential (Laursen & Salter, 2006). Innovation was in earlier years defined as either invention or entrepreneurial activity (Schumpeter, 1942), however more recent studies describe innovation as the full set of activities from the first scientific, technical or market concept through to delivery to the customer (Damanpour, 1991; Gregory, 1995). An innovation can be several things, for instance a new product or service, a new process technology or a new administrative system. It can also be defined as adoption of a purchased or internally generated device, product or service that is new to the adopting organization (Damanpour, 1991). External acquisition or internal development of new knowledge is important for firms in order to reduce the danger of obsolescence (Raisch, Birkinshaw, Probst, & Tushman, 2009). Furthermore, there are several key dependent variables that are important to consider before making the decision to *internally generate* or *outsource* technology innovation (Kessler et al., 2000).

External innovation

A rather new perspective on long-term organizational success is theory on ambidextrous organizations. An ambidextrous organization is defined as an organization that is capable of *exploiting* existing competencies and *exploring* new opportunities simultaneously

(Raisch et al., 2009). Thus, a suggestion to solve the paradox of exploiting and exploring at the same time is to externalize some activities through outsourcing or by establishing alliances with other firms, and at the same time securing that existing competencies are being used.

In new knowledge intensive, dynamic and complex industries, MNCs do not always possess all the necessary resources required for successful innovation (Ritala & Hurmelinna-Laukkanen, 2009). Companies seeking opportunities for innovation often seek to acquire or collaborate with external knowledge-intensive technology companies, such as born globals or small entrepreneurial firms. Collaborating with competitors has also been found an effective way to create both incremental and radical innovations, especially in high tech industries (Ritala & Hurmelinna-Laukkanen, 2009). In any form, such collaborations can enable both exploitative and explorative knowledge processes, be complementary to the MNCs, positively affect their competitive advantage and presumable yield improved financial results (Vapola et al., 2008).

Another more modern method of exploiting external opportunities has also been discussed in the literature. According to Chesbrough (2003), many firms have shifted to a more open innovation model where a wide range of external actors and sources are included to achieve and sustain innovation (Chesbrough, 2003). He finds that openness to external sources allows firms to draw in ideas from outsiders and such deepen the pool of technological opportunities available to them. The external search depth is further associated with the degree of radicalness of the innovation. In early stages of a radical innovation, only a few actors may have knowledge of the key technologies and innovators thus need to cling to these sources. An open innovation approach will increase the possibility to obtain access to the necessary knowledge and resources. (Chesbrough, 2003)

Factors of importance when selecting technologies

Research on motives for firms to engage in a technology cooperation or acquisitions have shown that *proximity*, *complementarity* and reduction of the *innovation* time-span are among the most important factors in the decision making process (Hagedoorn, 1993; Harrigan, 1988; Knoben & Oerlemans, 2006).

Proximity refers to the relative closeness two businesses in collaboration have to one another, and is described as being close to something in a certain dimension (Knoben & Oerlemans, 2006). A high level of proximity is often considered necessary to ensure efficient sharing and transferring of knowledge, and are furthermore assumed to strengthen the competitive position of the firm by improving their capabilities, competences and resources (Knoben & Oerlemans, 2006). Knoben and Oerlemans (2006) have identified three dimensions of inter-organizational collaboration as the most important regarding proximity: organizational proximity, technological proximity and geographical proximity. *Organizational proximity* covers several proximities identified in the literature, namely cultural, institutional, social and cognitive proximity (Knoben & Oerlemans, 2006). These are similarities in the way people or organizations perceive the world and interpret information. They are caused by the organizational cultures, national cultures, institutional systems and other frames of reference being similar. Organizational proximity creates a basis for efficient communication and knowledge transfer, which furthermore facilitates collective learning and is a prerequisite for joint creation of new resources and innovation (Knoben & Oerlemans, 2006). *Geographical proximity* refers to territorial, spatial, local or physical proximity (Knoben & Oerlemans, 2006). The importance of this dimension is that short geographical distances facilitate face-to-face interactions. This further enables communication with a high level of information richness and eases the knowledge transfer, especially in the exchange of tacit knowledge (Knoben & Oerlemans, 2006).

Technological proximity or complementarity refers to common technological experiences and overlapping knowledge bases (Cohen & Levinthal, 1990, p. 128; de Man & Duysters, 2005). It does not refer to the technology itself, but rather to what the organizations know about and learn from their technology and the similarity between the business activities that firms pursue, such as R&D, manufacturing and marketing, implying that a good fit leads to higher economic returns (Jacobides, Knudsen, & Augier, 2006; Milgrom & Roberts, 1990). Technological proximity is closely linked to the concept of absorptive capacity, which is a firm's "ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128) and is an important source of innovation (de Man & Duysters, 2005). Literature suggests that memory development is self-reinforcing. This means that the more objects, concepts and patterns that are already stored in the memory, the easier it will be to acquire new information and employ it in new settings (Bower and Hilgard (1981) as cited in Cohen and Levinthal (1990)). For organizations this implies that two collaborating partners should have a common knowledge base in order to apply the newly acquired knowledge in an effective and creative way (Cohen & Levinthal, 1990). Research on alliances also suggests that complementarity plays an important role in determining the success of firms in relationships (Harrigan, 1988). The more different two firms are in their technology knowledge bases, the more there is to learn, but proportionally, the harder it is to learn (Knoben & Oerlemans, 2006).

Cost reduction capabilities are important in long-term survival of a business (Loock, 2012). This factor is particularly relevant when MNCs consider making investments in companies in emerging industries with very resource demanding processes in the first years of operation. In a study on renewable energy investors' preferences for service-driven business models, Loock (2012) proposes that renewable energy investment managers prefer to invest in business models with superior cost reduction capabilities. He even states that business models with low cost reduction capabilities repel away investors.

Internal innovation

Internally generated products or processes are frequently termed as *new product development* (NPD) in the literature. NPD is seen as a transformation of a newfound market opportunity into marketable and saleable products (Gmelin & Seuring, 2014).

According to Kessler et al. (2000), firms should internally develop those technologies that will strengthen their core competencies or increase their competitive advantage. However, Gmelin and Seuring (2014) consider new product development hard because in order to succeed, companies need to develop high-quality, low cost and differentiable products, with high speed and high flexibility. Furthermore, there exist several uncertainties towards customers, technology and competitors in the marketplace, which are elements out of the firm’s control. Therefore, only if an MNC is sure no available existing system will satisfy its needs, in-house technology development should be considered (Leonard-Barton, 1992).

Facilitating internal innovation

Dougherty and Hardy (1996) argue that sustained internal innovation requires a fundamental shift in the configuration of power, from personal network base to an organizational system base. This implies developing an organization-wide capability for sustained innovation, and thereby shifting to a more lasting approach. Power is needed to facilitate, orchestrate and shape it (Frost & Egri, 1991) and must extend beyond the personal and include the organizational behavior (Dougherty & Hardy, 1996). Traditionally, the literature has stressed how the power of rigid processes inhibit change and innovation, however, more recent research has enlightened how such power can be mobilized to stimulate and encourage change. Managers can create momentum for the activities associated with innovation (Pettigrew, 1979) and make these more meaningful to people in the organization (Dougherty & Hardy, 1996). Dougherty and Hardy (1996) found examples of deep mistrust regarding senior management’s commitment to innovate, so there is a need to counter this perception in the organization. Another method of changing the deep structure of power configuration and everyday activities is by actively engaging the innovators of the company in open strategic conversations around innovation. Eisenhardt (1989) suggests that effective managers broaden the number of people involved in strategic conversations. Such processes can deliberately link the right people and emphasize the right criteria, such that resources flow more effectively to the right places in the organization (Dougherty & Hardy, 1996).

If a firm decides to develop the technology in-house, it is important to consider the uncertainties towards customers, technology and competitors, also frequently termed ‘the fuzzy front end’ of new product development in the literature. According to Khurana and Rosenthal (1997), this is where managers find that the greatest weaknesses in product innovation exist. In order to overcome the failure of new product development, it is of great importance that the products that are developed match the company’s competences and strategy. Furthermore, in order for important development projects to succeed, key people need to be available and spend the required time and resources on them. Last, a realistic time perspective of product development is necessary in order to succeed. Many new products are introduced later than originally planned because the product concept becomes a ‘moving target’. This may be due to unclear product definitions, instability and change in markets, or customer needs adding complexity to the end product. (Khurana & Rosenthal, 1997)

3.3.4 Entry mode: Choosing mode of entry

When an industry has been identified and in the case where external innovation has been selected, the next step is to decide on the right mode of entry. Choosing mode of entry is mainly concerned with decisions on how to embed the selected technology effectively within the organization (Gregory, 1995). The right mode is largely determined based on the uncertainties regarding the investment decision, along with other factors which will be elaborated on further (Van de Vrande, Vanhaverbeke, & Duysters, 2009). MNCs can use a variety of entry modes based on different environmental factors.

3.3.4.1 Strategic technology alliances

Strategic technology alliances are defined as modes of inter-firm cooperation where innovation and technology exchange is part of the agreement (Hagedoorn & Duysters, 2002). The term *cooperative agreements* refers to all joint activities that do not involve shared equity (Harrigan, 1988, p. 142). The least committing forms of cooperative agreements are contractual arrangements such as R&D pacts, technology exchange and relevant customer-supplier relationships, which have a one-dimensional perspective and technology transfer that aims at technology achievement (Hagedoorn, 1993). These technology alliances are expected to have an important impact on the long-term product and market combinations of the companies that are involved (Hagedoorn & Duysters, 2002), though they are often short-term in character (Hagedoorn, 1993; Hagedoorn & Duysters, 2002). *Joint ventures* along with *minority equity investments* are examples of strategic technology alliances with relatively strong inter-organizational governance. These alliance forms both involve shared equity of various sizes, and are considered most relevant for the purpose of this paper. (Hagedoorn, 1993)

When to use strategic alliances

Strategic alliances are suitable when MNCs and small technology firms find mutual interest in cooperating on technological development or innovation (Alvarez & Barney, 2001). MNCs can benefit by getting access to new technologies, state-of-the art engineering talent and innovative capabilities, while the small firms get access to funding, resources, experienced management, brand, etc. (Alvarez & Barney, 2001). Furthermore, cooperative agreements are a tool to manage uncertainty related to technology in the competitive environment. Technology is one of the most important bargaining points that firms hold when negotiating the terms of their cooperative strategies (Harrigan, 1988). Therefore, the MNCs often seek equity control over, and close coordination with their ventures involving technological resources.

Negative aspects

There are some negative aspects related to large firms in alliances with small technology firms. Alvarez and Barney (2001) points out that technology firms are at risk when in alliances with large firms, because they can be exploited by their partners. This risk is highest when the only thing the small firm brings into the alliance is technology (Alvarez & Barney, 2001). Then, the large firm can learn from the small firm and potentially shift away resources from the alliance, which will harm the small technology firm. However, these risks can be reduced by writing contracts that recognize these issues, and to facilitate for trust in the relationship. (Alvarez & Barney, 2001)

3.3.4.2 Minority equity investment

Minority equity investment is defined as a shared equity arrangement, which do not create a separate entity nor have significant strategic impact on the firm, like for example majority investments or acquisitions (Harrigan, 1988). Minority equity investments made by large companies in smaller technology companies are examples of cooperation that in the long-run can affect the technology performance of at least one partner. This type of investment is often used as a tool to gain in an alliance as a first step towards mergers or acquisitions. The literature seems to use both the terms *minority equity investments* and *corporate venture capital* investments (CVC) (Basu, Phelps, & Kotha, 2011; Van de Vrande et al., 2009).

When to use minority equity investments and positive factors

A primary motive for pursuing minority equity investment or CVC is to pursuit novel technologies relevant to the investing firm's core business (Basu et al., 2011). In industries with intense competition, incumbents have incentives to use exploratory ties that provide strategic flexibility in response to the competitive environment so that they can keep their options open (Van de Vrande et al., 2009). Furthermore, minority equity investment in a small technology firm can provide the investor with development of complementary products, increase the demand of the investor's products and differentiate them from competitors (Basu et al., 2011).

An advantage of minority equity investment and CVC, is as commented above that they offer *strategic flexibility* and loose inter-firm ties (Van de Vrande et al., 2009). Loose ties provide each partner with more accurate information about the partner's resources, which reduces the uncertainties involved (Basu et al., 2011; Van de Vrande et al., 2009). It also allows investors to reduce the commitment of the investment and downside risk, while retaining their ability to gain via later proceedings. The investment is from an investor's perspective a means to quickly access available external innovation and exploit these external resources to achieve new strategic opportunities. In other words they assimilate potential disruptive knowledge and use it to enter new markets or industries (Basu et al., 2011; Van de Vrande et al., 2009). Minority shareholdings or CVC investments can in general increase the investor company's ability to innovate, increase the market value and the financial returns (Basu et al., 2011).

Even though flexibility is high, the investing company also has a higher level of control in minority equity investments than with non-equity cooperative agreements. Minority equity investments typically involve smaller permanent investments of organizational resources and are easy to restructure or exit in the face of changing conditions (Folta, 1998). This means that the investor has the flexibility to either abandon, scale up or down the partnership activities in response to e.g. environmental changes (Basu et al., 2011; Van de Vrande et al., 2009). Last, minority equity investments also provide strategic benefits, like complementary assets that otherwise would be unavailable. It also gives the firm a signal of quality to other potential stakeholders. (Basu et al., 2011)

Negative aspects

Although there are several positive aspects to minority equity investments, there are also a few negative. Cooperation might suffer in the case of minority equity investment if one firm exhibit self- interested behavior (Folta, 1998). Especially, when the investing firm is powerful and the other firm small and lack of resources, opportunistic behavior may occur.

3.3.4.3 Joint ventures

Joint ventures are business agreements where two or more companies create a separate entity (Cavusgil et al., 2008; Harrigan, 1988). The parties involved in creating a joint venture typically invest money into the new enterprise, which may endure for short or long periods of time (Cavusgil et al., 2008). More accurately joint ventures are referred to as a combination of the economic interests of at least two separate companies, in one separate, distinct entity where profits and losses usually are shared between the partners in accordance with their equity investments (Hagedoorn, 1993).

When forming a joint venture, two firms create new strengths that they would never have managed alone (Harrigan, 1988). This permits the firms to share in the use of technologies otherwise never accessed. Their use also represents an interesting competitive behavior because joint ventures can change the industry structure to the disadvantage of competitors. Companies engaged in this complex cooperative strategy can further be expected to have a long-term perspective on the benefits of the agreement (Hagedoorn, 1993). (Harrigan, 1988)

When to use joint ventures

Joint ventures are organizationally the most interdependent alliance form, though complex and difficult to manage (Hagedoorn, 1993; Harrigan, 1988). Therefore, joint ventures are typically formed when companies lack the necessary assets to exploit an opportunity (Cavusgil et al., 2008). Such complex inter-organizational modes of strategic technology partnering are normally applied by companies if they have motives related to market access and technology (Hagedoorn, 1993). These motives demand greater control by the focal company than any other cooperative agreement (Hagedoorn, 1993). This is gained through complex shareholder agreements and equity investments, which makes joint venture a high governance strategic alliance form. Before entering into joint ventures, managers should be sure to understand complexities that come with this alliance form and how they can affect company performance. (Harrigan, 1988)

Negative aspects

There are several drawbacks in creating a joint venture. Joint ventures for one, entails a complex management structure with low strategic flexibility (Harrigan, 1988), where two once separate companies are to take shared decisions (Cavusgil et al., 2008). Failure to coordinate between the partners might be a concern, and can end in conflict and in worst case, failure of the venture. Especially if the participating firms seek close coordination of all their pieces in a global strategy, shared-equity ventures can restrict this coordination (Harrigan, 1988). Therefore, firms that pursue global decision-making will not use joint ventures as an entry mode into a new industry unless their partner in the joint venture or minor investor is willing to take a passive role in decision-making. This is because shared decision-making and shared ownership can be hard to manage. Another drawback is that the complexity in nature makes it difficult to terminate and splitting the assets can be challenging (Cavusgil et al., 2008).

3.3.4.4 Acquisitions

In the literature, acquisition theory is mostly found together with merger theory, and jointly they are termed "mergers and acquisitions" (M&As). M&As refer to cases where two once separate companies are combined into one company (Hagedoorn & Duysters, 2002), or to the process of combining or gaining parts of companies (Yang, Wei, & Chiang, 2014). *Acquisition* alone refers to when one company obtains a majority shareholding position in another company (Hagedoorn & Duysters, 2002) or becomes the sole owner of that company (Yang et al., 2014). The motives for M&As vary, but the most evident goal of is to overcome the weaknesses and unite the strengths of companies (Falck & Gordon (1979) as cited in Yang et al. (2014)).

When to use acquisitions

Acquisitions are means to achieve greater market power (Hitt et al., 1996). Consequently, acquisitions lead to an increase in firm size as well as securing additional resources and capabilities. Firms can use acquisitions to enter new markets, to improve and strengthen its competitive position in the global marketplace, and to reduce its dependence on mature markets with competitive pressure and high cyclicality. Acquisitions can also be useful to overcome barriers to entry into new and desirable markets, and in some cases it might even be the only way enter (Balakrishnan (1988), as cited in Hitt et al. (1996)). An acquisition strategy can be less costly, require less time and achieve more returns than approaching a new business field internally (Hitt et al., 1996). A "doing it alone" approach might be associated with high risks and be harder to assess. However, in contrast to when a company decides to develop the technology in-house, a targeted firm can provide historical records of accomplishment, which gives the MNC a possibility to analyze the technology and through this forecast future revenues. (Hitt et al., 1996)

An acquisition strategy can in general be a preferred option for companies that seek external sources of innovation (Hagedoorn & Duysters, 2002). When choosing external innovation, the target firm should possess innovative capabilities that are related to the acquiring company's core business, as this would ensure the necessary controls. By acquiring innovative technology firms with recently introduced new products, processes and technology, MNCs can remain innovative and increase competitiveness in their business fields. (Hitt et al., 1996)

Negative aspects

There are some negative aspects of acquisitions. Acquisitions are often associated with being capital intense with large investment sums (Hitt et al., 1996). According to Yang et al. (2014), M&A deals may result in negative outcomes such as market share losses, declining profits, lower R&D intensity and losses for shareholders in the long-term. They are also often associated with the transfer of control mechanisms. The *market for corporate control* is a commonly found term in the literature that refers to transfer of managerial control to new shareholders through control transferring mechanisms such as mergers and acquisitions (Hitt et al., 1996). Acquisition thus activities absorb managers' time and energy, which leads to reduced available resources for other internal projects.

Hitt et al. (1996) also argues that when managers' capacities become strained, emphasis is moved from *strategic controls* to *financial controls*. Strategic control is built on personal and sometimes intuitive evaluation criteria. This entails the use of long-term and strategically relevant criteria for evaluating business-level managers' actions and performance. On the other hand, financial control uses objective criteria such as return on investment (ROI) for such evaluations. It is important to recognize the consequences caused by shifting from strategic to financial control. Strategic controls has a positive effect on internal innovation and development, while financial controls has a negative effect (Hitt et al., 1996). Such development may also be damaging to the target firms, as these new and innovative businesses are implemented into the acquiring firms' organization and thus apply the same set of control systems. The new business is likely to become immobilized by the unfamiliar financial control systems, which may make them less innovative with time. (Hitt et al., 1996)

3.3.4.5 Factors influencing choice of governance mode

Various elements affect a firm's choice of governance mode when acquiring new technology externally. Uncertainties in the industry environment can will ultimately affect the choice of governance mode (Van de Vrande et al., 2009).

Exogenous and endogenous uncertainty

Uncertainty related to choice of governance modes can be divided into exogenous uncertainty and endogenous uncertainty (Folta, 1998; Van de Vrande et al., 2009). Exogenous uncertainty on is uncertainty that can only be resolved with time and is largely unaffected by actions of the firm (Folta, 1998). Examples of elements that can create exogenous uncertainties are *environmental turbulence* and *technological newness* (Van de Vrande et al., 2009). Endogenous uncertainty refers to uncertainties that can be decreased by actions of the investing firm through organizational learning (Folta, 1998). Projects involving a large degree of endogenous uncertainty have added potential outcomes and more growth options, which makes it attractive for investment. Typical elements that cause endogenous uncertainties are dissimilarities between firms caused by for example *technological distance* and *lack of prior cooperation* to overcome information asymmetries (Van de Vrande et al., 2009). An optimal governance mode for dealing with endogenous uncertainty should consider where learning and technology transfer can take place more efficiently (Folta, 1998).

