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Open Innovation in SMEs

- Exploring the wind turbine industry

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Sammanfattning

Titel: Open Innovation in SMEs – Exploring the wind turbine industry

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Nyckelord: Öppen Innovation, Små och medelstora företag, Vindkraftsindustrin, Samarbete, Forskning och Utveckling (FoU)

Syfte: Givet det begränsade antalet studier inom Öppen Innovation i små och medelstora företag samt i vindkraftsindustrin syftar denna uppsats främst till att utöka kunskapsområdet inom detta ämne. Syftet är vidare att komplettera föreslagna teorier inom Öppen Innovation för att förbättra tillämpbarheten på små och medelstora företag i vindkraftsindustrin.

Metod: Studien har antagit en deduktiv ansats i vilken föreslagna teorier inom Öppen Innovation har använts och testats. En flerfallstudie har genomförts på tre företag där data har samlats in i form av semi-strukturerade intervjuer.

Teoretiska perspektiv: Uppsatsen utgår från tidigare studier genomförda inom ämnet Öppen Innovation från vilka föreslagna teorier har utgjort basen för analysen av det empiriska resultatet.

Empiri: Empirin består av primärdata insamlad genom semi-strukturerade intervjuer med representanter från tre företag verksamma inom vindkraftsindustrin som använder sig av Öppen Innovation, vilka är: Vertical Wind AB, Whale Power samt GGRail AB. Ytterligare en intervju har genomförts med FMT AB, samarbetspartner till GGRail AB. Övrig empiri består av sekundärdata. Insamlad data redovisas under sex olika variabler.

Slutsatser: Denna studie har kunnat visa på vikten av personliga nätverk, delade visioner samt valet av samarbetspartner för att små och medelstora företag framgångsrikt skall kunna använda sig av Öppen Innovation. Dessa viktiga egenskaper har samtidigt visat sig vara lösningen på många av de utmaningar som små och medelstora företag ställs inför vid implementeringen av Öppen Innovation. Vidare har denna studie fastslagit att föreslagna teorier inom ämnet bör kompletteras med följande två aspekter för att öka tillämpligheten på små och medelstora företag: Marknadsföringseffekt samt behov av finansiella resurser.

Abstract

Title: Open Innovation in SMEs – Exploring the wind turbine industry

Seminar date: 2011-14-01

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Key words: Open Innovation, SME, Wind turbine industry, Collaboration, Research and Development (R&D)

Purpose: Given the lack of studies conducted on Open Innovation in the wind turbine industry and on small and medium sized enterprises, the purpose of this thesis will first and foremost be to expand the knowledge within this field. Further, the purpose of this paper is also to complement suggested theories within the field of Open Innovation to increase their transferability to SMEs in the wind turbine industry.

Methodology: This study applies deductive research logic where suggested theories within the field of Open Innovation have been used and tested. A multiple case study has been conducted through semi-structured interviews at three companies.

Theoretical perspectives: This study's theoretical framework consists of previous research within the field of Open Innovation from which suggested theories have served as a base for analyzing the empirical results.

Empirical foundation: Empirical data has been gathered through semi-structured interviews with representatives from three SMEs that have adopted Open Innovation, operating in the wind turbine industry: Vertical Wind AB, Whale Power, and GGRail AB. One additional interview was conducted with FMT AB, collaboration partner to GGRail AB. The empirical results are presented under six different variables.

Conclusions: This thesis have been able to conclude the importance of networks of personal contacts, shared visions and the choice of collaboration partners in order for SMEs to successfully implement and manage Open Innovation. These important features have also been proved to be the solution to many of the challenges that a SME faces under Open Innovation. Furthermore, this study concludes that the suggested theories within the field need to be supplemented with two additional aspects in order to increase the transferability to SMEs: Marketing effect and Need for financial resources.

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1. INTRODUCTION

1.1 Background

Henry Chesbrough (2003) was one of the first authors who recognized the need for a new innovation process which included the input of information and knowledge from external sources in the company's environment. He argued that due to shortened product life cycles, increased globalization, and increasing research and development (R&D) costs, companies today need to share these costs and find new revenue sources. Open Innovation is the key to this. By collaborating with external sources like universities, competitors, suppliers and customers, companies are able to find faster ways in bringing new products to market than companies with closed innovation processes are able to reach.

One well known example of an Open Innovation approach is the one implemented by Procter and Gamble (P&G). In the year 2000, the company abandoned its "invent-it-ourselves" principle and adopted a new innovative business model which they called Connect and Develop. P&G was able to create new and better products faster by identifying and incorporating external ideas and applying their own capabilities to them. Partly due to this more open innovation process, P&G increased their R&D productivity with close to 60 percent. (Huston & Sakkab, 2006) Another example of an open innovation project is the online platform which Fiat has created for the development of their new car; Mio. (www.fiatmio.cc/en) Through this website, Fiat invites people to contribute ideas and comments with the aim set at developing the first car in collaboration with customers.