Environmental turbulence

When environments are turbulent, it is typically caused by unpredictable changes due do radical innovations, and the phenomenon can typically be found in high-tech industries where technologies change rapidly (Van de Vrande et al., 2009). When the environment is turbulent, it is typically in an entering firm's best interest to keep its options open and the flexibility high because of the high level of exogenous uncertainty about the future developments of the industry and market. Thus, less integrated governance modes such as minority equity investments and corporate venture capital (CVC) are preferred governance modes in turbulent environments because the investing firm has the option of retracting easily from the cooperative agreement if the results are not satisfying. Also, there is an option to 'bet on more than one horse at the same time' (Van de Vrande et al., 2009, p. 66). Harrigan (1988) also concluded that in volatile competitive environments, firms will be less willing to commit capital to the risk of highly formalized venture agreements, and will be more prone to choose one-dimensional cooperative agreements. This view is also supported by Hagedoorn and Duysters (2002)'s findings that flexibility and opportunity to learn through loosely structured agreements appears to be increasingly important in industries with high technology intensity and that in industries with low technology intensity, formal control and integration through M&A's become increasingly important. Harrigan (1988) found that when the competitive environment is stable and activities are of high strategic importance, firms are more inclined to choose acquisitions or joint ventures.

Technological newness

The second source of exogenous uncertainty is technological newness, and refers to the uncertainty related to the potential for the product or technology of a new business in which a firm may invest (Van de Vrande et al., 2009). Such uncertainties cannot be influenced by the investing firm, and typically reduces with time when the investing firm gets a better understanding of the technology and its market potential. Thus, it will be in the investing firms' best interest to make small, learning investments in the beginning, reducing uncertainties about the business potential through time and learning. Indeed, the results presented by Van de Vrande et al. (2009) found that technological newness indeed had a negative effect on the use of M&As and joint ventures. They also found that minority equity investments and CVCs were preferred over non-equity cooperative agreements. Van De Vrande, Lemmens, and Vanhaverbeke (2006) also found that when technological uncertainty is very high, firms prefer the use of governance modes that are reversible and require low commitment. Furthermore, Folta (1998) found support for technological uncertainty leading to a preference for equity collaboration over acquisition.

Technological distance

The choice of governance mode can be affected by the lack of similarities in the companies' knowledge bases, and is an example of endogenous uncertainty (Van de Vrande et al., 2009). Dissimilarity between company knowledge bases can lead to a limited ability to detect, adjust and integrate technology that is different from core technology. Thus, the absorptive capacity of the firm is limited, and effective transfer of knowledge through integrated governance modes such as acquisitions might be favored. Technological distance can also lead to uncertainty about the partner, which forces the focal company to safeguard against opportunistic behavior. In order to overcome danger of information asymmetries and increase efficient transfer of knowledge between partners with large technological distance, higher levels of integration can be preferred. This is supported by Hagedoorn and Duysters (2002), who found that external sources of innovative capabilities will take the form of M&As for companies related to core business, while strategic alliances such as cooperative agreements or minority equity investments will be used for non-core businesses. Firms seem to prefer M&A's if the potential partner has capabilities related to their core business regardless of the industry environment (Hagedoorn & Duysters, 2002). As previously listed, the same study found that in high-tech industries, prevalence for low commitment governance modes was preferred. Furthermore, Folta (1998) found strong support in his hypothesis that partners with dissimilar primary business operations should prefer equity collaborations over complete acquisitions, and that information asymmetries are best resolved through sequential investment or through transition from low to high commitment governance modes.

However, investing firms can fail to realize gains from their acquisitions (Hitt et al., 1996). Prior to acquisitions, firms engage in negotiations to attract the highest price possible, while target firms may withhold important information. This makes it hard for the acquiring firm to predict potential synergies with the target firm accurately. Further, such information asymmetries may lead to problems when acquired assets are integrated into the acquiring firm, and economies of scale can turn out lower than predicted (Hitt et al., 1996). As large knowledge base dissimilarities might take time to ease out, low levels of commitment with slow learning through minority equity investments might be preferred (Van de Vrande et al., 2009). Actually it has been found partial support for that technological distance has both negative and positive effect on use of integrated governance modes, and that there is no linear relationship between technological distance and governance modes (Van de Vrande et al., 2009).

Lack of prior cooperation

Another important indicator for endogenous uncertainty is whether partners have been engaged in previous cooperation (Van de Vrande et al., 2009). Prior cooperation between partners can limit endogenous uncertainties through previous learning and knowledge transfer, and in such overcome information asymmetries. If firms have not engaged in prior cooperation and the information asymmetries are high, they might be more inclined to use flexible alliance forms such as *transitory alliances*. Transitory alliances are alliances where the firm first enters using a non-equity alliance, potentially CVC or minority equity investment. If the development goes well the commitment may be increased with time and learning, and finally scale up to a high commitment governance mode, such as acquisition.

When information asymmetries exists and there is a lack of prior cooperation, joint ventures are preferred above acquisitions because the costs of valuing the target organization is strongly increased (Balakrishnan and Koza (1993) as cited in Van de Vrande et al. (2009, p. 68)). O'Dwyer and O'Flynn (2005) state that equity joint ventures are an effective means to transfer tacit knowledge between partners when this is necessary. However, Harrigan (1988) argues that if the key resources needed for success in an industry are knowledge-based, it is less likely that companies will form joint ventures because the knowledge in question cannot easily be protected (Harrigan, 1988). On another hand, if shared technology development is capital intensive, joint ventures are more likely to be considered than if the technology development is labor-intensive because close coordination between the companies is easier.

Furthermore, opportunistic behavior can be reduced through prior cooperation. Through prior cooperation, trust can be developed (Van de Vrande et al., 2009) and lead firms to the use of non-equity based alliances rather than equity-based alliances (Gulati (1995) as cited in Van de Vrande et al. (2009)). Accordingly, lack of prior ties can be an argument for a firm to apply more hierarchal governance modes. In fact, Van de Vrande et al. (2009) found partial support for their hypothesis that prior cooperation has both positive and negative effect on the use of more integrated entry modes, and that minority equity investments and joint ventures are preferred over non-equity alliances, and further that these strategies are preferred over M&As. (Van de Vrande et al., 2009)

Industry development phase and innovation

Joint ventures is according to Harrigan (1988) important in the development and renewal of industries, and in the development of firms' competitive advantages. If the industry is under slow growth, joint ventures are particularly attractive because managers find it difficult for firms to survive independently. This is because in such industries projects are large and risky, with very expensive technologies and the challenges of global competition increase (Harrigan, 1988).

Hitt et al. (1996) conclude that an active acquisition strategy is more likely to be successful in industries where innovation is less important, like mature industries, where internal efficiency improvements can produce greater returns. Their research shows that an active acquisition strategy has a direct negative effect on internal development of firm innovation, and that the least innovative firms are the firms who choose a portfolio strategy, and therefore regularly acquire and divest businesses. Likewise, de Man and Duysters (2005) found that alliances are to be favored over M&A's because they are an important source of innovation. Managers should not engage in M&As for innovative renewal, unless their goal is saving costs. This is also in line with the findings of

Hagedoorn and Duysters (2002) and Basu et al. (2011), that strategic technology alliances and CVC investments, respectively, increase the possibilities for firm innovation.

Market attractiveness

The market attractiveness is a factor that also influences the governance mode. The more attractive the market is to a company, and the bigger the perceived reward is, the more tempting the use of cooperative strategies to enter will be (Harrigan, 1988). In particular, where the costs of entry is high and the payback time on investment is short, joint ventures can be a tool for companies to enter the market quickly and to spread potential risks between partners. However, whether a joint venture is the best option for strategic technology partnership or not depends on the uncertainties related to demand and growth of the market. When demand uncertainties and business risks are high, low commitment cooperative agreements will be used more frequently than high commitment modes of governance (Harrigan, 1988). To conclude, joint ventures are preferred when risks are moderate or low, and more frequently used to ease firms out of a declining or troubled industry.

3.3.5 Protection: Preserving knowledge

The last element in the adapted technology management process by Gregory (1995), is protection. Protection is important, and concerns preserving the knowledge and expertise that are embedded in the technology partnership or investment. Corporations in possession of heavy investments, tacit knowledge and expertise built through careful technology management over long periods of time should make an effort to protect these values and preserve the competitive edge they have created. Furthermore, correct protection may also be a tool to block competitors. Blind et. al (2009) as cited in Grimpe and Hussinger (2013) describe this as a strategy for protecting a firm's position in areas of intense technology development, and thus secures the firm's 'freedom to operate'. Protection can be sought through legal routes such as licensing or patenting and should be considered during all the phases of technology management; development, acquisition and product design (Gregory, 1995). Patents give an exclusive right that protect a technology or solution for a distinct period of time (Yang et al., 2014). They also provide a good overview of a company's technological and innovative capabilities. Furthermore, patents can be used as a tool to assess whether a target firm has similar technological organizational capabilities to the focal firm, as well as for analyzing a firms' technological progress. (Yang et al., 2014)

3.4 Application of theory

The literature studied and presented above proposes an explanation of different elements important to large multinational corporations investing in an emerging industry, and thereby the marine energy industry. A modified version of the technology management framework developed by Gregory (1995) is applied as a basis to elucidate each process and systemize the necessary activities prior to and post entry into a new industry. Emerging industries have not yet reached a commercial state, where exploitation of the technology and the market are important factors. Therefore, only the elements in the process from the idea of entry, through the initial entry and to current situation will be focused on in this paper. The four topics, identification, selection, acquisition and protection, as presented in Figure 6 will be brought forward in this case study when applying the theory to the current situation of the wave and tidal industry.

According to the main research question: How is the process of MNCs investing in the emerging marine energy industry? and the three sub-questions: (i) How are opportunities in new industries identified and why do some MNCs choose the marine energy industry?; (ii) How are potential technological opportunities assessed and selected?, and (iii) Why is a particular entry strategy chosen, and how does this develop over time?, the three first important topics identified in the literature are very suitable. However, the last topic protection stands out, as it does not immediately fit to a specific sub-question. The topic still appears to be of importance when investing in new technology, and generally in technology management. Therefore, according to the main research question, considering how the process is as a whole, it will be included further in the study. Finally, the research questions will be discussed in light of this literature review, the industry review and the findings and analysis, in the discussion.

4 Methodology

This master thesis is a subsequent study to our project thesis conducted in the fall of 2013. The project thesis considered partnerships of the technology developers in the wave energy industry. Although the focuses of the two papers differ, they are both set in the same sector, the marine energy industry, though adding the tidal energy industry. A great deal of our general understanding of the industry and the actors within it therefore originates from this project thesis. The focus of this paper is on the large multinational corporations that have entered the marine energy industry by investing in wave and tidal technology companies. More specifically, this case study aims to analyze the process of MNCs investing in the industry, identify the entry modes used and explore how the entry strategies changes over time.

The following section explains how we have conducted our research, in order to ensure reliability and to secure that later researchers may find the same conclusions if conduct the same study (Yin, 2014). Yin (2014) considers case study research to be a linear, but iterative process, consisting of a plan, preparations, research design, data collection, data analysis and presentation of findings. This chapter therefore explains the plan and the intention, of this master thesis, and why case study was selected as the most suitable research method. The design section elaborates on the case study design used in this paper. The data collection section summarizes which sources of evidence we have utilized and how these were accessed. The fourth section, evaluation of the research design, assesses the quality of this research by using tests provided by Yin (2014). Three of these four tests are relevant to our study, namely construct validity, external validity and reliability. Analyzing case study evidence is concerned with explaining how the findings from the case companies can be analyzed in terms of the literature review. The final chapter seeks to explain in which ways this research could have been conducted differently, and thereby achieving potentially better results.

4.1 Plan

The aim of this paper is to explore the entry process of large MNCs investing in the wave and tidal energy industries.

How is the process of MNCs entering the emerging marine energy industry?

More specifically:

i. How are opportunities in new industries identified, and why do some MNCs choose the marine energy industry?
ii. How are potential technological opportunities assessed and selected?
iii. Why is a particular entry strategy chosen, and how does this develop over time?

The main research question is concerned with the process MNCs go through when entering the marine energy industry. More specifically, the three elaborating questions regard three different stages of the entry, namely 1) identifying a new industry providing new opportunities, 2) assessing and selecting potential technological opportunities within the selected industry, and 3) why a particular entry mode is chosen and how this evolves over time.

The nature of these research questions indicates that this paper is exploratory. Exploratory studies may be carried out through several different research methods (Yin, 2014). However, Yin (2014) suggests the use of case study method when exploratory studies with *how* and *why* questions, are conducted in contemporary events when the relevant behaviors cannot be controlled. The emergence of the wave and tidal energy industry is currently happening and its complexity leaves researchers with little or no control over the development. Case study is therefore the most suitable research method for this paper.

4.2 Design

This case study has a multiple-case design, meaning that the findings are based on several individual case studies. All six MNCs have been studied as subjects of individual single-case studies, however the study looks at all six companies as a whole and hence a multiple-case design is applied (Yin, 2014). The entry process and important factors to consider have been explored for each case company, and the findings have been sought replicated by the following cases. Therefore, each case supplied new information that was either congruent or different to the previous cases. The case companies were selected due to their similar nature as large multinational industrial companies that are investing in the wave and tidal energy industry. This selection process is considered literal replication (Yin, 2014), and the underlying replication logic assumes that the case similarities will cause the cases to support similar findings. The focus on the companies' strategy, motivation and entry process implies several subunits within each MNC. This case study can therefore be described to have an embedded design (Yin, 2014).

4.3 Data collection

Yin (2014) discusses six sources of evidence, which are most commonly used in case study research, namely documentation, archival records, interviews, direct observation, participant-observation and physical artifacts. Sources used in this study are documents, interviews and direct observations. A detailed overview of our sources is listed in Table 3. The Findings chapter of this paper shows that some of the findings are supported through all three sources of evidence. This is referred to as data triangulation and is believed to strengthen the construct validity of the findings (Yin, 2014).

4.3.1 Interviews

Our research question directly addresses MNCs entry process into the marine energy industry. Interviews with key representatives from these MNCs are therefore the main source of case study information in this paper. Interviews with representatives from the technology companies the MNCs have invested in has been included to provide more information on the details around the investment from their perspective, e.g. on their motivation to get a large industrial actor in as an investor. Including more interviewees from each case also prevents bias and has helped us grasp the information from the organizations' point of view rather than from that of individual interviewees. This further increases the reliability of the findings. Due to some sensitive information collected from this research, the case companies have requested their identity is kept anonymous and therefore provided aliases. The companies are all given fish name aliases due to the marine nature of their activities. Tidal or Wave is added to the name in the case of the technology companies explaining the technology they are developing. Information that easily reveal the identity of the companies or interviewees, such as names of company divisions, have been generalized, e.g. all divisions handling the ocean power business have been renamed the ocean power unit, and all the interviewees are referred to as male. However, to increase the reliability of the study, the positions of the interviewees have been included in the table below.

Table 3: An overview of the interviews conducted for this study. The interviews are listed by MNC; the perspective of the interviewees' is included as well as the date of the interview.

Case companies interviewees	MNC	Tech.	Date of interview
Catfish Corporation			
Head of the ocean energy department in CC and managing director of CCT	✖	✖	27.02.2014
Eel Enterprise			
Director at EE	✖	✖	08.04.2014
Goldfish Global			
VP and Head of Sales and Product Management (S&PM) in the ocean power unit of GG	✖		27.03.2014
Head of Technology and Innovation (T&I) in GG	✖		06.03.2014
VP of Engineering unit in GG (became the CEO of GWW after the interview was conducted)	✖		26.02.2014
Business Development Manager of GWW		✖	21.03.2014
Icefish International			
Business Development Manager of the ocean power unit in II	✖		26.02.2014
Commercial Manager of the ocean power unit, was previously Project Development Manager of IIT		✖	11.03.2014
Mackerel Multinational			
Head of New Investment unit and board member of MMT	✖		21.03.2014
Independent consultant hired by MMW, previously Public Affairs Manager of MMW		✖	10.03.2014
Whitefish Worldwide			
VP in controlling in WW and board member of WWT	✖		20.03.2014
Turbine System Engineer in WWT		✖	27.02.2014
Shareholder of WWT		✖	18.02.2014

The Institute of Industrial Economics and Technology Management at NTNU have conducted research on the ocean energy industry previously. This research, particularly our project thesis from the fall semester of 2013, has been helpful in providing us with an understanding of the industry. With funding from Centre for Sustainable Energy Studies (CenSES) we have also attended two ocean energy conferences; Ocean Energy Europe 2013 (organized by the European Ocean Energy Association) in Edinburgh and Renewable UK's Wave and Tidal 2014 conference in Belfast. These conferences have also contributed immensely in our understanding of the industry development, the actors of the industry and been crucial in establishing contact and schedule interviews with most of the MNCs included in this study. Through these sources, we were made aware of and familiar with the large industrial actors in the industry.

Our starting criterion when identifying potential case companies was large MNCs that are currently investing in wave and/or tidal technologies. Due to the early emerging state of the wave and tidal industries, the list of relevant companies consisted of less than 20 firms. We then limited the list to industrial actors with a major presence in Europe and the UK, which left us with a list of less than 10 companies. The nature of this paper creates a need to interview people working on a strategic level of the company. These proved to be busy people and hard to reach, however, after repeated efforts we managed to get seven companies that seemed interested in participating in our study. Our primary ways of reaching our contacts were through emails and in person at the conferences. Meeting in person was as mentioned the most efficient mean, but emails through LinkedIn also proved to be an efficient communication channel. Some of our interviewees also became informants by referring us to other people of interest, both within their own company, but also to employees of competing companies. When we were organizing our interviews however, we were unable to get in contact with our seventh case company, bringing our study down to the final six case companies.

Our method of finding and selecting the subjects for our study is considered to be quota sampling, which is defined as a non-randomly selected sample of a "population in terms of the relative proportions of people in different categories" (Bryman & Bell, 2007, p. 731). Through our selection process, we narrowed down our scope by excluding utility companies, and merely focusing on industrial MNCs.

In preparation to the interviews, we made an interview guide with the main topics that were relevant to our research questions. These topics were covered in all the interviews, but the formulations of the questions were adapted to fit the individual conversation in each case interview. The formulation of our questions were also improved throughout the interviewing process as our growing level of interview experience, increased our ability to formulate the questions in a manner which retrieves the answers we were looking for. The interviews we conducted can according to Yin (2014) be categorized as focused interviews with open-ended questions within a short time frame. The questions allowed for the interviewees to elaborate on the relevant topics, and to express their perceptions. The duration of the interviews was approximately 30 minutes.

The very first interview was conducted on an audio conference, and gave us information on the acquisition process of Whitefish Worldwide Tidal. The four next interviews were conducted in person at the Belfast conference. The following eight interviews were all conducted by audio conference. A recording device was utilized in all the interviews by permission from the interviewees, and allowed us to be more flexible during the conversation. We were all asking questions during the interview, but had each our main responsibility on one single part, or section. Similarly, we were all taking notes when this seemed necessary, but mainly when some of the others were leading the interview. This was to ensure a more organized and structured interview. The recordings were transcribed, and these transcriptions along with the notes were used to write interview summaries, which later were emailed to the respective interviewees for approval. The interviewees first reviewed and then approved the text, and emailed it back to us. We thereby ensured that the summaries represented their correct opinions and not influenced by our possibly subjective perceptions. These measures are considered to increase the construct validity of the study (Yin, 2014). Thereafter the information in the interviews regarding the same case company was merged into the case company summaries presented in this paper.

4.3.2 Documents

Documents were used as the main source of evidence in the literature review and the industry review. The documents used for the industry review were mainly journal articles and industry reports.

4.3.2.1 Documents concerning the theory chapter

The theory is provided to help generalize and support the findings from our case study. This kind of generalization is analytic, and refers to the use of previously developed theory as a template to compare empirical findings (Yin, 2014). Analytic generalization increases the external validity of the case study by making the findings applicable beyond the scope of the immediate study. In order to answer the research questions, we have primarily used literature revolving emerging industries, entry modes, technology management and innovation. The theory on the entries are related both to important selection criteria when assessing technologies and/or companies and different entry modes. Some theory on the different actors in the marine energy industry and emerging industries in general is included to supply a better understanding of the situation of this industry.