Both P&G and Fiat are examples of two large multinational companies with an open view of the innovation process. However, there are also examples of how small and medium sized enterprises (SMEs) have managed to be highly innovative by embracing Open Innovation. The increasing demand for renewable energy seems to have created a number of small companies all over the world that has proven to be extremely innovative. The demand has driven the research development and kept growth almost constant in spite of the recent deterioration of the global economy. This is perhaps most apparent within the industry of wind energy where installed capacity has grown an average of 31,4 percent over the last 13 years and the outlook for the future indicates even more impressive growth rates (Global Wind Report 2009, GWEC).

Examples of open innovative solutions include vertical axis wind turbines (VAWT), modification of the blades by implementing science from whale fins, and wind turbines for urban locations mounted on rooftops in cities. All of these solutions originate from small companies and their relative capacity outperforms that of traditional wind turbines.

The list of examples of implementations of Open Innovation can be made quite extensive which consequently has lead to an increased interest from the research society on how to manage and implement Open Innovation. However, there is yet no holistic theory in Open Innovation. West & Gallagher (2006) identified three main challenges for companies when implementing Open Innovation. These were *incorporating, maximization* and *motivation*. The challenge of incorporation concerns how to locate and implement external knowledge and information into the companies own R&D process. The maximization challenge refers to the challenges with maximizing the internal R&D function to license new ideas to outside companies and to take in licenses from external sources. The motivation challenge focuses on how to motivate outside innovators to take part of an innovation process when they might not profit on the finished innovation, and also how to motivate and overcome the internal obstacle of "not-invented-here" principle. The authors found four key solutions to these challenges: *Pooled R&D resources* and *spin-offs*, which they viewed as structural approaches and the product-centric approaches by *selling complements* and *donating complements*. In each of these strategies the companies are forced to contribute some intellectual property (IP) to overcome the challenges.

There is also a process perspective of Open Innovation. This perspective describes how companies do in order to open up their innovation process and how they chose companies or external collaboration partners. Gassmann & Enkel (2010) established that companies use three different strategies in order to engage in Open Innovation. The first strategy is the *outside-in process* where companies get new knowledge from external sources. For example they might choose to collaborate with suppliers, customers or competitors in order to get new information. The second process is called the *inside-out process* and refers to how companies chose to license innovation to other companies that could reach a market which the licensed company is unable to reach. In addition, there is also a third choice of strategy which is called the *coupled process*

which means that companies use a combination of the two mentioned strategies in order to open up their innovation process.

1.2 Problem discussion

When evaluating earlier research within this field, we found that there are a limited number of studies conducted on the concept of Open Innovation in small and medium sized enterprises. In addition, potential differences between industries regarding how to manage Open Innovation hasn't been fully researched or established. Also, we haven't been able to identify any studies on Open Innovation within the wind turbine industry, where a number of highly innovative products have been developed lately.

Lee et al. (2010) showed the benefits for SMEs to collaborate with external partners in the commercialization stage of the innovation process and presented a network model on Open Innovation in SMEs based on Chinese companies. Harryson (2008) applied a network perspective on the innovation process and was able to conclude that the investigated case company creates innovation and growth to relationships. Furthermore, Yen et al. (2010) investigated Open Innovation on SMEs in Taiwanese companies and found that SMEs adopt a more aggressive Open Innovation strategy. The focus of most of these studies has been on the potential profit and other advantages that an open approach to innovation could bring to the firm.

With regards to the social and economic importance of SMEs and the fact that they constitute almost 99 percent of the total amount of companies in the European Union (http://ec.europa.eu), the lack of Open Innovation research on SMEs is surprising. The challenges established by West & Gallagher (2006), the three strategic processes mentioned by Gassmann & Enkel (2010) and the majority of research in Open Innovation have been conducted on large multinational corporations and the suggested theories has never been tested on SMEs and their transferability has not been verified. Possible explanations to this research shortfall might be found in the SMEs limited resources and ability to find and attract external information (Narula, 2004). Narula (2004) further argues that SMEs often have less technological resources to offer external collaboration partners which make them less attractive to outside sources. However, Chesbrough et al. (2010) states that Open Innovation is not just a privilege for large multinational companies

but rather that Open Innovation has shifted from larger to smaller companies. We have therefore recognized the need of further research on Open Innovation in SMEs within the wind turbine industry.