When we started on our literature review, we wanted to start wide to ensure that we did not miss out important parts of the theory. During our search for appropriate literature for this chapter we used online databases provided by the university, such as Scopus, Bibsys Ask and Oria. We first started by browsing articles concerning MNCs and how they enter new industries. There seemed to be limited available research in this field, so we tried different approaches by including other keywords, such as "market entry strategy", "MNE's", "MNCs", "joint ventures", "acquisitions", "emerging industry", "motivation", "partnerships", "strategic alliances", "strategic technology alliances", "process", "R&D", "innovation", "external innovation", "new industries", "governance mode", "technology management" and a combination of these. Overall, we did not conduct a structured literature search, but rather started by searching the databases, and gradually found more and more relevant articles. Relevant articles created a snowballing effect, where we found new articles through the references. Google Scholar was frequently used to access specific articles when the name and authors of the articles were known. We were also supplied with a few articles from our supervisors in addition to tips on additional search keywords such as “proximity” and “entry process”. Following our discovery of the technology management process framework proposed by Gregory (1995) we used this framework to structure our literature review, and thereby it became more apparent which sections that needed more work and vice versa. This framework is used throughout this paper to describe elements in the processes firms go through when appropriating to external technology. A short introduction to which companies are present in the relevant industry and their motives for entering is included. Literature on emerging industries has also been included in this paper.

The available literature on entry modes is extensive. The utilized sources are therefore from acknowledged journals and respected authors, and considered reliable. The available theory covering emerging industries is however less extensive, and less credible sources were used due to the lack of recognized literature. We mainly used articles from respected journals within the fields of management and strategy. When available, we further chose articles from respected authors within the respective fields, and articles that had been cited several times. All this was done in order to increase the construct validity.

4.3.2.2 Documents concerning the wave and tidal energy industry

When researching the wave and tidal energy industry we found a lot of information with various levels of credibility. To ensure good quality and reliability, we decided to focus on industry reports provided by research institutions. We believed these to provide objective analysis and observations of the current and future state of the industry. Industry reports from organizations and agencies such as the UK Department of Energy and Climate Change (DECC), Enova, European Ocean Energy Association (EUOEA), International Energy Agency (IEA), International Panel on Climate Change (IPCC) and Renewable Energy Policy Network for the 21st Century (REN21) were therefore the main sources of evidence. Reports and documentation directly related to the industry in the UK and the marine energy resources in the UK are taken from UK organizations such as Renewable UK and the Carbon Trust. Some written documents and pamphlets from the Ocean Energy Europe 2013 conference in Edinburgh and the Renewable UK Wave and Tidal 2014 conference in Belfast. Additional sources such as websites and news articles were also used, but then mainly to back up or provide more detailed descriptions if necessary. Such sources might be influenced by the opinions of the writer, and their objectivity might therefore be questionable (Yin, 2014). The credibility of these sources was always evaluated, and if it was found questionable we tried to find additional sources. We also brought with us loads of our knowledge from our project thesis from the fall of 2013. The industry review in this master thesis is therefore to a large extent based on the information collected during our work with the project thesis.

4.3.2.3 Documents concerning the case company information

To verify and supplement the information obtained through the interviews with the case companies, we used the companies' websites, online news articles and press releases. The reliability of these sources of evidence can be considered questionable as they can be colored by the perceptions of the author (Yin, 2014). However, as they were only used to triangulate the data from the interviews, they were considered reliable enough for this context. After the interviews, we wrote summaries that the interviewees were asked to approve of or if necessary edit. We also emailed them some additional questions in those cases we felt the need to get more detailed descriptions or more elucidating information. Only one interviewee proved impossible to get a hold of. As our follow-question e-mails remained unanswered, the information on the case company Catfish Corporation is therefore not as comprehensive as the other case companies. On the question on whether the information in the summary is correct our email stated that fail to reply to our email will be perceived as an approval and therefore used in our study. The information on Catfish Corporation is thus considered equally reliable as that of the other case companies.

4.3.3 Direct observations

We attended the European Ocean Energy Conference in Edinburgh on the 29-30th of October 2013. This conference addressed the challenges facing the European ocean energy industry. We also attended the Renewable UK Wave and Tidal conference in Belfast on the 26-27th of February 2014. Before the conferences we had browsed through the delegate list and identified the representatives that we were interested in talking to. We had also sent them a personal message through LinkedIn introducing ourselves and asking for time to discuss our study. A few of the interviews were conducted during the conference, but most interviews were scheduled at the conference and conducted later. The conferences allowed us to meet several of our interviewees in person and to introduce our study.

We took some notes during the speeches and we recorded some of the most relevant panel discussions at the conference. The Edinburgh conference was mainly used for our project thesis of the fall 2013, however we also came in contact with one of our interviewees for our master thesis there. This conference gave us a better overview of the industry as a whole and of relevant actors. During the Belfast conference we were actively searching for the people of interest to us, and this conference gave us an even better understanding of the dynamics of the industry.

4.4 Evaluation of the research design

Yin (2014) presents four tests for judging the quality of a research design. Three of these are relevant to our study, namely construct validity, external validity and reliability. The fourth is mainly concerned with explanatory case studies, and is therefore excluded from this evaluation. The *construct validity* is concerned with the subjectivity of the researcher resulting in a non-objective study. The construct validity of this paper is believed to be quite strong, as we have adopted several tactics in order to ensure this. The use of multiple sources of evidence, triangulation of data and utilizing documents from reliable sources are all measures used to increase the construct validity. The use of recording devices during the interviews ensured the accuracy of the interviews, and reduced the risk of subjective interpretations. Further, by having the case companies approve of the case summary text, these are believed to represent the current situation, as perceived by the case companies. By interviewing several people from the same case company we also reduced the risk of bias and thereby improved the objectivity of the information. Unfortunately, we were not able to get in contact with more than one representative in two of the companies, which somewhat reduces the construct validity of our case study. However, in the four other case companies we interviewed form 2-4 representatives with rather induces the construct validity. Due to our selection of articles on the different theory topics the construct validity will to some degree be reduced. Our choice of keywords and the combination of these, along with the limited number of databases used, might have caused us to fail to include relevant articles. The limited theory available on emerging industries made it challenging to get an all-embracing overview of the topic. This has made the theory focus on a limited number of aspects, which might have led to a less comprehensive theory base. However, we have made sure to mainly use highly acknowledged journals in the search for literature.

The *external validity* defines the domain to which our findings can be generalized. In case studies like this, it is important to make out that the generalizations in questions are analytic generalization, and not statistical (Yin, 2014). The external validity is strengthened by using theory in single-case studies and replication logic in multiple-case studies. Both of these tactics have been used in our paper, and we therefore believe the external validity to be quite strong. We have considered MNCs with a variety of adopted entry strategies into the emerging industry, as well as explained how they differ; our results may therefore be generalizable for large international corporations entering emerging industries. As UK is the leading nation of the marine energy industry, our study mainly comprises companies investing in UK based technology. A weakness to the external validity is therefore that MNCs investing in UK companies may not necessarily be generalized to MNCs investing in technology companies based elsewhere. However, the international nature of MNCs and the fact that they are accustomed to entering new business fields more or less regardless the nation, our findings may be considered valid also for MNCs investing in emerging industries in other nations. Another factor that may reduce the generalization of this case study is that the UK government is very engaged in this particular industry and has set up a solid support system helping the industry to grow. This is rather the exception than the norm for an emerging industry. This said, our findings do account for this factor and thus should still keep the external validity to a reasonable level and the process of MNCs entering in any other emerging industry, regardless the country may therefor be similar to what we found.

This methodology chapter is included to increase the *reliability* of our paper. The reliability of a study is related to whether a later investigator can arrive at the same findings and conclusions (Yin, 2014). To ensure this we have explained how we have found and selected the articles the theory is based upon, and how the empirical part of our study has been conducted. All of the sources of evidence used to conduct this case study have further been included in the bibliography. A weakness to the reliability of this paper is the anonymous identity of the case companies, making it impossible for later researchers to conduct the exact same case study. However, we have interviewed several of the large industrial MNCs involved in this industry, and if researchers were to repeat our study they are likely to result with an overlapping sample of case companies. They should therefore arrive at similar findings to those presented by this paper. Though an important questioning regarding the reliability of our paper is the dynamic nature of the wave and tidal energy industry. Our findings are based on the current conditions, and they are likely to change with the future development of the industries. However, as long as these factors are taken into consideration, the overall reliability of this paper is believed to be strong.

4.5 Analyzing case study evidence

Analyzing the case study evidence involves "examining, categorizing, tabulating, testing and otherwise recombining evidence, to produce empirically based findings." (Yin, 2014, p. 132). With the research questions being of an exploratory nature, the analysis of the empirical findings has been predominantly concerned with understanding and describing the process MNCs go through when entering the marine energy industry. Yin (2014) defines this strategy as developing a case description. Through the literature review, we decided to focus on the process of MNCs investing in an emerging industry, elements of technology management and the selection process when selecting an investment. The theory on these topics in the context of an emerging industry is limited, and this paper seeks to contribute to cover this gap. We further try to explain our findings, and these explanations can be considered suggestions for further research. Cross-case synthesis is an analyzing technique that is used in multiple-case studies. After conducting the case interviews we created word tables, summarizing the eight companies' views on several specific categories linked to the literature review. This word table was further used to identify the key findings of our case study. Results from this word table are illustrated in tables found in the Findings chapter.

4.6 What could have been done differently?

When considering this research design in retrospect, we acknowledge that we could have conducted our study somewhat different. However, we are not sure changing the research design would necessarily have made our study better, as we believe our approach has been appropriate for the purpose of this paper. Factors to consider are that the study could have been a more in-depth study on the chosen entry modes of the MNCs. We could also have conducted prolonged case study interviews either with longer interviews or with several interviews over an extended period of time (Yin, 2014). This could have provided us with an even better understanding of the dynamic character of the entry process. The time perspective available when working on this paper, and the location of the interviewees made however such in-depth interviews difficult and we had to settle with shorter focused interviews.

All the interviews could have been conducted in person, which would have given a more personal interaction. This could have reduced the risk of misinterpretation and made the communication more efficient. However, the budget and time span of this study combined with the location of the case companies made this impossible. Interviewing even more people from both the MNCs and from the technology companies could have increased reliability and provide us with an even more in-depth understanding of the investments. In addition to this, we could have included the utility companies as these actually play an important role in this industry, both as investors, co-developers and potential customers. This could have provided us with a more balanced view of the entry process, though a more comprehensive approach would not have been possible due to time limitation.

An alternative to our approach in this case study with the time perspective could have been to conduct more in-depth interviews on more interviewees, though considering fewer cases. Another option could have been to conduct survey-like interviews on a much larger sample, and thereby obtained quantitative data that are easier to compare (Yin, 2014). A combination of focused interviews and survey-like interviews could also have been conducted to provide the interviewee the freedom while still obtaining a degree of quantitative data. However, due to the limited number of large MNCs involved in this industry, it would have been challenging to attain quantitative data. Regardless, as mentioned initially, we believe our selected research method has been appropriate for the purpose of this paper, particularly regarding the immatureness of this industry.

5 Case company presentations

This chapter presents the information gathered through the interviews and from the case companies' websites. Each presentation goes into details regarding the motivation for entering the ocean energy industry, the entry process and selecting entry mode. The selection criteria used when assessing the technologies in the industry are also presented. Thereafter the presentations contain a section regarding the objectives and long-term strategy of the companies.

The interviewed case companies of this study are six MNCs active in the ocean energy industry. All the companies are already large global actors within the energy industry, and several of them are dominant players in the conventional hydropower industry. Some companies have experience from the wind energy business as well, while others have maritime experience. Nearly all the companies do their technology development in the UK, and all the companies have their prototypes tested off the UK coast. The companies are listed in an alphabetic order according to the assigned alias.

5.1 Catfish Corporation

5.1.1 About the interviewee

The interviewee is the head of the ocean energy department in Catfish Corporation (hereafter Catfish) and the managing director of the tidal technology of the company.

5.1.2 Motivation for entering the industry

Catfish was seeking an industry with a growth potential that was similar to their core business, the hydropower. The company considered the ocean energy industry to be quite similar to their core technology, and therefore an interesting investment area. The ocean energy further presents a large opportunity in an industry with vast global resources. The managing director found this an opportunity not to be missed and expresses the move into the tidal energy industry as "a logical step in the development of our competences in the field of hydro power".

5.1.3 Process of entering

Catfish first started considering an entry in the wave and tidal industry in 2004. They started by doing a market assessment, and entered in 2005 by acquiring the wave technology company Catfish Corporation Wave (hereafter CCW). Later, in 2009 they started an in-house development of a tidal energy technology, Catfish Corporation Tidal (hereafter CCT). CCT was started as an 80:20 joint venture, where Catfish had the majority shareholding position of 80%. The decisions to make the ocean energy investments were first made at group level, but approved by the top

> *"Entering the tidal energy industry was a logical step in the development of our competences in the field."*
>
> *- Managing Director*

level and by the owners.

The development of the turbine required Catfish's engineers to conceive appropriate solutions that face the requirements of the ocean. The technology is therefore not simply a modification of the known wind turbine technology, but represents an independent design concept based on Catfish's experience in hydro and ocean technology. The development process combined with decades of experience gave rise to a new generation of turbines, which are according to the company: simple, robust, efficient and deployable worldwide, and under strict environmental and economic standards. (Company website)

In 2013, a decision was made to no longer keep CCW as an active company. The knowhow, experience and people are still in the business, but the division is currently focusing on the tidal technology, CCT. In 2014, the 20% shareholder of CCT decided to exit, leaving Catfish the sole owner of the company.

5.1.4 Important factors when choosing technology

Catfish considers the technology itself to be the key factor when investing in or acquiring a technology company. With the resources of Catfish as a large industrial actor, anything but the technology could be changed if necessary. The technology of CCW fulfilled the requirements for innovative forms of renewable energy conversion at an acceptable cost (company website), which was also very important. Other important factors to consider are technology simplicity, maximum reliability, sturdiness, maintenance requirements and predictability. For example a tidal turbine has to meet demanding requirements: strong currents and the resulting high mechanical loads on materials, long operating times, long maintenance intervals, cost effective installation and high efficiency.

5.1.5 Entry strategy

Catfish is among the companies who have been involved in both wave and tidal, although they are currently just focusing on the tidal technology. The first entry into the wave and tidal industry was made through the full acquisition of CCW. The wave technology company was in a difficult situation at that time and in the need of a rescuer. This situation made the matter more urgent to Catfish, and forced them to make a quick decision whether to invest in the company. At that time, the alternatives were either a full acquisition or no acquisition at all, due to the struggling phase the company was going through. The tidal technology development is however a completely different story. CCT was developed from scratch through the joint venture explained earlier.

Catfish generally prefers a majority shareholding position in order to be in control of the acquired company. Staying as a minority shareholder could be an alternative if Catfish did not seek to change anything in the newly entered company. However, that is rarely the case as Catfish often seeks a drastic change within a newly acquired company, or to fully integrate the technology with the relevant technology department in Catfish. They acknowledge that the safest way to enter a new sector is likely to be the stepwise approach where the minority shareholder can sit back and learn about the industry. This approach however, prevents the investor from intervening and making changes. There will always be a trade-off between risk and control, and Catfish prefers being in control. The company further highlights that an investment in any industry will be reviewed frequently. However, investments in emerging industries are generally reviewed more frequently due to the high levels of uncertainty and risk.

5.1.6 Main objectives and long-term strategy

Catfish pursues a long-term business strategy based on global presence, innovation, a balanced product portfolio and financial independence. For the company to remain in this industry, the tidal technology must become a stable, self-financing business making profit like any other business. It is emphasized that believing in the technology and supporting the development with a long-term strategy is necessary, as developing this type of technology and industry is a time-consuming activity. Catfish will continue their focus on CCT because they believe in this company, and because it makes no sense to switch focus from business to business. Catfish considers a key factor for success to be commitment, and have decided on a long-term commitment to the CCT technology.

5.1.7 Main challenges when entering an emerging industry

The biggest challenge faced by the wave industry in general, at the time being, is to lower the costs. The biggest challenge faced by developers is the need to construct sturdy, corrosion-resistant plants, which will run reliably in salt water (company website). The wave climate is very tricky and demanding the developer to design for the extreme but dimension for the average wave conditions. These demands make the leveled cost of energy very high, and this challenge is by Catfish considered the main issue in this industry at the moment.

5.2 Eel Enterprise

5.2.1 About the interviewee

The interviewee is the Managing Director of Eel Enterprise Wave since 2003, an internal project in Eel Enterprise (hereafter Eel). The interviewee is responsible for the development of the internally developed wave energy project since 2003.

5.2.2 Motivation for entering the industry

The general motivation for Eel to enter into the ocean energy industry is the personal motivation of the owner of the corporation. In fact, the decision to enter these industries were not a product of board meetings and strategic decisions, but rather based on the owners' dreams and visions. He was early worried about the earth and the consumption tendencies that were becoming known. He believes that in order for humans to survive, we need to become more sustainable, and following this, he started gradually to invest more and more in renewable energy. Thus, the primary motivation for Eel to enter into the wave- and tidal energy industry is based on one man's worry. In fact, 99.9 percent of the motivation for entering the ocean energy industry was based on personal and internal motivation. The rest were structural inputs on pollution and the global need for energy. Furthermore, earning money on this project is also an important motivation.

The core values of the Eel are to a large degree set by the owner family. Important traits of this family are their long-term perspective on everything they do and their drive to innovate. The combination of these two traits has been the trademark for the family for six generations. This can be seen by examples in other lines of the business when the family, thus the company was an early adaptor of new technologies. The early entry into wave energy also makes them pioneers in this business field. Further, the environmental aspect may also be considered an external driver. When Eel started the development of the EEW device there was not an established market for wave energy. However, that was not important to Eel at the time. Now, as the technology is starting to work properly, they are working towards opening the market. Environmental concern can also considered an external driver for entering the ocean energy industry, however, Eel mentions this as an internal factor through the visions and dreams of the corporate owner.

5.2.3 Process of entering

The wave energy project was started as a result of the owner of Eel's interest in renewable energy. First, different "free sources" of renewable energy were identified, and then the work continued with the sources where input and material was for free. After identifying that wave energy was the largest existing untouched resource, a previous employee with an interest in wave energy was requested to come up with a concept. Due to the owner's belief in testing concepts, they started by building "things", and further develop these. In 2006-2007, they saw that their current solution was not working properly. However, they had accumulated a lot of knowledge on wave energy extraction, and continued the project by developing new concepts and other ways to extract the wave energy. The current technology, is the ninth "thing" or device, on the list of this ongoing development, and is currently in the sea for testing. This wave energy project will hereafter be referred to as Eel Enterprise Wave (EEW).

On the tidal energy side, Eel first looked into several different alternative technologies. The owner was convinced that the best solution already existed in Eel Enterprise Tidal (hereafter EET), and the company therefore decided to make an investment. Thus, they met with the funder, and took a large minority equity investment position in the company.

5.2.4 Important factors when choosing technology

When entering the wave energy industry, Eel started with an idea that had been created inside the company. People inside the corporation are generally encouraged to present ideas to the owner; these ideas are thereby assessed and consented or rejected. In the case of the wave energy project, it was the owner who approached a previous employee who already had had an idea on wave energy. As the next step, the directors of Eel were asked to evaluate the concept. Because they found the idea interesting, they thereafter looked into several available technological solutions. They spent very little time analyzing the market in the first phase, because the big picture was not particularly relevant back then.

Eel considers the reasons for entering wave energy to be fundamental; the global demand for energy will dramatically increase and the demand for fossil fuels will decline and such fuels become more expensive. The world cannot afford using fossil fuels. There is a need to find and develop renewable energy to cover the future demands. This macro-perspective is the foundation of Eel's involvement in the ocean energy industry.

Eel does not have a standard procedure when entering a new industry. When they decide to invest in new projects, the evaluation of technology and company is based on competence and common sense. The people working in Eel are competent and experienced people who work together on making a final evaluation on target companies and technologies. Their evaluations are based on pros and cons, and some quantitative assessments. Later in the process, calculations on the product and the target company are conducted to evaluate the potential to make money. Eel does consider the technology to be the most important thing when investing in a company, but find the total life-cost of the product and the target company to be conclusive. In addition, maintenance cost is highlighted as important to understand the big picture. Eel is in a unique situation where experience from years of maritime operations can be found in-house, combined with experience from shipping and wind power and hydropower generation, and a general understanding of these industries.