Due to SMEs limited resources it is interesting to research how they manage Open Innovation in the wind turbine industry where the projects often are large scale and demands much resources. Which challenges do they face in this process and do they differ from the ones presented by West & Gallagher? How do they overcome their disadvantage of limited resources? One assumption is that SMEs must incorporate the risks of loosing profit from the innovation when collaborating with larger companies because of their lack of input regarding financial resources into the project. Could it be that SMEs therefore chose primarily to collaborate with other SMEs in search of a more balanced negotiation position but how do they then circumvent the financial aspect? This raises questions about how to attract the right collaboration partner and on which grounds the knowledge exchange between the company and the external sources are based on; trust or control as a management mechanism? Are there any differences in management of an Open Innovation process between large and small companies? SMEs choice of external partners is therefore essential for the success of the project and on the possibility for SMEs to profit from an Open Innovation approach.

Because of the importance of choosing the right collaboration partners for SMEs, it is reasonable to assume that companies to some extent have specific criteria when searching for partners. Garcez et al. (2010) investigated the search process and found that companies use different search criteria depending on the characteristics of the project. In addition, they proposed that larger companies have a tendency to choose competitors and international partners as collaboration partners. However, this research is only conducted on the chemical industry and the results transferability to other industries is unknown.

To be able to present a model describing how SMEs in the wind turbine industry should chose collaboration partners when applying Open Innovation might be of great importance for other companies in order to best benefit from Open Innovation, especially when it´s a fast growing industry with an average growth of 31,4 percent over the latest 13 years. The industry's fast

growth and ability to produce highly innovative products separates them from other industries. It is therefore motivated to investigate the wind turbine industry in order to explore if they have found a new way to manage Open Innovation that is more efficient. In addition, it is important to analyze and illuminate the entire process, from choosing collaboration partners to getting the product to market. The result of this study might thus be valuable for managers in other industries as well. To attain a comprehensive picture on how this process evolves in SMEs we will study cases from highly innovative companies within the wind energy industry.

1.3 Purpose

Given the lack of studies conducted on Open Innovation in the wind turbine industry and on small and medium sized enterprises, the purpose of this thesis will first and foremost be to expand the knowledge within this field. Further, the purpose of this paper is also to complement suggested theories within the field of Open Innovation to increase their transferability to SMEs in the wind turbine industry.

1.4 Research question

The questions raised in our problem discussion indicate that there might be differences between how Open Innovation is managed in the wind turbine industry and in SMEs compared to larger companies. These potential differences will be examined from the following six variables: *Intent of opening up the innovation process; choice of partners and search criteria used to find partners; how to attract collaboration partners; challenges of Open Innovation and ways to manage these challenges; management mechanisms – trust versus control; intellectual property rights.*

By studying these variables in SMEs, we aim to answer our main research question:

How do SMEs in the wind turbine industry successfully manage an Open Innovation process?

1.5 Delimitations

Open innovation can be researched from many different perspectives, such as spatial-, network-, process- or user perspective etcetera (Chesbrough et al. 2010). We have chosen to research Open Innovation from a collaboration perspective, using six variables to answer our research question. This is a deliberate delimitation given the time constraint of the study. In addition, the research variables presented in this study could be researched using many other theories, not directly related to Open Innovation. For example, when investigating the search criteria used to find partners, many alliance or network theories could perhaps explain this relating it to other fields. However, this is neither the aim nor the purpose of this study. The suggested theories used in this study derive directly from the research field of Open Innovation and are based on new findings.

2. METHODOLOGY

2.1 Research logic

As we established in chapter one, there are no confirmed holistic theories on Open Innovation in small and medium sized enterprises. Most of the research conducted on Open Innovation has studied large companies where the authors have suggested theories and models in order to explain their results. However, these findings have neither been tested on SMEs nor on the wind turbine industry. The nature of this study is therefore exploratory where we explore if these suggested theories could be transferred to SMEs in the wind turbine industry and to complement these theories. Based on this, deductive research logic will be applied to this thesis. When applying deductive research logic, the researcher presupposes from theories within the field to understand the phenomenon in question. The researcher tests the empirical results against the theories to confirm or discard them. If the theories are discarded, the researcher could complement them or construct new theories better fitted to more accurately explain the phenomenon. (Bryman & Bell 2005)

Given the fact that Open Innovation in SMEs is a relatively unexplored phenomenon, it is important for us as researchers to be open for new information. The deductive approach might limit us in that perspective due to the risk that we only seek information that is associated with the incumbent suggested theories. To fully prevent this, the alternative would be to apply an inductive reasoning, where we disregard previous suggested theories within Open Innovation and construct new ones from the empirical findings. On the other hand, this would make the collection of data inefficient and time consuming in a sense that we as researcher's don´t know where to start searching for information. Therefore, we agree to some extent with the critique pointed at this reasoning logic; that it's a naive way of conducting a study (Jacobsen, 2007).