5.2.5 Entry strategy

Eel is currently involved in both the tidal energy industry and the wave energy industry. The selected entry mode in these two cases, however, has been significantly different. In fact, Eel has a policy to try different entry modes when entering new industries, and choose the entry mode they perceive to be the most suitable. In entering the wave energy industry Eel decided to develop the technology in-house. The idea was generated internally, and a project group was assigned to oversee the development that has now been ongoing for about eleven years. One of the reasons for the continued focus on wave energy is their agnostic approach to finding the best solution.

When entering the tidal energy industry, Eel took a minority shareholding position in the Scotland based company EET. This company was chosen because the owner of Eel believed EET to be the best technology available. Entering this company was therefore considered to be the best option. This entry strategy of a minority shareholding position has been used quite frequently, but for different purposes. Sometimes, they have invested in other firms in order to supply useful resources and knowledge, whereas sometimes it has been to reach a new industry. At times this entry mode has been successful, other times not.

The two mentioned ocean energy projects have not been the only such projects in which Eel has been involved. Some projects are based on more cooperative and relational agreements, whereas in others they are direct investors. Some alliances have developed successfully and are still active today. Other projects have gone broke, or had the wrong technology. Occasionally, they have decided to enter a market first, and then to commercialize the best solution there. In this case, it is important to be up-close. However, now they are not active investors in any other companies/projects than EET and EEW.

5.2.6 Main objectives and long-term strategy

> *"If the economists were to rule the world, there would not have been a single innovation in the past century."*
>
> *- Managing Director of EEW*

The strategy of Eel exists in the mind of the owner and is shared only with the people managing the business. The owner of Eel sees no point in sharing the strategy publicly because it would not contribute to a competitive advantage. However, the interviewee highlights that when developing new technological solutions, e.g. a wave energy device, it is crucial not to have a too detailed strategy. If deciding too early on how to make the solution commercial and profitable, the probability for failure is dangerously high. The risk is then high to create a lock-in effect, either financially or mentally, to a non-superior solution.

The EEW strategy has been dynamic ever since the start-up. In fact, in the beginning they were aiming to be a power-generating company producing electricity to the grid on a large scale. Today, however, they do not consider that a realistic scenario. The current objective of Eel is to be both a supplier of equipment and services, as well a power supplier to smaller more specialized areas, though not to the grid. However, though the strategy is dynamic, the EEW team works towards specific goals.

Like EEW, EET has been allowed to try and fail in the development by testing devices at sea, trying different unit sizes and finding new solutions. Now, they are starting to develop a full-sized commercial prototype. The EEW have proceeded to the same level, and have signed the first demonstration contract abroad. In addition, a pre-commercial pilot site is under development off the UK coast.

5.2.7 Main challenges when entering an emerging industry

The owner of Eel believes that "if the economist were to rule the world, there would not have been a single innovation the past century". Thus, investing in innovation is important regardless of markets and demands. Too big a focus on money would hinder innovation and thus emerging industries, and could affect innovation in mature industries. It is harder to invest in emerging industries than in mature ones due to the higher levels of uncertainties. However, the owner of Eel believes that if you have a vision and a heavy drive force, you can achieve something, although not necessarily what you set out to achieve. Too big a focus on strategy and numbers can cause you to be too caught up in your own perfect system.

The interviewee is not worried about the competition in the ocean energy industry. He does not believe any of the current actors in the industry will be "the new Microsoft". The market is big enough for several actors, and it is more important to cooperate with competitors. In addition, competition is good because it conduces to tactical and strategic thinking, and an attempt to position products in relation to others. However, collaborating with others and learning from them is important because the activities in the ocean energy industries are capital intensive and efficiency is therefore crucial. The interviewee further makes an example saying that you ought to consider buying a solution of a competitor if is believed to improve your technology.

5.3 Goldfish Global

5.3.1 About the interviewees

The interviewed people representing the case of Goldfish Global (hereafter Goldfish) are three representatives from Goldfish, and one representative from Goldfish Global Wave (hereafter GGW). The interviewees representing Goldfish have various backgrounds. The first representative is currently the Vice- President and head of sales and product management (S&PM) in the hydropower and ocean power unit of Goldfish (hereafter referred to as the head of S&PM). He is also chairperson of the board in GGW. The second representative is the head of technology and innovations (T&I) in the hydropower and ocean power unit of Goldfish. The third representative from Goldfish is newly appointed CEO of GGW, but was when the interview was conducted a Vice- President of an engineering unit within the energy sector for the company. The fourth interviewee represent the technology firm GGW and is the business development director (BDD) of the company.

5.3.2 Motivation for entering the industry

The potential to earn money was the obvious reason for Goldfish to enter into the ocean energy industry. As the head of T&I put it; "we want something to sell at the end, a quality product, which has the right to have the name Goldfish on it". Since Goldfish is not a philanthropic organization, they seek attractive markets in which they can earn money. External factors that attracted Goldfish towards looking into ocean power business were the huge resource and therefore market-potential of ocean power. However, as explained by the head of S&PM, external pressures can never justify an investment and would never hold for a shareholder. One has to be convinced internally; there has to be business opportunities and economic reasons to invest in a new industry. However, the UK support system has been essential in the decision for Goldfish to enter the tidal power industry. Goldfish would never have entered at this point in time if it were not for this support system, because of the high uncertainty and lack of visible market mechanisms.

> *"We want something to sell at the end, a quality product, which has the right to have the name Goldfish on it!"*
>
> *- Head of Technology and Innovations*

The VP of the engineering unit believes all the big companies have some kind of funding unit that supports ideas that sounds promising, since good innovation and ideas not necessarily need to origin in the organization itself. There are good ideas outside in the world, and you need to recognize them. In addition, the ideas need larger companies to see them and to recognize them. According to the head of S&PM, the energy market is one of the core markets in Goldfish, and it was identified that since ocean energy, and in particular tidal power, has synergies with other business fields, it was an attractive market. More specifically explained by the head of T&I, Goldfish's decision to enter into the ocean power business was motivated by applying the already established knowledge from the hydropower business within Goldfish, and on knowledge about e.g. generators and power electronics from within the corporation. In addition, the potential to expand market share within the hydropower unit was a driver for expanding the business into the ocean power industry, and more specifically tidal power.

Internally in Goldfish, there already exists a portfolio of different renewable energy technologies. According to the VP from the engineering unit, Goldfish is involved in wind power and hydropower. Goldfish is always looking for businesses that are similar to what it is doing already, and where existing know-how can be used. Tidal power in its structure is so similar to wind power; he says it is "…basically a windmill below water", and many synergies and established know-how can be useful. Though tidal power industry itself is new, the VP from the engineering unit believes there are many components that Goldfish is already familiar with, especially when it comes to the supply chain. Therefore, looking at the components, there must be a possibility to reduce the costs so that they are in a range comparable with offshore wind.

5.3.2.1 GGT motivation for seeking OEM partner

Before Goldfish took a shareholding position, GGT never had a continuous feed of investment and funding to do all the work that they needed done. Mainly, the support had come from various venture capitalists and private investors. At the time that Goldfish appeared, GGT had circa 13 board members, which made it quite unwieldy to manage. Therefore, GGT wanted to rationalize the board and clear out some of the investors. Bringing in an OEM such as Goldfish would also help GGT see a clear opportunity for their technology and help them bring the technology to market, bring the costs down and bring in manufacturing expertise to meet demand. At last, Goldfish could help GGT to achieve credibility in the marketplace and a long-term security towards potential customers.

5.3.3 Process of entering

The head of S&PM and the head of T&I describes the process prior to entering a new industry as a number of things in a row that are important to consider. First, a strategic analysis should be done; assessing the external factors that make the industry attractive, what the risks are, and what improves business performance. Also, before starting to invest in companies it is important to have a clear view on the market; whether there is a market potential, whether it is big enough and when is the right time to enter. In addition, it is important to consider who potential competitors are, and the time to maturity for the market in general. Next, one should consider all the technologies and the risks associated with them, whether they are at a certain readiness level, if the investing firm can contribute with synergies, and the amount of money and time required bringing the technology to market. The strategic position should be as attractive as can be, and it is important to make sure that the margins that one thinks is likely to be earned are sustainable and defendable to avoid being replaced or substituted by competing or alternative technologies. Considering these steps, which are all a part of a market assessment, one should proceed by looking at the entry options available and decide on how to enter the industry.

5.3.4 Important factors when choosing technology

When choosing a company or technology to invest in, one should first consider the technology itself, thus, it is necessary to do a technology assessment and find the most promising technology concept, which in Goldfish's case was found to be the horizontal axis turbine. Goldfish chose this concept based on two different aspects; that there was a supply chain available or that there was a possibility for a supply chain through synergies towards other technologies where you can mirror the supply chain. The horizontal axis turbine has many similarities and synergies with offshore wind, and this is extremely necessary because it brings down the costs. A total cost assessment of the technology now and in the future should be done as well, in order to establish whether it is possible to break the costs in a range where you can be successful in the market. Next before choosing which company to invest in, the Technology Readiness Level or maturity of the technology should be evaluated. The patent situation of the technology firm should be considered, and how defendable and sustainable the technology is; whether anybody can do it or if it is hard to imitate.

The head of S&PM and the head of T&I agrees that the technology and its potential is one of the most important thing to look at once the attractiveness of the market has been established, but team and location should be considered as well when choosing investments. Cultural aspects can be of importance, and having a company in the UK could be much easier than having one in China, due to closer cultural relationships. It is important to analyze the team in order to identify the team members and their roles, and how the know-how is distributed throughout the team.

5.3.4.1 Investing in GGT

Goldfish decided to invest in GGT, a small tidal technology company from the UK. The decision to choose GGT over any other company was that GGT had the highest Technology Readiness Level of the potential companies at the time, with a readiness of seven or eight on the scale. In addition, they were the only one running a full-scale prototype, and the tidal turbine machine was working and producing energy, which was important. They had also passed all the environmental tests, the technology was unique and Goldfish could see that GGT had an obvious competitive advantage for some time in the future. Before actually investing, a due-diligence was done on the company where they looked into important details about the economy and technical facts, with external support.

5.3.4.2 Choosing Goldfish as a partner

The two founding directors of GGT approached Goldfish in the first place. As far as GGT's BDD understands, the two founding directors had some very good contacts within

Goldfish and probably in the UK, who made the introductions to the technical people from the strategic headquarters. GGT also had other alternative OEM's in consideration; three of the biggest OEM's in the hydro power and power generation industry. These companies are now some of the main competitors and actors in the tidal energy industry.

Important criteria for selecting Goldfish as a partner were that they would actually fund GGT and carry on providing appropriate funding to take the technology from a demonstration stage through to a commercial stage. In addition, that they would increase the size of the team to meet the personnel demands to develop the technology. It was also important for GGT that Goldfish would actually brand the product to provide credibility in the marketplace, and that they were given access to various expertise on power electronics, generators, gearboxes and all other useful central engineering and corporate technology capability and global marketing ability within the corporation.

5.3.5 Entry strategy

The stake that Goldfish has taken in the tidal power industry was in the tidal turbine company GGT. Entering GGT, Goldfish decided to start by taking a small technology bet. The idea was to invest in a company with a small stake to first get to know the business, and what was going on in the industry, and then further decide whether this was interesting for the company. From the head of T&I's perspective, this is important when entering an emerging industry. Goldfish also recognizes that considering emerging industries, technology companies are small and they need room to grow. To include them too quickly into a company like Goldfish might harm their way of doing business and suffocate them. Therefore, in early 2010, Goldfish acquired a minority shareholding of 10 percent in GGT as a part of a capital increase in the company. In 2011, Goldfish participated in a capital increase and took a larger shareholding, thus increasing the shareholding position to 45 percent, though not a controlling stake, which is only consolidated at or above 50 percent. Thereafter, it became obvious that a large amount of capital was required to develop the next generation of products. Either the company could carry on with a pace that all shareholders could afford, or Goldfish could buy out the shareholders who lacked the funds necessary to accelerate the product development. Thus, since 2012, Goldfish owns 100 percent of GGT and all the people of GGT were brought inside Goldfish. They believe that giving GGT more time has helped the technology firm to integrate into Goldfish's internal processes.

Buying in with a small share at first is not a standard procedure for Goldfish. Before deciding on this particular entry strategy, Goldfish considered other ways of entry. It was first considered whether they should develop a technology themselves, but decided that it would take too long and that it was better to invest in a proven concept. A simple investment such as a venture capital investment was evaluated also, but in order to be successful in the tidal power business, which is very technology driven, they had to have an influence on what was going on. As another option, Goldfish could have bought 100 percent of GGT right away, but there were a number of reasons why that was not the best idea. First of all, GGT did not want to be bought 100 percent straight away, and Goldfish did not want a controlling stake immediately either because the business field was new and unknown. Since the company had never been exposed to the industry before, it was important to understand more of it from the inside, how it worked and how Goldfish could contribute and bring in their own synergies. In order to gain control and influence on the technology development they thus decided to first take minority shareholding, and later increase that shareholding position.

5.3.6 Main objectives and long-term strategy

The long-term goal for Goldfish is to earn money and create value, and the strategically best position in doing so is to be in a market leading position based on technology and innovation. Therefore, they expect to be one of the leading developers of tidal turbines in the future. According to the head of S&PM, Goldfish wants to develop a position where they are number one or two in the marketplace, which would imply greater than 10 percent market share. The head of T&I states that Goldfish wishes to become one of the top three leaders within the industry which is a goal that the company normally has when investing in other companies, independent of industry. Accordingly, the company would like to become one of the major leading technology developer within the tidal energy industry, a similar position as to what they currently have in the offshore wind industry.

In order to get to a strategically optimal position in the market, two factors are important. First, there is the need for a proven and reliable technology. The second need is a market, and thus it is necessary to attract different stakeholders in order to kick off the market. In order to become the leading company within tidal power, Goldfish is doing a number of things. The number one priority now, is to reduce the Levelized Cost of Energy (LCoE) of the tidal system in order to match the costs of offshore wind. The second thing that Goldfish currently works on is to prove that the system is reliable. Goldfish is known for having good products with a high quality and reliability, and in order for the tidal turbines to match the product portfolio and have the Goldfish Corporations' name on it, reliability is important.

When developing the strategy for GGT, the GGT team works together with a team from the Goldfish headquarters to develop a joint, combined strategy for the tidal business. According to GGT's BDD, it is probably 50/50 influence on the strategy between the two teams. The strategy planned is built into a strategy for the UK, which has been accepted throughout. In addition, the headquarter office help define a more politically oriented strategy, so that their political influence and local influence in the UK should be maintained.

5.3.7 Integration and future prospects for GGT

After the full acquisition by Goldfish in 2012, GGT has slowly migrated to Goldfish's platforms and various areas. As examples, GGT has migrated to Goldfish's payroll, their purchasing unit, IT etc. The process has been difficult at times, and having people from within the corporation come into GGT and help them with the transition has been essential for the success. People from accounting, from HSE, operations and purchasing have come across to GGT to help them on the way. The most difficult part for GGT has been the new processes. The BDD of GGT admitted that it has given the people from GGT headaches sometimes, when they are “banging their heads against processes”, where they before would have just gotten on and done things. Approval is necessary from certain levels before decisions can be made, but essentially, it has been positive and they are quite pleased with the development. The BDD is confident that if Goldfish had not come on board, GGT would have gone under a long time ago.

GGT and Goldfish currently have pipeline projects planned to get them between 500 to 600 MW delivered by 2025-2026 in the UK alone. In addition, they would like to be shipping 400 to 500 kW a year from 2025 an onwards. According to the BDD, GGT will probably charge somewhere between a million to two million euros per MW. Working with an OEM has made the potential for the industry to build a billion-a-year business.

GGT’s BDD points at the difficulty of the industry being in the middle of technology development. Because of this, Goldfish and GGT are planning to develop their own projects because there is a need to develop a marketplace and they do not want to wait on the sideline, as others do at the moment, to see if there are some positive movements in the market. Therefore, they have their own planned line of projects in the UK, currently of about 120 MW, but hopefully it will be 300 MW. Until they can see that these projects can work at scale and that the costs are going to come down, there will not be too much other involvement in site development. Goldfish and GGT take the liberties to develop additional sites and get the sites installed and operational in order to show some success and some reduction on Levelized Cost of Energy (LCoE). GGT and Goldfish are looking at seven or eight sites at the moment, requiring an investment of 35 -40 million pounds into site development. Since Goldfish is investing in several projects where they deploy their own technology, this actually helps attract other investors because it decreases the risk profile.

5.3.8 Main challenges when entering an emerging industry

The head of S&PM specifies that the process of entering an industry is not different when entering an emerging versus a mature industry. However, the detail questions will be different and have higher levels of uncertainty in an emerging industry. Therefore, when entering an emerging industry, it is important to weigh off the risks and innovation requirements. Following this, one should weigh the investment requirements against the expectations and risks of an opportunity. The more emergent an industry the more alternative outcomes there are and the higher the risks. However, entering a mature industry is not always wise, unless you have something very good to compete with, because mature industries are not growing in size and is almost destined for decline. Therefore, entering emerging industries is attractive to large firms such as Goldfish to seek new business opportunities.

5.3.8.1 Main challenges for the ocean energy industry

According to the head of T&I, the tidal industry has just a small timeframe to become successful, and if it is not successful within 2020, it will never be successful. This is because interest for tidal is now. The biggest competition for this industry now is offshore wind, and therefore the ultimate goal is to match the LCoE of offshore wind in the near to mid-term.

According to the head of S&PM, the main challenge for the tidal industry today is probably money. Also, the government has to participate in taking some of the risks and invests more in flat rates or feed in tariffs. What needs to be done now is to get the machines out into the water to produce energy, though there are large investment needs and risks associated with it. Since there has not been a project that is going to create extraordinary returns for anybody at this point in time, the willingness to invest is reasonably limited. Furthermore, the biggest challenge for the wave energy industry is that the technology development is not adequately advanced in the wave industry just yet and that investing in any technology there at the moment is unlikely.

5.4 Icefish International

5.4.1 About the interviewees

The interviewees are one representative from Icefish International (hereafter Icefish) and one representative from Icefish International Tidal (hereafter IIT). The former is the Business Development Manager of the ocean power unit in Icefish. The interviewee's responsibilities hence include the international business development of the wave and tidal technologies. The latter is currently the commercial manager of the ocean energy unit at Icefish, but was previously employed as the project development manager at IIT.

5.4.2 Motivation for entering the industry

Icefish has several motives for entering the emerging marine energy industry. The company is currently one of the biggest players in the power generation market as a supplier of equipment. Because of their experience with other similar types of power generation equipment, they consider entering the marine energy industry to be a manageable challenge.

Icefish continuously observe what their competitors, customers and the politicians are saying and doing. Through such actions, they become aware of new and interesting technologies and industries that complement or provide increased opportunities exploiting their existing core skills. It is also important that Icefish is capable of bringing added value to the development. The marine energy industry was such a case as it allowed Icefish to use their experience from other similar types of power generation. Entering the marine energy industry was therefore considered a manageable challenge.

The Business Development Manager of Icefish emphasize that it is apparent that renewables in general are no longer considered a niche, but becoming more of a mainstream method for power generation. In order to prevent competitors from gaining a first mover advantage, Icefish need to invest in this industry. For the company to remain a big player in the energy sector and to build energy market share, it is essential to understand the entire energy sector. Tidal energy may not be a large market at time being, but keeping up with the developments is crucial to stay among the leading players in the power generation market.

Whether the emerging and growth of this industry is due to power concerns or environmental concerns is irrelevant to Icefish, because they are attracted to the industry primarily because of the profitability and sustainability.

5.4.3 Process of entering

Icefish has a standard procedure for assessing potential investments. The market is assessed by utilizing huge amounts of marketing data that the company has gathered through their global presence. Technical specialists do the technology assessments. In the case of the tidal industry, they used specialists from the hydro division with water and turbine expertise, which was the most similar in-house expertise. A set of financial specialists is employed in Icefish' mergers and acquisitions department. The company buys about a dozen or more companies every year, and these specialists do the financial checks, the legal checks and the IP checks. If both the technical and the financial experts approve a case, then business specialists must decide whether Icefish can make this company work. Cases that the business experts approve are then passed on to the board that have the final say in whether an investment is made.

5.4.3.1 Wave energy industry

Icefish was briefly involved in the wave energy industry as well, investing in and providing equipment to a wave energy company. However, they later exited that business. The interviewee considers there to be a hundred and one ways of getting the energy out of the waves, and claims that a reason the OEMs are not very involved yet is that it is hard to recognize the superior technologies.

5.4.3.2 Tidal energy industry

Icefish started looking at the tidal energy industry around 2007, which was the time when the technology was beginning to look stabilized and interesting to OEMs and other investors. The technical specialists then did a technology assessment of many of the then available tidal technology solutions. The financial experts conducted financial checks of the relevant companies. Third, an assessment was made to check whether the company could work as a part of Icefish. The board further decided to invest, and in 2009, the company entered the tidal industry with an exclusive license with a Canadian company. It later appeared that this technology was too inefficient to become economic, and the case was dropped in 2012.

In 2013, Icefish decided to acquire a different tidal technology company, IIT, from another MNC. IIT had ever since the start in 2005 been hoping to be acquired by a large OEM or MNC backer. Having such a large backer is crucial for small technology developers because their customers are large utility companies who require relevant warranties and guaranties with the technology. Achieving these guaranties while being run by only a few people is close to impossible, so big investments were required (IIT interviewee). In 2008, the MNC entered as a minority shareholder, but later increased the share to 100% and took over full management of the business. Thereafter IIT was fully acquired by Icefish in 2013.

Prior to the purchase of IIT, Icefish was in the process of developing their own tidal device, and they had their own development team. In acquiring IIT they effectively doubled the size of this team and accelerated the mark-readiness of the tidal offering (and preferring to use the proven IIT device than develop their own device which would take much longer and potentially miss market opportunities).

5.4.4 Important factors when choosing technology

"So you look at tidal, three blades – it's a turbine. I can understand that!"

- Business Development Manager

Icefish considers the people and the patents to be very important when assessing which technology company to invest. It is important to secure properly the technology and the core value adding activities of the company. The Business Development Manager of Icefish states that many of the small companies often waste a lot of money patenting the wrong things, while forgetting to patent the important things. When considering the investment alternatives, there is a need to assess a combination of everything (technology readiness level, the people, patents, risk, debt, route to market).

It is highlighted that it usually is easier to assess small companies, as they have not been selling into the marketplace yet and have had limited interactions with third parties. With new technology, the main thing is to consider the technology sensible and to believe there is a market. More mature technologies involve the threat of legal risks with old contracts.

The technology developed by IIT was cheaper than their competitors' were, and had a performance advantage provided by demonstrated blade pitching and yawing. The MNC that first owned IIT also possessed marine knowledge that Icefish was very interested in accessing. The company therefore approached the MNC to see if they were interested in a partnership in order to exploit both this marine expertise and the power expertise of Icefish. It turned out that they were interested in selling the tidal business altogether, and as this was an opportunity "too good to miss", Icefish made the acquisition.

5.4.5 Entry strategy

Icefish believes there are three different ways of getting into a new business area: (1) develop from scratch, (2) enter through a partnership and (3) acquire a company within the relevant business area. The first option takes a lot of time and money, and is dependent on the company already having the necessary knowledge, knowhow and capabilities. Entering through a partnership saves the company time and money but does not maximize profit, nor does it promote the brand of the company. Regardless, a partnership is considered a good starting point in some situations. The third option, allows the company to use the full weight of your name and to be in total control of further developments. The success of such an acquisition is however depending on the people staying with the technology, as they are carrying the necessary know-how.

When Icefish decides to invest in a company, they normally choose alternative three and buy it outright. A full acquisition is considered the best option for several reasons; it is a less risky alternative, and believed to induce lower costs and to generate maximum value. In the one case with the wave company, they actually broke their own rules and were only a shareholder and not the owner. This was a much earlier stage of the industry, so they were not 100% sure it was the right thing to do at that point and wished to share the risk and cost with other shareholders.

At the time of the entry into the marine energy industry, Icefish did not possess the marine skills and knowledge of the working environment necessary to develop a tidal technology. The business model of Icefish highlights the importance of being a market leader in every market they enter, and in order to achieve this goal a technology acquisition was regarded as the only way to go. This entry mode allows Icefish to provide engineering knowledge to industrialize the prototype. They believed IIT could go the distance, so they decided to invest in it, and keep investing into the development to make it into a commercial product.

5.4.6 Main objectives and long-term strategy

The main reason for Icefish′ involvement in the marine energy industry is that they want to remain a major player in the global power generation market. With the shift from fossil fuels to more renewable sources of energy, there is a need to keep up with this development. The investments into the marine energy industry allow them to develop competences in this new form of energy and thereby be ready when the sources are widely adopted. This is further a part of the plan to remain a large actor in global power generation.

5.4.7 Relationship and daily operation

Icefish′ renewable energy department almost operates as a renewable energy business incubator with projects within different sectors of the renewable sources. IIT is located in the ocean power unit, which further is a part of the renewable energy department.

Icefish′ ocean power unit is operating in two different cities. They have split the management and the responsibility evenly between the two teams, and they operate as their own business unit within the department. On a day-to-day basis, their own Vice President manages the two sites and the two teams. Despite their split location, they are one team and try to operate as such. The ocean power unit reports to the renewable energy department on a monthly basis. This is a light report on what is going on, and not meant as control and direction. However, they buy off their strategy in a three-year plan, so they have to achieve approval both at the sector level and at Icefish′ board level.

5.4.8 Current status

The time to enter this sector and become commercial with the technology is *now*, especially in the UK and France. In the UK the market support, the Crown Estate's fund and other sources of funding all contribute to making a real and present opportunity for the pilot projects being planned in the tidal sector. Pilot farms are an essential step on the path to commercialization because you need to test a technology on a small scale before you can move on the commercial scale.

5.4.8.1 Current status of the wave energy

Wave energy was the first source of marine energy in which Icefish invested. However, they now consider wave energy to be too far from commercialization and have stopped any further focus. They are open to reenter when the prospects look more promising.

5.4.8.2 Current status of the tidal energy

Tidal energy technologies are at a higher technology readiness level than wave energy technologies (tidal energy technologies at TRL 7 – 8). Icefish are predicting this technology to reach commercialization in 5-7 years. However as the technology continues to depend on governmental support (grants and FiTs) there are still investment related risks. Icefish find these currently to be at an acceptable level, and are therefore continuing their investments to improve performance, reliability and reduce cost.

Icefish has small tidal energy demonstration projects developing in several locations in partnerships with utility companies. The utilities have a similar perspective as Icefish; they want to learn more about the industry and technology. Icefish believes the only way to learn and to understand the industry from a business perspective is by being involved in project developments and actually operating the technology.

5.5 Mackerel Multinational

5.5.1 About the interviewees

The interviewed persons are one representative from Mackerel Multinational (hereafter Mackerel) and one representative from Mackerel Multinational Wave (hereafter MMW). The interviewee from Mackerel is the head of the unit of new investments, which makes equity investments in areas of strategic interest to the company. He is also a board member of MMT. The interviewee from MMW was previously their public affairs manager; however, he is now an independent consultant representing the company.

5.5.2 Motivation for entering an emerging industry

Mackerel has multiple motivations for entering the wave and tidal energy industry. The company has historically been in the entire power value chain from generation, transmission and distribution, down to the low voltage products; wiring accessories, and power and controls in homes. They sold their generation business to another MNC about 15 years ago and felt after this that there was a hole in the portfolio. The company thus started looking at the marine energy industry and with the level of activity, realized that this was worth exploring. A positive factor was that renewables feed into Mackerel's sustainability mindset and sustainability strategy. Mackerel as a significant supplier to the marine energy industry has an extra interest in helping the industry grow and survive, because when the industry grows, Mackerel sells more products. Therefore, they will support the industry so that wave- and tidal companies remember Mackerel as a company who supported them. Mackerel believes that the earlier they get into an industry and the earlier they help design or define the standards the more likely it is that their products will be used.

The head of the unit of new investments does not feel they are under external pressure to invest in renewables. The company will not make an investment just because it is clean tech or sustainable. They will make an investment because it fits their corporate strategy, though the head of the investments unit states, "it is indeed positive that our investments have positive effects on global and environmental issues."

According to the consultant representing MMW, it is quite clearly documented that the technology firms in this industry are dependent on external investment in order to survive economically. Earlier there may have been a perception that one can receive venture capital money quite easily in this industry. However, it soon became apparent that the commercialization of the technology actually requires large-scale investments, with very long investment horizons, which is why technology developers started knocking on the doors of big industrial players. The investors are attracted to the technologies and pick the technology company, whereas a venture capitalist is mainly looking for a quick and high turnover of the capital.

5.5.2.1 MM Wave

Mackerel has a long-term view of the potential of the wave energy industry. Therefore, they were looking for an investment object. The wave energy firm MM Wave needed an investor with a long-term view who could see potential in their technology, and preferably whose core business was a close match to MMW's such that they can bring expertise to the company. Mackerel wanted to become a major investor of MMW because they had faith in their technology, the management team, the business plan and the market development. They could also see a long-term potential of MMW's technology in the markets where Mackerel currently operates. Mackerel was therefore an ideal match for MMW.

5.5.3 Process of entering

When exploring new investment cases, the unit of new investments assesses where the opportunities are, what is happening in the market place, where the investments are happening, what the experts are saying and generally where different industries are heading. The unit mainly focuses on areas where Mackerel's current skills, knowledge base, and customer relationships can be of value. The business people, technology people and strategy people of the company are also involved in this process. On a quarterly basis to the board, the unit reports their activities and receives guidance from the board, which consists of the CEO, CFO, CTO and the leaders of the different departments. Together they discuss what they think of the potential investment opportunities in emerging technologies or sectors and try to predict where the future is going.

When Mackerel decided to enter the wave and tidal energy industries, the unit of new investments first mapped and analyzed the industry to decide further which companies to invest in. They looked at the sector's business proposition, the technologies, and the size and the strength of the market. Then a small number of wave and tidal companies were shortlisted based on a range of attributes such as technology, management, and other investors. They also considered what they had successfully developed and whether the top team in the business could drive the vision to developing the market. MM Wave on the wave side and MM Tidal (hereafter MMT) on the tidal side came out on the top of the list. In November 2010, they invested £8 million in MMW, which secured them stakes in the company and made them one of the major shareholders. They also invested in a subsequent investment round. Mackerel makes sub-sea cables, convertor stations and power stations, so potentially there may be a future route for the company to invest even more heavily in MMW. In 2012, they made a first investment and then in 2013 a second investment in WWT, which expanded Mackerel's renewable assets even further (company website). After getting involved with these companies, they have gotten a knock-on start in the industry with around 25 new wave and tidal projects to work on.

5.5.4 Important factors when choosing technology

As a large multinational corporation that makes investments for their own company and not for other stakeholders Mackerel can invest anywhere in the world and in any technology it chooses. However, important criteria are that the investment falls within the boundaries of the core competencies of Mackerel, that the business has the potential to become self-financing and that the investment has a strategic value to the company. In addition, if a new development could potentially disrupt Mackerel's current activities, a driving factor could be the opportunity to enter the sector before competitors do.

In the case of MMW, the technology was very simple and therefore easy to build; it was not as complex as other technologies. In addition, it was near shore so it was possible to put the generation equipment on land rather than under water, which create fewer issues around the submerged technology, or pressure of the water, corrosion, or waterproofing and leakage. In addition, many of the wave companies are run by their founders, which are often young Ph.D. students who have written a thesis on the wave energy technology and raised money to become entrepreneurs. The head of the unit of new investments is concerned that they lack experience in building and running a business although they might have been smart students. In MMW the original founders who defined and invented the concept had stepped away, and been replaced by new professionals. Therefore, MMW had the best and most experienced leadership out there in Mackerel's opinion.

With rare exception, Mackerel only invests in partner syndicates, which is the norm in venture investing. This is because all ventures are interested to share their risks and to get in each other's deals. What Mackerel looks at in potential co-investors is how much they understand about the relevant sector, whether they are easy to work with and whether they have enough finances. If something will cost a couple of hundred million dollars, will they have enough money to invest? Mackerel wants to avoid having to pick up all the bills when moving forward. In the case of MMW, there were already other investors involved that would be good to work with, including a large utility company. Similarly, in the case of MMT, the company had two large MNCs as investors, which they believed would be good partners. However, it is not only about money, the investors also contribute with important knowhow and market access.

5.5.5 Entry strategy

Mackerel spends their time looking at new areas, evaluating new sectors, and then deciding where to place their investments. They do not "jump into an industry with both feet at once", but rather invest money and buy some shares. This is the chosen entry mode in both of the two marine energy companies. As this is a high-risk industry and Mackerel has no immediate skills or knowledge base in this area, they seek to first learn from others while simultaneously make some 'bets'.

> *"Sometimes when you see something shiny in the horizon it could be an oasis, while other times it could be a mirage."*
>
> *- Head of Investments Unit*

Mackerel acts as a venture capitalist in the marketplace and in the way that they take minority positions, particularly when going into a syndicate with other investors. Thus by definition, the head of investment says, nobody really has the majority shareholding. In the old days, investors either ignored the case or went all in and spent a few hundred million developing a technology or buying a company. Now there is a quite common third option: to make an investment in the company, 5-15 percent, and continuously increase that investment as the company is improving. It is like buying an option in a company that you are not quite sure of how well will do, rather than buying the shares directly. "Sometimes when you see something shiny in the horizon it could be an oasis, while other times it could be a mirage," the head of investment says. Because of the market risk, the technology risk, and that things always take longer than anticipated, Mackerel choose to make an investment, rather than a full acquisition. They did not consider developing the technology in-house, as they believed they lacked the necessary skill base and were unsure whether they wanted spend that kind of money and take such a large risk.

5.5.6 Main objectives and long-term strategy

Mackerel aims to become a supplier to the marine energy industry. They believe that the more they get involved, the more people think they understand the industry. This further brings them more business and creates an upward spiral. This said, it is difficult to have a long-term strategy in an emerging business because it is hard to know whether the business will actually succeed, what size the industry will achieve, and at what rate it will grow. The early years are always extra difficult to predict, and then if it succeeds it might grow very rapidly, which further brings new challenges. No one knows where the marine energy industry will be in 2020, or further down the road.

All emerging technologies have difficulties before they become truly commercially viable. Still most people (the head of the investments unit includes himself here) underestimate how difficult it is to develop the marine energy industry, and this industry has already had a number of false starts in the last 15 years. The stated objective from MMW's side is to develop a commercially viable wave energy technology and to make that technology available worldwide. MMW's strategic direction is to sell devices around the world and make money for the shareholders, which goes hand in hand with that of Mackerel.

5.5.7 The relationship

Mackerel sits on MMW's board of Directors and the relationship with Mackerel is positive and constructive. All the major investors are represented on the board; there are two Non-Executive Directors from Mackerel, and one from a utility company, as well as other non-executive shareholders. The non-executive board consists of people who can bring experience from the industry, and help advice and set the overall direction of the company. As the investors of the company ultimately are the owners of the company, they have a strong basic interest in setting the strategic direction. They are not involved in the day-to-day activities, but they are involved in the strategic direction. An important factor for MMW is that Mackerel is part of very large expert businesses, which can draw in necessary and helpful expertise to the company. MMW has used to some degree expert people from Mackerel for internal business matters as well, but the general relationship is to help set the strategic direction.

5.5.8 Future prospects of MMW

Having had Mackerel as a major investor for four years has put MMW in a different league. For any small start-up technology company to get a multinational corporation as a major shareholder is a very positive signal. It is important for MMW to be receiving a third party validation of their technology and business plan. If a large MNC is prepared to invest significantly in the company, it shows that they have had a good look in the business and that they can make a business case for investing in the company. Therefore having Mackerel as an investor is a very strong endorsement for MMW and this is generally how it is seen across the renewable energy industry. It is also a strong and positive signal that their utility investor has stayed on as a major shareholder in MMW, although they divested some of their shares.

5.5.9 Main challenges when entering an emerging industry

At a basic level, there are two challenges, one is internal and one is external. The internal challenge is to convince people that the industry is worth looking at and spending some time, effort and money on. The skepticism roots in the fact that even though an industry appears to develop successfully, it may never materialize. People are hesitant to get too excited too soon and put too much money too early in something that will not be sustainable in the long run. From another perspective, one has to consider whether Mackerel has the talent and the skill base to get there, if it leverages their current skills, or whether it has the channels to market and customer base.

The external challenge is the high technology risk, and whether it will work satisfactorily, how expensive it will be, whether it will scale, and if people can afford to pay for it. The market risk is another external challenge. For an industry to work, it is not sufficient that the technology; the entire value chain must be in place. In the developing stage, it might take a year to develop one prototype. As it reaches a commercial level, customers might order 20 units a year, which requires an established supply chain. The industry is depending on suppliers who are willing and able to supply the necessary equipment and services, and this might become a challenge further down the road.

5.5.10 The utility companies' motives

A number of utilities are now moving away from the wave and tidal sector and the consultant in MMW thinks this can be seen as a part of a broader context. Having to make many long-term investments particularly in the grid infrastructure, which the network requires, the balance has been very stretched. They seem to be focusing more on their core business: power generation, rather than being involved in ventures. As a result of this, the utility company investor has moved some of their MMW shares to other partners, though they still have retained a major shareholding in the company.

5.6 Whitefish Worldwide

5.6.1 About the interviewees

This case company presentation is based on three interviews. The first interviewee is the Vice President of controlling in Whitefish Worldwide (hereafter Whitefish) since 2007. The controlling division includes financial activities and mergers and acquisitions. This interviewee has been part of the process of investing in Whitefish Worldwide Tidal (hereafter WWT) ever since the beginning in 2010, and is currently also on the board of WWT. The second interviewee has been employed as a turbine system engineer in WWT since 2009. The third interviewee holds a board position in WWT and is the CEO of one of the largest shareholder companies. He is however, not employed by Whitefish.

5.6.2 Motivation for entering the industry

Whitefish's primary motivation for entering the tidal energy industry was the potential growth opportunity for this emerging industry. Whitefish is among the major actors in the global conventional hydro business. This industry is saturated, and thus provides limited growth options, and Whitefish is therefore always seeking ways to expand their current portfolio of products or components, improve the service offering, extend the value chain or enter a different market. They acknowledge that large growth opportunities potentially exist in emerging industries. In order to be able to leverage the company's expertise, global presence and existing customer base, Whitefish generally seeks business areas that are related to their existing ones.

When considering the marine energy industry, they take advantage of some previous experience with seawater from a tidal barrage project. With their core expertise linked to conventional hydropower plants, they found the linear and predictable tidal flow to be the most appealing energy alternative within the ocean energy industry. The technological similarities would make it easy for their production facilities to switch to producing tidal plants. The other alternatives within ocean energy are considered too far from their core competencies and too far from commercialization.

In addition to the main motivation, other drivers are identified as important in the process of deciding to enter this industry. The governmental support in the UK is emphasized as essential. Other sites all over the world have the potential for tidal generation, but the lack of support prevents them from developing such an industry. The support mechanisms available in the UK are vital in order for tidal energy generation to compete with other forms of renewable energy and more conventional energy forms.

5.6.3 Process of entering

The company first considered entering the wave and tidal energy industry when a small start-up company approached them from the tidal energy industry in 2008. Following this encounter, they did a market assessment, screening all the alternative technology companies and their technologies. The screening showed about sixty different technologies that Whitefish narrowed down to a few companies with devices in the water. They were in dialogue with several companies before they decided to invest in WWT. Whitefish acquired 1/3 of this company in 2010, and later increased their share in 2012 by acquiring one of the other shareholders' shares, bringing them to their current shareholding of 59.43%. In 2012, they also decided to change the name of the company to better fit with Whitefish.

5.6.3.1 From WWT's perspective

WWT on their side was started in 1997. After scanning the market, they established a subsidiary in the UK after acknowledging the good support mechanisms for developing tidal energy. After the startup in the UK, a large utility company came in on the owner side to help with the further technology development. However, it soon became apparent that there was a need for an industrial actor. With the Scottish subsidiary growing larger than the parent company, several of the foreign shareholders were looking to exit the company.

WWT did a first round with several international companies that were somehow operating in either the marine industry or power production. By the end of this phase, there were two good alternatives. The final negotiations were focusing on improving the company and accessing capital to finance the production of the new technology. The actual selling price was only one of several variables that were considered. The remaining owners were not interested in contributing with more capital at that point. It all resulted in Whitefish making the investment.

5.6.4 Important factors when choosing technology

The most important factor when Whitefish decided in which technology to invest, was the technological expertise. They sought a company with a high technology readiness level, with a working prototype and available operations data. In the tidal industry, frequent interventions are extremely costly and it was therefore important that the device was able to remain operational in the water for a minimum of a few years. In 2010, at the time of the investment, WWT "probably had the most advanced technology". The second most important factor was that two potential customers were among the existing shareholders of WWT, one of them with a licensed tidal site and a realistic schedule for investing in a pilot array. Other factors were the know-how and experience of the team as well as the underlying patents protecting the key intellectual property. In addition, it was crucial that Whitefish could create synergies with the new investment, e.g. through current market or customer access, R&D resources, and global supply chain and manufacturing facilities.

5.6.4.1 From WWT's perspective

WWT, on their side, were seeking a large industrial investor with which they could create synergies. A key aspect of the WWT's operations is the manufacturing of large steel installations, and the company would therefore prefer a partner with competences and facilities for such activities. Experience within the conventional hydro business would also be a plus as the tidal energy industry has great similarities to this more traditional industry. Whitefish seemed to be a good fit to all the criteria and thus the deal was signed.

5.6.5 Entry strategy

The interviewee explains that there are two ways to enter a new industry; either by developing the technology in-house or to acquire a technology development company at a more advanced stage. Whitefish estimated that developing a proven tidal energy technology through an internal R&D project would take years due to a lack of such experience. The industry was expected to break through soon, and the company was worried that an in-house development would be too slow and cause them to miss the race for industry leadership. With several already existing technologies in the market and a limited time frame, Whitefish decided to invest in WWT. They first acquired a third of the company and then later increased that share to just below 60%.

Whitefish rarely buys into start-ups or completely new industries and the interviewee does not recall any similar acquisitions. It can be considered a risk- averse company. Being risk-averse is also demonstrated by the fact that the company decided to first acquire a minority shareholding. Despite this being a special case, the company is always looking for new investments for reasons stated above and have set processes for assessing such potential companies. These processes involve evaluating the financial performance, existing assets and growth, and earnings potential. A major difference between mature industries and emerging ones, is the lack of such accessible data making it impossible to use standard valuation tools such as EBITDA multiples and peer comparisons. This increases the uncertainty of the performance of the start-up company and increases the risk related to an investment. Normally, Whitefish only enters markets where they can become a relevant player.

5.6.6 Main objectives and long-term strategy

Whitefish's objective is to become one of the major tidal power equipment suppliers (i.e. supply turnkey tidal power farms for the global market). They can leverage their global market presence and manufacturing capabilities to this new industry. They predict that the three large conventional hydro industry players Catfish Corporation, Icefish and Whitefish, combined with a couple of others e.g. Goldfish, will be the key players in this industry as it develops. In order to achieve this long-term goal, they are currently focusing on securing first commercial contracts that can show that the technology can operate in small arrays. This is a pre-condition for any larger orders from customers, which would justify scaling up the operations.

5.6.6.1 From the perspective of WWT

The long-term goal of WWT is to be among the leading suppliers of tidal energy technologies on a global level. Today there are about five actors, who have reached an industrial phase in the tidal energy industry. It is important to stay among the competitors to be in the industry's final race for commercialization, when that time comes. In order to succeed in this industry, it is important to reach other markets but the British; other parts of Europe e.g. France, and elsewhere in the world, like North America, South America and South East Asia. These are just examples of other markets with proven potential for this type of power generation. They have a large lift of tide or other continuous ocean currents of a certain velocity

The interviewed WWT engineer states that the strategy is developed high up in the organizational hierarchy, but as this industry is still developing, it does not provide any clear guidance. There is a need for flexibility, the ability to respond to feedback from the industry as a whole, the employees and the potential customers. WWT are close to commercial projects, and as soon as these are signed, things will change quickly.

5.6.7 Biggest challenge for this industry

"If we can't make it there, we can't make it anywhere!"

- Vice President

Whitefish considers funding the biggest challenge facing this industry today. It is emphasized that there is a need to join forces with utilities, with Whitefish working on the technology development side, and utilities and others on the customer side. The point is that the investor or technology developer cannot pre-finance forever, and even though Whitefish stands for their share of developing the technology, this is still only a portion of the total cost. The total cost of the project also involves the grid connection, the power lines, the sea cables, etc. Other challenges are the hostile marine environment, power-to-shore transportation and difficult access for repair and maintenance. So looking at the total scope of the project and what the output is at this point in time, the economics of the project is very tight. The industry is reliant on the utilities and that the government agencies provide the first level of funding, as well as grants and the ROCs scheme, which is already in place. It is also necessary that both sides accept a certain risk sharing on the first projects to achieve economies of scale and lower manufacturing costs. Another factor is the budget crisis all over Europe, which certainly does not help. However, Scotland is keeping up the five ROCs for tidal energy so that is certainly something that is very favorable. “If we can’t make it there, we can’t make it anywhere!”

5.6.8 The relationship and daily operations

All the technology development is still located in WWT. The team of 15 employees in the UK have the responsibility for the technology development and all the way through to the operation and maintenance of the machines. Whitefish played a part in the first few years of the acquisition, when the technology was in an earlier phase. Now, about 50-70% of the machines are produced in Whitefish’s facilities, but WWT mainly operates as a separate division. WWT has a test machine installed in the UK and two projects at consenting level. Whitefish owns 59.43 % of WWT, while the other shareholders individually hold much less percentages. However, since they do not hold the full 2/3 of the company the other minority shareholders have the possibility to block proposals in the general assembly. This means Whitefish does not hold full control of WWT.

6 Findings and Analysis

The intention of this chapter is to summarize the findings from the six case companies presented in the preceding chapter. First, findings regarding how the case companies identify new business opportunities are presented. Thereafter, factors making the marine energy industry attractive are analyzed. Next, how the case companies assess new technological opportunities is listed, followed by a presentation of identified attractive factors of technology firms. Furthermore, case company entry modes when investing in firms in the marine energy industry is included, followed by findings and analysis of time of entry into the industries and the investment development over time.

In general, all of the six case companies seek to become leading technology and equipment suppliers to the ocean energy industry. Table 4 summarizes which relevant sectors the case companies are currently operating in, and if they have invested in the wave or tidal energy industry. It also illustrates that all of the case companies are currently involved in the tidal energy industry, and that Eel and Mackerel also are involved in the wave energy industry. Catfish and Icefish have also been involved in the wave energy industry, however, Catfish has currently paused their wave energy technology development, while Icefish has exited their engagement.

Table 4: Sector of operation and industry of investment. A red x illustrate an exited involvement, an orange hyphen illustrates a paused technology development.

Case company	Relevant sectors of operation	Wave	Tidal
Catfish Corporation	Hydro power	-	✔
Eel Enterprise	Maritime, power generation	✔	✔
Goldfish Global	Hydro and wind power		✔
Icefish International	Hydropower	✖	✔
Mackerel Multinational	Power generation	✔	✔
Whitefish Worldwide	Hydro power		✔

6.1 Identifying opportunities in new industries

The case company interviews reveal that the companies have ways to *identify* new industrial opportunities. Most of the companies specifically state that they *scan* the marketplace. Another way to discover new opportunities is by approaching or being approached by contacts in *networks*. How the case companies identify opportunities for investment in new industries is summarized in Table 5 below.

Both Goldfish and Mackerel have *separate units* dedicated to activities such as identifying and investing in promising ideas. As stated by Goldfish, not all good innovative ideas stem from inside the company. These units normally focus on areas where their current skills, knowledge base, and customer relationships can be of value. Recognized opportunities are first discussed in these units before they are brought further to other experts in the company and last to the highest level of management, who makes the final decision. Eel was different in this phase, as the corporate owner was looking to invest in a renewable source of energy, particularly. However, the company still scanned the renewable energy industries to look for the right opportunity of investment. They also have a history of constantly searching for new or emerging opportunities, and an internal drive to innovate.

Table 5: How the case companies identify opportunities for investment in new industries.

Identifying opportunities in new industries	
Scanning	**Networks**
• Evaluate what competitors and customers are doing (Mackerel, Goldfish, Icefish) • Pay attention to where investments are being made (Mackerel, Goldfish, Icefish) • What experts are discussing and where industry is headed (Mackerel) • Pay attention to political activity (Icefish) • Constantly searching for new opportunities to be innovative (Eel)	• Being approached by technology company (Goldfish, Whitefish) • Approach firms with complementary know-how (Icefish) • Contact an entrepreneur with a promising idea (Eel)

6.2 Reasons for choosing the marine energy industry

All of the case companies have mentioned the large resource potential of marine energy as an important trait that attracted them to the industry. Furthermore, the reasons for choosing this industry for investment can be explained as a combination of factors regarding the industry and the investing MNC. Industry *growth prospects*, *renewable nature* and *government support* are identified attractive industry factors. Factors regarding the investing MNC are the *strategic value* to the company and potential for *synergies* with core competences. Although, the case companies find the marine energy industry attractive for various reasons, the potential for growth seems to be the foundational motive to invest. The most essential factors to consider when deciding whether to enter the wave and tidal energy industry as identified by the case companies, are listed in Table 6.

Table 6: Overview of the factors making an industry attractive to MNCs.

	Factors making the industry attractive to MNCs				
	Growth prospects	**Renewable nature**	**Gov. support**	**Strategic value**	**Potential for synergies**
Catfish	Large market potential	Sustainability, CO_2-free, tidal: reliable and predictable		Global presence, innovation, a balanced product portfolio	Experience from hydro power
Eel	Largest existing untapped renewable resource, future profits	Sustainable energy production for future generations, global trend		Vision and dream of the owner	Experience from shipping, power generation and maritime operations
Goldfish	Large new energy market potential	Bonus that the energy resource is renewable	Crucial prerequisite for investment	Reach a market leading position based on technology and innovation	Experience from hydro and wind power, take advantage of current skills and knowledge base, supply chain
Icefish	Large new energy market potential, potential for company growth	Global trend	Crucial prerequisite for investment	Grow portfolio, maintain position in energy sector	Experience from hydro power, use of core skills
Mackerel	Potential for growing company as both supplier and investor in industry	Bonus that the energy resource is renewable		Improve portfolio, regain position in power generation industry, prevent competitors	Experience from power generation, take advantage of current skills and knowledge base, existing customers, supply chain
Whitefish	New energy market is attractive, potential for company growth	Marine: less noise	Crucial prerequisite for investment	Grow portfolio, maintain position in energy sector	Experience from hydro power, production facilities, existing customer and markets

6.2.1 Factors making the industry attractive

As the table above shows, all the companies point out the *potential for growth* in the marine energy industry as the key motive for entering. Emerging industries generally have a higher potential for growth than mature industries and are therefore considered especially attractive by the companies. Industry growth can further influence the growth of the company, and Whitefish seeks growth as a consequence of the saturating hydropower market. Goldfish and Icefish emphasize the economic potential by creating a new energy market. Mackerel highlights two potentials for company growth by investing in the marine energy industry. One is the potential of their technology company investments and the second lies in the fact that Mackerel also aims to become one of the leading equipment suppliers to this industry. Furthermore, they find it advantageous to enter new industries during the early emerging phase because it enhances the opportunities to influence the final design and defining standards of the technology, thereby increasing the possibility that Mackerel's products will be used, which further secures company growth.

Several of the case companies mention the *renewable nature* of the marine energy as an attractive factor. Eel is the most extreme case, where the decision to enter was based on the owners' belief that investing in renewable energy is considered a necessary step towards a more sustainable world for future generations. Some of the case companies highlight that renewable energy and sustainability is a global trend, and that it is important to keep up with the changing demand for these resources and take part in the renewable development, especially if the aim is to remain a major player in the energy industry. However, despite that the renewable aspect is considered positive, both Goldfish and Mackerel state that external pressures to invest in renewables never can justify an investment. They emphasize the need for business opportunities and economic reasons in order for an investment to make sense, though both these two companies consider it a bonus that an investment has a positive effect on global and environmental issues.

Some of the companies mention the *governmental support* in the UK as a crucial prerequisite for their decision to invest in the marine energy industry. Goldfish specifically states that they never would have entered without the UK support system, due to the high levels of uncertainty and lack of visible market mechanisms. However, Icefish points out that being dependent on governmental support also involves certain investment related risks, considering that such support may reach an end.

6.2.2 MNC factors increasing the industry attractiveness

All the case companies highlight the importance of creating *synergies* by combining their existing experience and resources with resources in the new industry. Icefish and Mackerel highlight the general use of core skills, and only consider an investment attractive if they can bring added value by applying their existing skill and knowledge set. Icefish explains that they have a team of specialists dedicated to assess the possibility to create synergies with potential new investments, and that entering the tidal industry was considered a manageable challenge due to similar industry experience. Similarly, the hydropower companies highlight the value of similarities with tidal power and the potential of using their existing competencies. This has played an important part in making the industry relevant for investment. Icefish and Whitefish particularly state that they were attracted by how understandable the tidal resource was due to these similarities. Similarly, Goldfish sought to apply the established know-how from their existing hydro and wind power business to the tidal energy industry, and Eel emphasize maritime knowledge, as well as experience from related industries. The companies also mention other types of synergies, in addition to those based on technology, know-how and capabilities. Other resources such as production facilities, global presence, existing customers and market access create relevant industry synergies. In addition, supply chain synergies can bring the development costs down. These synergies can take the technology from a demonstration level to a full commercial scale by bringing expertise and know-how.

All the case companies have also highlighted that investing in new industries provides *strategic value* by contributing to reaching company objectives. Several of the case companies express a continuous search for opportunities that complement their existing business or expand their current product portfolio. Icefish and Whitefish explain this behavior with the objective of maintaining their position as a big player in the energy sector, which is rooted in the maturing nature of the hydropower market. After terminating their involvement in power generation about 15 years ago, Mackerel sought to get back into the business. The marine energy industry was considered a strategic fit, because it involves generation of energy and because of future possibilities for supplying the industry.

6.3 Assessing potential technological opportunities

After an industry has been identified as attractive, the case companies start considering their entry options. The principal alternatives to enter the industry are either by investing in an existing technology or developing in-house technology. All of the companies have an established approach to assess the in-house knowledge and experience on the field and to assess the external technology in the industry. The aim is to map the current internal situation of the company and identify the most promising external technology solutions, in order to make an informed investment decision on the entry.

The companies generally find it important to make an in-house assessment on *know-how, experience and resources* that can be exploited in the industry of entry. Relevant experience and know-how often arise from operations in industries with similar activities or processes to marine energy industry (ref. Table 2). When entering the marine energy industry a few of the case companies found they possessed sufficient levels of knowledge and experience to start in-house technology development (Eel in EEW, Catfish in CCT), while the rest chose to invest in external technologies because they considered to lack sufficient expertise (Icefish, Mackerel, Whitefish).

The other important assessment to conduct prior to making a decision on entry option is on the *existing technology companies* and their technological solutions. In fact, the case companies emphasized this and all have routines for assessing potential investments, except Eel. Eel invested in EET because of their superior technological solution. This emphasizes that a thorough assessment of existing technologies can reveal possible design winners and save the MNC for unnecessary spending of resources. The case companies typically do a cursory assessment of all the technology companies to find the most interesting ones, and then continue by more in-depth evaluation of the financial performance, technology, existing assets, growth and earnings potential. It seems unreasonable to initiate technology development in-house unless this is believed to become superior to existing technologies.

6.4 Attractive factors of external technology firms

Superior technology combined with the most resourceful people and partners ultimately creates a technology company with best *financial potential*. The MNCs emphasize that they only ever invest in technology companies with the potential to be economically independent and profitable. In addition, they all emphasize that they must see the potential to add value by improving the technology development. To identify the technology company with the best financial potential the case companies list several criteria, which have been bundled into five factors presented in Table 7. *Technology* summarizes all the traits considered important with the physical technological solution. *Technological know-how* includes the intangible knowledge related to the technology possessed by the engineering team of the technology company. *Patents* summarize what the MNCs finds important regarding technology protection. *Management and company culture* bundles other traits regarding the people of the technology team and the business culture. Last, *co-investors* bundles those traits identified as attractive with the technology company's co-investors.

The intention of the technology assessment is to recognize the superior technological solution, so naturally the *technology* is the most important factor. Icefish and Mackerel have explicitly said they have special teams dedicated to assess new technologies, and it appears the other companies have similar approaches. Among necessary requirements, the technology readiness level (TRL) is crucial as it indicates the level of reliability and to which extent the technology has been proven. The technology should further be efficient and have acceptable life-cycle costs. These two are interconnected as low costs are related to high efficiency through low maintenance needs, simple design and cheaper technologies.

Three of the case companies also emphasize the importance of assessing the *patents* of the technology. However, from the interviews it seems all the companies find correct protection important. Correct patents defend the technology and secure sustainability of the technology, and protect it from being copied or imitated by competitors. Goldfish finds that without the appropriate protection, unique technological advantages may be reduced or eliminated.

Table 7: An overview of important factors when assessing external technological opportunities.

	Factors making the technology company attractive to MNCs				
	Technology	**Technological know-how**	**Patents**	**Management and company culture**	**Co-investors**
Catfish	Proven, simple and reliable; low maintenance needs; high efficiency	Less important			
Eel	Best technology; low maintenance needs; low life-cycle costs				
Goldfish	Proven and reliable; high TRL and full-scale prototype; unique; passed environmental tests	Team and know-how distribution	Appropriate protection	Similar business cultures	
Icefish	Efficient; cheap; performance advantage	Team and know-how	Protection of the important parts		
Mackerel	Simple technology induce lower production costs			Management and leadership	Contribute with funding; know-how and market access; must be easy to work with
Whitefish	Proven and reliable; high TRL and most advanced technology; low maintenance needs	Experience, know-how and engineering expertise	Protection of key intellectual property		Potential future customers

Icefish amplifies the importance of the technological *know-how* embedded in the engineering team. According to them, the success of a technology investment depends on the people behind the technology and their essential know-how. Although less extremely so than Icefish, half of the case companies emphasize the know-how and experience of the team as important factors to consider when assessing technology companies.

In addition to the factors presented in Table 7, a few companies have highlighted other important traits to consider when assessing investments. Mackerel find it important to have faith in the *management team*. They point out a challenge with small start-up companies regarding the technology inventors, which often stay with the company, whose technological focus may inhibit the business development. A favorable trait of MMW was hence that business professionals had replaced the original founders, and the company instead had some of the most experienced leadership in the industry. Goldfish finds it easier to work with companies with *similar company cultures*. Catfish expresses a rather different view, and says that as long as the technology works the team is less important because, unlike the technology, the people can easily be replaced.

Another factor mentioned by a few of the companies is the importance of a technology company's *co-investors*. The attractive trait is particularly related to the co-investors ability to "pick up the bills", generally facilitate the technology development and the path to the market. Investors may either contribute with resources and funding, or act the role as a possible future customer.

6.5 Entry modes into the marine energy industry

All of the case companies find investing in external technology solutions an important way of accessing new industries. The entry modes applied when investing in the wave and tidal energy industries are listed and presented below. The case companies were asked in detail whether they had a standard entry strategy, in addition to elaborate on the particular entry mode used, why these were chosen and how these had developed over time.

6.5.1 Entry modes

The companies have applied different entry modes when entering the wave and tidal energy industries. Table 8 below summarizes how the MNCs made their initial entry, or entries, into their respective technologies. Technology companies that later has been exited are also included to provide the overview of the MNCs' investments.

From Table 8 above, it becomes clear that a minority equity investment in an existing technology firm is the MNCs' most frequently used entry mode into the marine energy industries. Indeed, all except Catfish have applied this entry mode at least once, and Goldfish, Whitefish and Mackerel have only applied minority equity investments. Furthermore, two of the companies have used a full acquisition of a technology company. Joint venture and in-house development are the least applied entry modes, and have only been used once by Catfish and Eel, respectively.

Table 8: Case companies' first investments in the wave and tidal energy industries.

Company	Technology	Entry mode
Catfish	CCW	Full acquisition
	CCT	Joint venture (80/20)
Eel	EEW	In-house development
	EET	Minority equity investment
Goldfish	GGT	Minority equity investment
Icefish	IIT_1	Minority equity investment
	IIW	Minority equity investment
	IIT_2	Full acquisition
Mackerel	MMW	Minority equity investment
	MMT	Minority equity investment
Whitefish	WWT	Minority equity investment

6.5.2 Advantages and disadvantages with different entry mode

Five of the MNCs explicitly state that they considered different modes of entry prior to making the initial investments. None of the case companies considered or applied non-equity partnerships. Since the research questions look at the process of *investing* in these industries, non-equity partnerships are not included. The following four tables summarize the advantages and disadvantages identified by the case companies with the four applied entry modes: in-house development, acquisitions and majority equity investments, joint ventures, and minority equity investments.

Table 9: Advantages and disadvantages with in-house technology development.

In-house technology development	
Advantages	**Disadvantages**
• Promotes innovation supportive company culture (Eel) • Exploit and strengthen existing capabilities and know-how (Catfish, Eel) • Makes early entry into industry possible (Eel)	• Time consuming (Goldfish, Icefish, Mackerel and Whitefish) • Costly (Goldfish, Icefish, Mackerel and Whitefish) • Higher risk than other entry modes (Mackerel)

Several of the companies considered in-house technology development, although only one of the MNCs actually applied this entry mode. As promoted in Table 9, in-house development comprise a large risk because it is time consuming and costly. However, it exploits and strengthens existing capabilities and know-how, and supports an innovative company culture. It also makes an early entry into new industries possible because it does not rely on existing technologies. Eel, as the only one of the case companies, selected this entry mode for the arguments provided by Eel in the table above.

Table 10: Advantages and disadvantages with acquisitions and majority equity investments.

Acquisitions and majority equity investments	
Advantages	**Disadvantages**
• Ensures integration of technology firm into existing business (Catfish) • Increased control of development (Catfish, Goldfish, Icefish) • Quick entry mode if late entrants into industry (Icefish) • Maximum value in terms of profit and resources (Icefish) • Provides additional expertise (Icefish)	• No time to learn about technology company and industry (Goldfish) • Integration right away can harm technology firm (Goldfish) • Higher risk than other entry modes (Mackerel)

All the case companies, except Whitefish, have provided arguments regarding full acquisition or majority equity investment, which indicates that most of them considered this option prior to entering. Table 10 above shows that the MNCs appreciate the high level of control provided by these entry modes, which further induces better integration of the technology firm. Furthermore, it also allows the acquiring firm to provide their set of expertise to the technology development, and is a quick entry option for late entrants when other alternatives are considered too time consuming. An advantage with full acquisitions in particular is that there is no need to share profits. Icefish and Catfish use the arguments stated above as the reasons why they chose to enter through full acquisitions. The primary disadvantage with this entry mode is the high levels of risk it induces. Some consider it unwise to invest so heavily with limited knowledge about the technology, the company and the industry.

Table 11: Advantages and disadvantages with joint ventures.

Joint ventures	
Advantages	**Disadvantages**
• Exploit own resources (Catfish, Icefish) • Access new resources and know-how (Catfish, Icefish) • Share risks with other stakeholders (Catfish)	

Only two of the case companies explicitly stated that they considered joint ventures as entry mode. However, none of the other case companies considered this entry mode, and this explains the limited information available in Table 11. A joint venture appears to be advantageous in the sense that it allows a company to exploit own, as well as access a partner's resources and know-how. Furthermore, it allows two companies to share risks and costs. These advantages are highlighted as the reasons why Catfish chose to start a joint venture.

Table 12: Advantages and disadvantages with minority equity investments.

Minority equity investments	
Advantages	**Disadvantages**
• Can invest in several companies and industries simultaneously, i.e. "buy several options" (Mackerel) • Share risk with other stakeholders (Icefish, Mackerel, Whitefish) • Share costs (Icefish, Mackerel) • Learn about company and industry (Eel, Goldfish, Icefish, Mackerel) • Provides technology firm with freedom to grow (Goldfish) • Provides some influence and control of development (Goldfish)	• Provides less influence and control than other entry modes (Catfish) • Co-investors can hold back development (Goldfish) • Does not maximize profits (Icefish) • Does not promote the company brand (Icefish)

All the case companies considered entering through minority equity investments, although not all found it advantageous. Table 12 illustrate that such an entry mode allows the case company to share costs and risks with other shareholders. It further allows it to learn about the technology company and the industry before making a major investment decision. The limited equity involved makes it possible for the investing firms to "buy several options". It also provides the technology firm with the freedom to grow as a separate entity. This entry mode provides the MNC with a level of control and influence over the development that some companies find sufficient, while others do not. Other identified disadvantages are that co-investors may hold back development by influencing the decisions. Furthermore, the profits are shared among all the shareholders, and it prevents an investing firm to promote the technology with the company brand.

The advantages listed in the table above are the reasons why Goldfish, Icefish, Mackerel and Whitefish chose to enter through minority equity investments. Eel provided limited information, and explained that the minority equity investment in EET was chosen because it was believed to be the best option, without further elaboration on the topic.

6.5.3 Standard entry mode

The case companies were specifically asked whether they have a standard entry mode when making investments. Only three of the six MNCs have such standard entry modes, and they all have different standard entry modes. The reasons for their preferred entry modes are provided in the four tables above. The findings regarding the standard entry mode are presented in Table 13 below.

Table 13: Summarizing the standard entry modes.

Case company	Standard entry mode
Catfish Corporation	Majority equity investment
Eel Enterprise	N/A
Goldfish Global	N/A
Icefish International	Full acquisition
Mackerel Multinational	Partner syndicate/minority equity investment
Whitefish Worldwide	N/A

The three companies that do not have a standard entry mode are Eel, Whitefish and Goldfish. Whitefish consider themselves a risk-averse company that rarely invests in start-ups, and they therefore have no standard entry strategy for new industries. Eel and Goldfish do not have a standard procedure, but rather assess their alternative options of each case. Eel further emphasizes their flexibility, and explains that they assess opportunities as they come and select the entry mode they perceive to be the better option.

6.6 Time of entry and development over time

Preceding the initial entry mode, several of the case companies have a dynamic entry strategy, meaning that their involvement in the technology firm changes over time. Such decisions are based on reviews of the existing investments. Catfish finds it necessary to review investments more frequently in emerging industries than more mature industries, because of the high levels of uncertainties and risks. Figure 7 below illustrates the time of entry and the dynamic entry strategies, exits and paused developments of the investments made by the MNCs up until May 2014. An exit is illustrated by a discontinued bar, and a divestment by a striped bar segment. The x-axis stop in 2015 to include that Catfish increased their involvement to full ownership of CCT early in 2014.

6.6.1 Time of entry

Figure 7 below shows that Catfish and Eel were the earliest entrants of the case companies into the wave and tidal energy industries. Eel says that they prefer being early adopters of new technologies, and explain the early entry into the wave energy industry with the owner family's long-term perspective combined with a drive to innovate. Furthermore, Catfish considers innovation an important element of their business strategy. Interestingly, both these companies have primarily chosen high commitment and risky entry strategies such as joint venture, acquisition and in-house development as the first among the case companies to enter this industry. The exception is Eel's entry into EET through a minority equity investment. It should, however, be mentioned that EET was not the primary focus of the interview with Eel, due to the interviewees' limited knowledge on the topic.

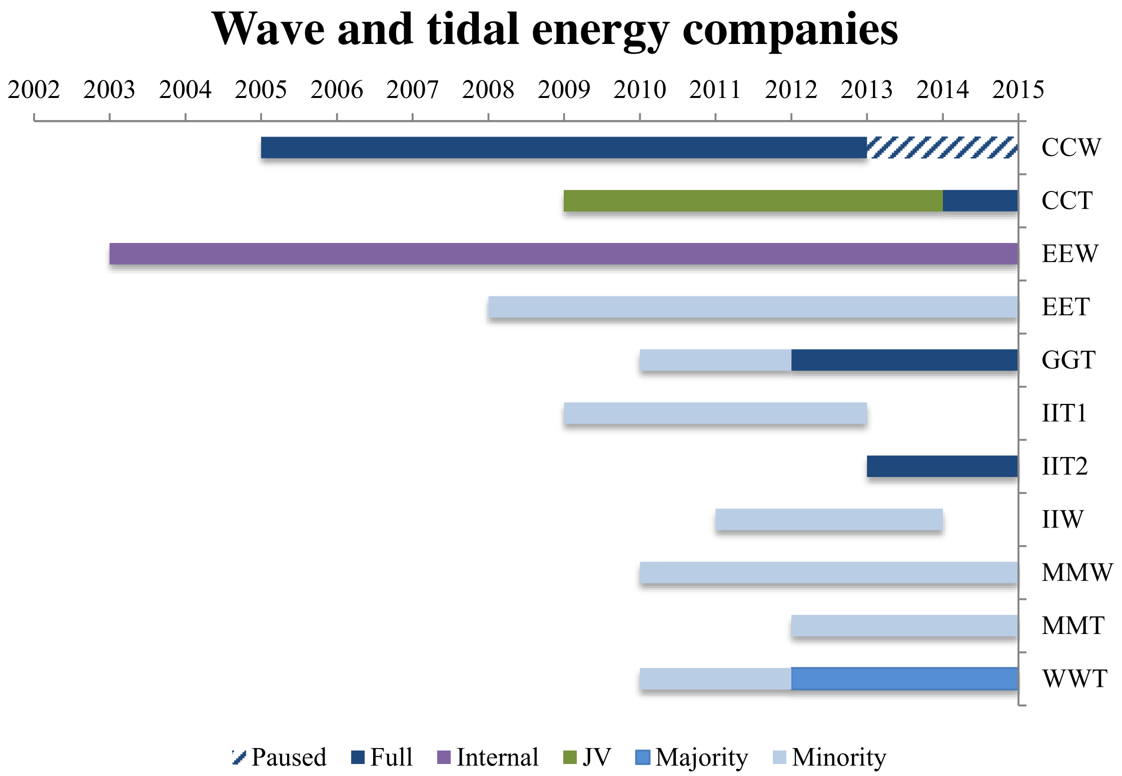

Figure 7: The wave and tidal firms the case companies have been involved in and the entry strategy used

According to Goldfish, the earlier a company enters an emerging industry, the higher the risk levels. They further highlight the need to weigh off risks and innovation requirements, and the development stage of the industry is therefore relevant. When they entered the marine energy industry, several other companies had already entered. They made a minority equity investment in GGT, which is a less risky and capital intense entry mode. Minority equity investment is also chosen by Icefish, Whitefish and Mackerel, that all entered a few years later than Eel and Catfish. However, in the case of IIT2, being a relatively late entrant, Icefish specifically found an acquisition to be the best option to catch up with leading competitors.

6.6.2 Development over time

From Figure 7 above it becomes evident that several of the case companies indeed have changed their governance mode with time. Catfish has paused their wave energy project, but kept the people and experience within the business. Furthermore, they took full ownership over the initial tidal energy joint venture because the other owner decided to exit the development.

Goldfish and Whitefish have increased investments in the technology companies. Goldfish started by doing a minority investment in GGT, later increased their shareholding position to just below 50 percent, and then further acquired the company. According to them, this was part of the plan all along; to first get to know the company and industry and then incrementally increase their influence and control in the technology company to better integrate it into the corporation. Furthermore, Whitefish increased from a minority to majority shareholding position in order to escalate their influence on the development, as well as to rename the technology company to exploit the brand. As a last example, Icefish has exited and discontinued two of their previous investments. In fact, in the same year they exited their engagement with IIT1 they fully acquired IIT2, illustrating an interesting development. They blame the exit on the technology being too inefficient to become economic, and explain that they had started developing their own tidal technology. However, an opportunity presented itself where they could acquire a tidal company from another MNC that had complementary skills, which they saw as an even better option.

6.6.3 Dynamic strategy and long-term perspective is important

Eel, Mackerel and Whitefish highlight the difficulties with developing long-term strategies within an emerging industry like the marine energy industry. Both Eel and Whitefish emphasize the importance of *flexibility* in order to succeed. If a strategy is too rigid, Eel acknowledges the danger of creating a lock-in effect due to a non-superior solution. The company also explains that they have altered their own strategy repeatedly, partly by being allowed to try and fail in their technology development. Eel thus specifically emphasizes not to have a too detailed strategy.

Catfish emphasizes the importance of a long-term perspective, and highlights strong commitment as the main ingredient for the success of this industry. In addition, Mackerel emphasizes the long-term perspective on wave energy. Goldfish explains that the uncertainty is higher when investing in an emerging industry compared to a mature industry, although they consider the main process of entering to be the same. As mentioned, they explain the need to weigh off the risks and innovation requirements, and that the risk levels are higher in the earlier phase of the emerging industry.

7 Discussion

This chapter discusses the process the case companies go through when investing in the emerging marine energy industry. In accordance with the research questions, it discusses (i) how and why opportunities in new industries are identified; (ii) how potential technological opportunities are assessed, and why they are selected; and (iii) why a particular entry strategy is chosen, and how this develops over time. A systematic analysis is conducted by studying the investment process of six MNCs and further compare these findings with relevant literature. A systematic process model describing the MNCs' entry into emerging industries is thereby developed and presented last in this chapter.

7.1 How are opportunities in new industries identified and why do some MNCs choose the marine energy industry?

MNCs need to evaluate the attractiveness of business opportunities in the marine energy industry prior to making an investment decision. The case companies all identified factors making the marine energy industry an interesting business opportunity (ref. findings tabell). This presents the *identification* element from the adapted model (ref. vår modell I litteraturen).

7.1.1 Scanning for new opportunities

All of the six case companies express the importance of staying up to date on the industrial developments related to their existing business Table 4. Being aware of the new business opportunities is important in order to reduce the danger of obsolescence (Raisch et al., 2009), and prevent competitors from obtaining a competitive edge. From Table 5 it appears that five of the six case companies search for new business opportunities by scanning what their customers, competitors, experts and politicians are doing. Some of the case companies even have separate units dedicated specifically to scan for promising opportunities, which is important for a corporation in order stay innovative (Hitt et al., 1996).

Several of the case companies become aware of investment opportunities through their professional networks. This may happen by attending technology conferences, approaching or being approached by small technology firms as these depend on investors in order to grow. Corporations engaged in technology based networks, i.e. *innovation networks*, have a better chance of recognizing business opportunities (Doz et. al. (2001) as cited in Möller and Rajala (2007); Laursen and Salter (2006)). Furthermore, they facilitate collaborative progress and growth for both small and large companies. Technology networks often comprise customers, politicians, competitors and experts, and exploiting such networks may therefore be a way of scanning for opportunities. It seems scanning and using networks are activities closely related and combined when searching for new opportunities, and it appears all the case companies have ways of scanning for new business opportunities.

7.1.2 Industry attractiveness

A combination of several factors makes the marine energy industry attractive to MNCs. The most important factor is the large energy resource potential, and the industry's prospects for *growth*. If the industry grows, a new energy market will appear, creating an economic potential and potential for firm growth. Generally, firm growth is considered important to sustain competitive advantage (Scott-Kennel & Akoorie, 2004). Some companies need new ways to grow because their current markets are saturating. This is a common motive for MNCs to seek new and similar industries (Scott-Kennel & Akoorie, 2004). The case companies see opportunities for growing the company by acquiring external marine energy technology. The literature refers to this as integration of external technology, learning and reconfiguration (Teece et al., 1997). Adaption and transmission of new external technology enhances the opportunity to quickly adjust to best practice in rapidly changing environments and deliberately grow the company.

MNCs invest in marine energy if it has *strategic value* to the company. All the case companies find it important to maintaining their global position as well as their position in the energy sector by being innovative. In addition, several companies declared the importance of maintaining a balanced product portfolio. These are factors that have strategic value to the firms because it causes economies of scale and scope, as well as sustained competitive advantage (Vapola et al., 2010). Linked to activities of strategic value, the firms also express the importance of exploiting experience and resources from existing activities, i.e. through *synergies*. Vapola et al. (2010) express the importance of firms gaining access to complementary resources an important aspect of competitive advantage. Through entering industries related to existing business activities, firms can save time and money on development by exploiting synergies with existing supply chains, know-how and capabilities, and thereby create a foundation for sustained competitive advantage.

The UK government has a goal of making the ocean energy industry a UK success story, and is leading the technology development through a solid support system (RenewableUK et al., 2013). *Governmental support* in the UK increases the industry attractiveness, and is to most of the case companies a crucial prerequisite for investment because of the uncertain future of the industry. Government support schemes are crucial for industry success in order to create a favorable and supportive industry environment (Enova, 2007).

The *renewable nature* of the industry also adds to the attractiveness, though only Eel find it the critical reason for entering the industry. This case company differs from the others both regarding core business activities and innovation supporting culture. This is, however, an exception from the general perception of the renewable factor as merely a bonus. Furthermore, some of the case companies find it relevant that renewable energy is a global trend. Indeed, the global trend of renewable energy that has emerged in recent years creates motives for the case companies to engage in sustainable activities (Kolk & van Tulder, 2010). Because of their global nature and influence, MNCs are expected to contribute to fighting global issues, such as climate change and poverty. However, as explained by two of the case companies, an investment can only be justified if economic profit and business opportunities are the primary motives for doing it. This illustrates an important trait of MNCs (Vapola et al., 2010).

7.1.3 The companies follow a technology trajectory

The companies all take a highly active and routinely approach in seeking new opportunities, at least in the case of the marine energy industry. This may support a statement made by the literature, that MNCs tend to follow a specific technological path or *technology trajectory* (Arthur, 1989). It seems that interesting new business opportunities and investments are closely linked to their current and previous operations and activities, which create an intentional and definite path of development. Therefore, synergies with new industries and technologies are highly important. This is based on core competences and knowledge, as companies seek to develop and leverage their key strengths into new opportunities (Hamel and Prahalad, 1993 as cited in (Gregory, 1995)), rather than building new ones from scratch. This further explains why MNCs consider it important for new business opportunities to be a logic continuation of their current business path, which has strategic value and creates sustained competitive advantage.

7.2 How are potential technological opportunities assessed, and why are they selected?

After making the decision to invest in an industry, the MNC needs to select how to acquire new technology and processes to match the new industry paradigm, and to gain competitive advantage (Vapola et al., 2008). Innovations may be appropriated by acquiring technology externally or by developing the technology in-house (Damanpour, 1991). It appears that the MNCs normally have an initial idea of whether in-house development is a good option or if it is better to invest in external technology. This further helps deciding which assessment, internal and/or external, to put in focus when starting the search for the best technology. The search for ideas with commercial potential is according to Laursen and Salter (2006) an essential part of innovation, and this is supported in the findings.

7.2.1 Analysing opportunities for new technology development in-house

An evaluation of the MNCs' core competences and capabilities is necessary to ensure they possess the required resources before deciding to do an in-house technology development (Gregory, 1995; Kessler et al., 2000). When in-house technology development is chosen in industries with existing technology, an ambidextrous organization would also do an external assessment (Raisch et al., 2009). Ambidextrous organizations manage to exploit their existing competencies while at the same time explore and learn from external solutions and increase their chances to gain competitive advantage. Such behavior is observed in the two MNCs starting the technology development from scratch.

Two of the case companies entered the industry by starting technology development from scratch. One entered through a joint venture, and one through in-house technology development. According to Leonard-Barton (1992) in-house technology development should only be considered if an MNC is certain no available existing system will satisfy its needs. As both of these companies were the first MNCs to enter these industries, it can be assumed that the existing alternatives were limited. The fact that the companies were pioneers in their industries explains and defends the companies' choice to develop the technology in-house in spite of the difficulties related to new product development, e.g. challenges regarding costs, the demand of high-quality and differentiation (Gmelin & Seuring, 2014). Furthermore, their existing knowledge and experience on the field helped revealing the "fuzzy front end" of the future of the technology (Khurana & Rosenthal, 1997) and transformed internal innovation to an acceptable challenge. Kessler et al. (2000) believe firms should internally develop those technologies that will strengthen their core competencies or increase their competitive advantage. In both these cases, the MNC's initial knowledge and competences were closely linked to the marine energy industry, and as they were among the first companies to enter, it can be assumed that the companies' competitive advantage were increased. Hence, the literature supports the companies' decision on developing the technology in-house. The rest of the case companies expressed the lack of necessary internal resources and experience in the field as the primary reasons not to choose in-house development.

7.2.2 Assessment of external technological solutions

If in-house development is not an option, the MNC needs to invest in an external technology in order to enter a new industry. To best make an informed decision on which technology to go for, the case companies make an assessment of the existing technology firms by mapping and comparing them. In general they seek the technological solution with the best future financial potential. The success of the investment depends on the MNC's ability to enhance, integrate and apply its current knowledge with new knowledge (Kessler et al., 2000). Throughout the case study the set of factors identified as important are *technology, patents, technological know-how, management and culture,* and *co-investors*. These combined contribute to enhance the financial potential of the technology.

Technology is the most important factor the case companies consider when assessing potential investment cases. A key requirement for investing in a technology company is that there exists technological proximity, shared technological experiences and knowledge bases (Cohen & Levinthal, 1990). Some case companies have special teams to ensure that the external technology and the core competences and knowledge of the MNC complement each other, which illustrates this. Technological proximity further enhance the absorptive capacity and ability to recognize value of new information of the MNC (Cohen & Levinthal, 1990), which is important to realize value from the investment. Moreover, the case companies' major roles in sectors such as hydropower, wind power, power generation and maritime operations indicate that the technological proximity with marine energy companies should be fairly high, which further implies that they can learn easily from each other (Knoben & Oerlemans, 2006). The case companies seek to identify the best available technology through technology assessments. Indeed, MNCs investing in firms in an emerging industry automatically seek for the highest performing technology according to Kapoor and Furr (2014). The best technology may refer to the technology readiness level, reliability, performance and the cost-efficiency of the technology. Only the companies possessing one of the superior technologies will succeed in the marketplace. Having a superior technology is therefore crucial for the economic feasibility, which further indicate a close relation to financial performance.

In addition to the technology itself, most of the companies recognize the importance of the *technological know-how*, meaning experience and competences of the people in the technology firm. Success of a technology investment can depend on the people staying with the technology after an acquisition and the knowledge these bring. In order for the acquiring MNC to properly benefit from this knowledge, there should be a relatively high level of technological proximity (Cohen & Levinthal, 1990) also known as complementarity (de Man & Duysters, 2005).These two terms both refer to the level of shared knowledge bases of two firms, and is an important source of sustained innovation. The MNCs that seek to integrate a newly acquired technology into their existing business bring the two knowledge bases closely together, and thus benefit from high technological proximity and complementarity. High levels of technological proximity facilitates this integration process by easing learning, technology development and innovation (Cohen & Levinthal, 1990; Knoben & Oerlemans, 2006) and induce higher economic returns (Jacobides et al., 2006; Milgrom & Roberts, 1990).

The *patents* play an important part in protecting the value of the technology, preventing it from easily being replicated by competitors and providing the company with ‘freedom to operate’ (Gregory, 1995; Grimpe & Hussinger, 2013; Yang et al., 2014). Although none of the case companies were explicitly asked about patents, three of them mentioned the importance of assessing the patent situation specifically. With the technology emerging as the most important factor when assessing technology companies, correct protection of this technology is naturally an important attribute. Some of the companies also considered competent *management, company culture* and *co-investors* important, however these factors are found less influential on the investment decision.

7.3 Why is a particular entry strategy chosen and how does this develop over time?

The case companies have applied different entry modes when investing in the marine energy industry. When selecting the entry mode, they are aware of their entry alternatives and most consider these prior to selecting an entry mode. Different modes of entry bring various advantages and disadvantages (ref. Findings and Analysis), particularly in the sense of commitment and the consequent levels of risk and control. This discussion identifies different factors that influence the choice of entry mode and these are further identified and discussed. In addition, there will always be case specific circumstances that can ultimately influence the final investment decision. These must be taken into consideration, as they may call for exceptions to the general trends.

7.3.1 The most frequently applied entry mode

The most frequently applied initial entry mode into a technology firm used by the case companies is minority equity investment, and all but one case company has applied this mode. Several of the case companies emphasize that such a position allows them to reduce uncertainties through time and learning. Indeed, the industry review and literature review identify the high uncertainty regarding the future development of the emerging marine energy industry. Therefore, entrants into this industry face high uncertainties both regarding endogenous uncertainties the firms have an influence on, and exogenous uncertainties outside the entering firms' control (Folta, 1998; Van de Vrande et al., 2009). When the levels of uncertainties are high, the literature recommends entries through flexible and reversible entry modes with low commitment (Hagedoorn & Duysters, 2002; Van de Vrande et al., 2009), e.g. minority equity investments. Furthermore, several of the case companies appreciate this as a less risky alternative than higher commitment governance modes.

7.3.2 Applying the standard entry mode

Half of the case companies declare that they have a standard entry mode for entering new business fields, and the findings show that they normally prefer this mode of entry. Furthermore, when a company has diverged from applying their standard entry mode, it has chosen minority equity investment because the risk levels are considered too high to apply the standard entry mode, which is in accordance with what the literature recommends (Van de Vrande et al., 2009). Hagedoorn and Duysters (2002) explain that MNCs often prefer one particular process for adopting external technologies, and seem to stick with this mode in their transactions. The preferred processes have typically developed with the firm, and have become a part of a routine that fits the firm's overall innovation strategy.

7.3.3 Differences between early and later entrants

In an emerging industry, uncertainties are reduced with time and thus earlier entrants face a relatively higher level of uncertainty than later entrants (Hagedoorn & Duysters, 2002; Van de Vrande et al., 2009). Although the literature recommends the use of low commitment entry modes to counterbalance increased levels of uncertainties, the findings show that early entrants do not choose low commitment modes. The first MNC entering into the wave energy industry applied in-house technology development, while the second entry was a full acquisition. Because the industry at the time did not offer any technologies of satisfactory levels, in-house technology development was a natural and logic choice (ref. 7.2.1). When considering the early acquisition, the company specifically stated that the entry was a logical continuation of their current activities. Further, they realized the high levels of risk, but when doing a trade-off between risk and control, they preferred being in control. This is supported by Hagedoorn and Duysters (2002) who found that firms seem to prefer M&A's if the potential partner has capabilities related to their core business, regardless of the industry environment.

Looking at the case companies, another relatively early entry was through the high commitment entry mode joint venture. However, this was not the MNC's first entry into the marine energy industry, meaning the endogenous uncertainties were decreased.

Through being active in the wave energy industry, they had grown and developed their knowledge base for some time, and thereby reduced the technological distance (Van de Vrande et al., 2009). This can explain why they chose joint venture; they believed that together with another MNC they had the appropriate knowledge to develop a superior technology to what was currently present in the industry, illustrating the importance of learning through interaction with the industry.

Another time aspect is related to how long the MNCs believe it will take to commercialize the industry. The very last entry made by the case companies was through an acquisition, because other entry modes were considered too time consuming. This would make the company miss market opportunities as several competitors were already well established in the industry (Hitt et al., 1996). Acquisitions are an efficient way to buy into the know-how and capabilities in the technology firm (Ritala & Hurmelinna-Laukkanen, 2009), and increase the competitiveness of a firm (Hitt et al., 1996). Furthermore, the fact that the firm applied an acquisition in this case can be explained by their years of experience from both the wave and tidal industries, where exogenous and endogenous uncertainties were reduced through previous learning. At this point, they were late entrants and believed that an acquisition was the best entry mode because it allowed them quick access into the industry joining the race towards commercialization.

7.3.4 How does the entry strategy develop over time

The findings show that several of the case companies have changed their involvement in the wave and tidal energy industries over time. During the involvement, endogenous uncertainty is reduced and the MNC learns more about the technology and the industry (Folta, 1998; Teece et al., 1997; Van de Vrande et al., 2009). Learning has been found to encourage MNCs to increase their investments, or conversely to exit, or to pause them. MNCs that choose to reinvest in a technology company after entering through a minority equity investment use so-called transitory alliances. Minority equity investments allow them to take a technology bet and keep their options open for future transactions. Exits and pausing of investments are typically results of inefficient technology or an immature market. This may be due to information asymmetries and may be rooted in high technological distance (Van de Vrande et al., 2009). Three of the case companies have applied transitory alliances, while two decided to pause or exit an involvement. This indicates that the investment process is a dynamic process, where the MNCs review their investments and make new investment decisions as the levels of uncertainties are reduced. Several of the case companies have highlighted the importance of a long-term perspective on the involvement in the marine energy industry, while at the same time having a dynamic strategy that can adapt to changing industry conditions.

7.4 The MNCs' entry process into the marine energy industry

Figure 8 is a dynamic iterative process model on how MNCs enter the emerging marine energy industry. The boxes illustrate activities, while the arrows show the direction of the process and involve a decision as to whether continue the process. The dynamic aspect implies that the process may at certain points take a few steps back, following the grey arrows, if a decision to terminate or re-evaluate the entry process is made. The model is, however, assumed to be transferable to MNCs entering into emerging industries in general.

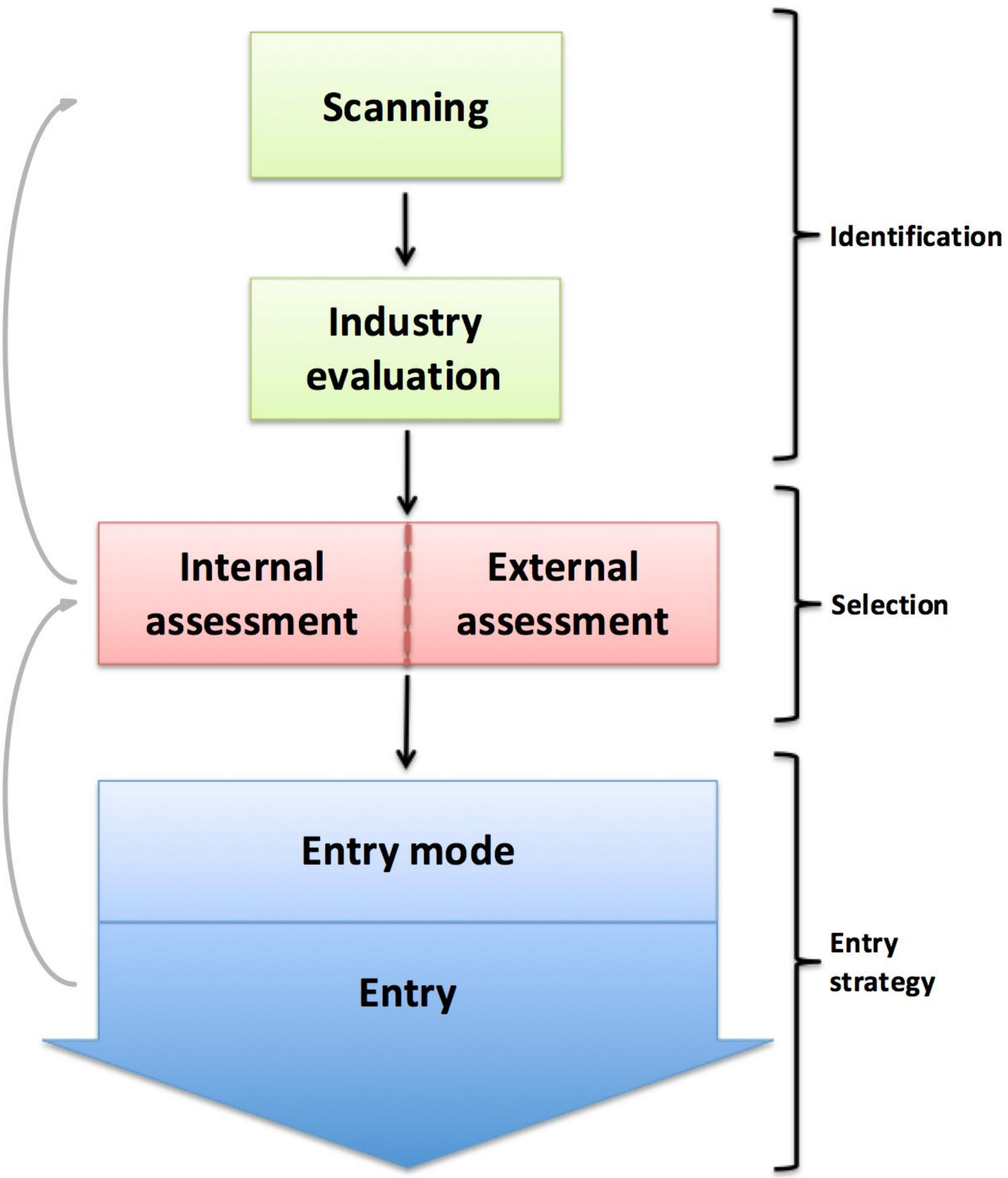

Figure 8: MNCs' entry process into emerging industries

Identification:

- MNCs continuously scan for new industry opportunities globally. This may happen in a separate unit in the company, dedicated specifically to exploring new opportunities, or through contacts in professional networks of the company.
- When an industry has been identified and considered interesting, a more in-depth evaluation of the industry is conducted. Experts from different departments in the MNC make an assessment of the economic potential, technological synergies and the potential of the market.

Selection:

- If the idea of the entry is approved, internal and external assessments are further initiated. The internal core competences and capabilities are evaluated in regard to the new industry, and an assessment of the existing technological solutions in the industry is conducted. The aim is to make an informed decision to either develop new technology in-house, or acquire technology externally.

Entry strategy:

- The entry mode choice is based on the internal and external assessments made in the previous step. The alternatives are either in-house technology development or investing in external technology. Investing in external technology includes minority and majority equity investment, and joint ventures.
- The entry process into the emerging industry continues after the initial entry mode is chosen. The investments are frequently reviewed, to make further decisions regarding re-investments. The strategy is in general dynamic and constantly adapting to the changing environment of the industry. This step in the process may take several years and lasts until the industry reaches a commercial state.

As mentioned above, this process may transfer to MNCs entering emerging industries in general. The wave and tidal industries can according to the literature be seen as *typical emerging industries* (ref. 4.2), and the case companies confirmed this in the interviews. The early stage of development, the high level of technological uncertainties and a network of cooperative actors are all traits of emerging industries, which to the utmost extent also apply to this case. Only the fact that the UK government intentionally supports this industry makes it somewhat unique. Many of the case companies have acknowledged this as a crucial factor in deciding to invest in the industry. However, this still does not interfere with the process of the MNCs investing in new industries. The government is considered a relevant actor in the development of any new industry (Carliner, 1998), and MNCs and other investors will consider the contribution of the government when looking at the emerging industry.

The process MNCs go through when entering mature industries or business fields may be considered quite different from the process developed in this study, both regarding the precautions to be made and the acting investors. Exogenous and endogenous *uncertainties* will to a high extent diminish as the industry grows and reaches a mature level, making it more predictable and thereby less risky. A significant part of the process of investing in emerging industries revolves around trying to predict the future. This involves calculating potential future economic profits and just as importantly, calculating potential losses which may be huge in some emerging industries. Further, investing in a resource intensive emerging industry, such as the marine energy industry, involves a certain requirement to *tolerating losses*. Investors in emerging industries are thus mainly resourceful actors, such as OEMs, large utility companies and governments, who believe in this new opportunity and have a long-term view and strategy on how to build and become a part of 'the new future'. Mature industries, on the other hand, have a history of operation providing financial reports with data from which calculations of economical potentials and future revenues can be made. Entering a mature industry is, consequently, involving fewer uncertainties and requiring a lower tolerance for losses.

8 Conclusion

This chapter presents the main findings and conclusions from this case study considering the process of MNCs investing in the marine energy industry. The process is found to be a dynamic and iterative series of activities regarding an identification of new business opportunity, selection of most promising technology solution and choice of appropriate entry mode. This process will now be explained in more detail. MNCs often have separate units identifying new business opportunities through a systematic scan of the business environment. Both the MNCs and the technology developers in the industry take use of professional networks to access opportunities otherwise unavailable to them. The marine energy industry is considered an attractive business opportunity to MNCs operating in the hydropower, power generation and maritime industry. The vast sustainable resources, the growth potential, and MNCs strategic value and synergies with this industry, are all attractive factors. In addition, the UK government support-scheme and the current global trends regarding fighting climate change are also relevant.

Prior to *selecting* whether to enter the industry through in-house development or invest in external technologies, the MNCs do an internal assessment of core capabilities and an external assessment of existing technologies. These MNCs appear to be ambidextrous organizations capable of simultaneously exploiting existing competencies and exploring new opportunities. They show an understanding for their various alternatives, and recognize the need for proper assessments of the available technological opportunities, in order to make an informed investment decision. When assessing external technological opportunities the physical technology is the most important factor to consider. The companies do an internal assessment of whether they have the required expertise and resources before initiating in-house technology development. In general this option is only selected if no available external technologies meets their needs.

There are several elements influencing an MNC's choice of *entry mode*. Because of the high levels of uncertainties in this industry, the low commitment entry mode minority equity investment is most frequently used. The exceptions from this are when high commitment entry modes, such as in-house development and full or majority acquisitions have been made. This is explained by the MNCs' preference for standard entry mode, as well as the time of entry. Earlier entrants have less external technological opportunities to choose from and have time to develop a technology in-house. Late entrants use acquisitions to quickly enter the industry and compete with the leading technologies for market opportunities. It appears that MNCs that choose low commitment entry modes proceed using transitory alliances. Learning from experience they tend to shift to higher commitment governance modes with time. This highlights the dynamic nature of the entry strategy, and the long-term perspective necessary to adapt to the changing conditions in the industry and to gain profits from their investments. It also appears that resourceful MNCs with higher experience in this industry have a higher tendency to utilize high commitment governance modes with time.

9 Implications and Suggestions for Further Research

The findings and conclusions made from this case study have certain implications for the most important actors involved. We will here present our thoughts regarding implications for MNCs, small technology firms, government and policy makers in the marine energy industry. We have also discovered some areas recommended for further investigation, and some suggestions are presented last.

9.1 Implications for MNCs

MNCs should be aware of the uncertainties and have a clear perception of the risks before entering an emerging industry, such as the marine energy industry. However, these types of industries are in dire need of capital and expert assistance in building sustainable technology solutions, while keeping the costs of energy down to an acceptable level. In order to be successful, MNCs should seek to gain strategic value by contributing with synergies related to technology and supply chain. Furthermore, a long-term perspective on the investment should be a premise for entering the wave and tidal energy industries, as these industries are very capital intensive and still have a long way to go on the path to commercialization. Looking back, especially the wave energy industry has failed to meet expected goals due to misapprehensions on the time perspective on development and commercialization. The future success of the industry is dependent on several different groups of actors, including technology developers, governmental organizations, utilities and other industry other. MNCs should recognize the individual importance of these actors and the need to engage in cooperative agreements, in order to reach success of this industry.

9.2 Implications for small technology firms

Small technology firms in the wave and tidal energy industries should be aware of that some MNCs seek to gain or maintain a major role in this industry in the future. Accordingly, they should understand the fact that MNCs have access to complementary resources as well as established routines and processes that might shorten the development time of the technology, and thereby help create a competitive advantage. Further, MNCs interested in entering the industry seek the best technological concept, but also consider patents and technological know-how as important in their future investments. Small technology firms should therefore focus on these factors when seeking an MNC as an investor or potential buyer of the technology. However, small technology firms should also keep in mind the potential risks of involving large multinational corporations in the business, giving them full access to their unique technology solution. Large rigid routines and control systems may suffocate the innovativeness and flexible nature of the firm, ultimately leading to giving away the control of future development. The MNC may also have opportunistic intentions, investing in the technology while eventually replacing the entrepreneurs and original development team. In the worst case this can be perceived as theft of the business idea.

9.3 Implications for governments and policy makers

Policy makers and governments must be aware of their influence on the marine energy industry when creating and setting the foundations for support systems. MNCs and technology firms have expressed that government support is crucial for the success of this industry, and MNCs identify it as a crucial prerequisite for their current involvement in the UK industry. They should also keep in mind the several positive national and environmental effects can come from the success of this industry, providing sustainable energy to the national grid, creating jobs for the people and further providing long-term economic profits. However, in order to create beneficial support policies, policy makers and governments should know the industry well, e.g. by obtaining extensive knowledge on the existing technology concepts, relevant actors, and influencing forces.

9.4 Suggestions for further research

This paper has considered the process of MNCs investing in the marine energy industry. In order to verify the findings and the conclusions, further research should be conducted on several aspects. First, to fully understand the concept on emerging industries, further research should be conducted on this field. Forbes and Kirsch (2011), Low and Abrahamson (1997) and Kapoor and Furr (2014) are the authors that provides the most relevant articles on emerging industries, and these have also been applied to in study. However, none of these contributions have brought the satisfactory in-depth knowledge on the phenomena but have rather mentioned interesting aspects and trends. A detailed research on emerging industries, which clarifies concepts and buildings blocks, could add greatly to the strategic literature.

Another suggestion for further research is on the process of MNCs entering emerging industries in general. A new study should be done with the use of case studies, questionnaires, quantitative methods or other research methods to verify the findings presented in this case study. More specifically, understanding the process of utilities investing in the marine energy industry should be researched in order to get a better understanding of the investors in this industry. Government involvement and the use of trade organizations are also areas that could bring interesting research to assess the importance and influence these actors have on technology firms, MNCs and the industry as a whole. Furthermore, a more in-depth study on the MNCs' involvement and interaction with technology firms could bring interesting results. Last, the influence MNC's may have on emerging industries in general could bring a relevant research contribution.

During the course of this study, the difference between the wave and tidal energy industry has become evident. Both these industries have been studied in this paper, though generally referred to under the common term of the marine energy. Therefore it would be interesting to see a more in-depth analysis on the existing differences between these marine industries and on MNCs' apprehensions of, and involvement in, the respective industries. It would also be interesting to research and compare these industries' prospects for the future.

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