It is our belief that existing theories in Open Innovation could help us in the sense that it gives us some understanding of what to search for when investigating how SMEs in the wind turbine industry manage Open Innovation. Hence, we have chosen to apply a deductive reasoning. In doing so, we will emanate from suggested theories within the field of Open Innovation and seek to create an increased understanding of these theories by exploring their transferability to SMEs. We will compare and analyze our empirical findings against previous theories to point out

differences and similarities in order to present a holistic view on how Open Innovation is managed in the investigated cases. To detect differences, it's important that we strive to maintain an open mind concerning new information so that vital data won't be overlooked. In addition, it's important to point out that this is a young research field where the knowledge base best could be described as incomplete and new information is needed in order to reduce the knowledge gap. In summary, this study will have deductive research logic with an open approach to new information.

2.2 Qualitative approach

This thesis will take a qualitative approach in the sense that it is focused on explaining Open Innovation in SMEs from an open perspective where we search for specific circumstances in the context of how Open Innovation is practiced; the qualitative method is therefore preferable (Jacobsen, 2007). Further, our choice of using a qualitative approach is motivated by its openness to new information, which is important for this study since the deductive research logic might be limiting in that sense.

Our aim with this thesis is also to present a full picture and a deeper understanding of how Open Innovation is managed in innovative SMEs. This is essential due to the scarcity of research within this field and a qualitative approach is in our opinion the most suitable method to attain this comprehensive view. Furthermore, Open Innovation also includes a lot of processes which consists of complex variables which might make it difficult to measure these quantitatively. The focus of this study is not how Open Innovation can increase revenues, it's rather how the process of Open Innovation develops; from stage one where companies search for collaboration partners, to the final stage where they take the innovation to the market. Thus, this thesis has nothing to gain from using a quantitative method where the empirical results are analyzed using statistical tests.

However, there are some concerns with using the qualitative method. First of all, it can be relatively time consuming and expensive. (Jacobsen, 2007) With regard to this thesis time scope of merely two months, the research area needs to be limited to fewer research subjects than might otherwise be preferable. Consequently, this increases the importance of the research

subject selection. Furthermore, it might place some constraints on the extent to which the results can be generalized to other industries. This will be explained in more detail under the section *2.6 External validity*.

There are also some concerns with the qualitative method regarding the difficulties with collecting information from the sources of evidence. The received information could be unstructured and might therefore be hard to interpret correctly. Moreover, the qualitative method is based on interpreting, which implies that the respondent could affect the presented facts by adding their own subjective interpretation of the reality which means that a critical view towards the information is needed. The interpretation of the empirical evidence is also an important element in the qualitative method, which means that this study's empirical results will be subject to our interpretations and values. (Jacobsen 2007)

2.3 Research design

There are in essence two choices of research designs that we could apply when exploring Open Innovation in SMEs. These are the extensive and the intensive research design. When applying the extensive design the researcher investigates few variables, but many units. In our case this means that we should focus on only two or three of our six variables and instead aim at investigate more cases. This design lacks depth and makes it harder to get a full picture of the phenomenon in question (Jacobsen, 2007). For this reason, we have chosen the intensive research design where we will focus on exploring six variables and fewer units. The upside of this design is the enhanced depth of the phenomenon, but the design lacks sufficient units in order to statistically generalize the results. The optimal design would be to combine the two, but because of the lack of time and limited resources this is not possible.

Furthermore, Open Innovation is too complex to only be viewed from a few variables. This would only have given us an overview of the process which is not enough to explain how Open Innovation is managed in SMEs. In addition, our choice of research design also corresponds to Jacobson (2007) reasoning where he states that when a phenomenon is new, a deeper exploration is preferred.

2.4 Case study

Given the outlines of this study and the nature of the intensive research design that we apply, we have chosen to conduct a case study in which we investigate three cases where an Open Innovation approach has been successfully used in SMEs in the wind turbine industry. Many times, the case study design is connected to an inductive method. However, this is not necessarily the only option. In order to successfully generate theories, or to test them in a new research field, the case study as a research strategy is also compatible with the deductive method. (Bryman & Bell 2005) In addition, when generating new theories in a new field, you need to compare these with existing theories to know if your findings are unique or if old theories could be transferable to the case. Yin (2009) argues that the theory which the researchers emanates from, when using the case study design, is essential for the study and determines both the purpose of the study and the degree of generalization.

The aim of this study is to explore Open Innovation in a new context. In order to verify that our findings are novel information, we need to compare these in our analysis with earlier studies to conclude the novelty and the contribution to the research society. Yin (2009) states that the choice of research strategy is defined in the research question. In our research question, we focus on "how" which indicates that the case study is a good choice of research strategy.

The case study that we have chosen to conduct is classified as a multiple case study where we investigate three cases in one context (Yin 2009). To better fit the purpose of this study we have chosen to do so from a holistic perspective. This means that we study the three organizations, or the cases, as a hole and do not divide the organization into subunits such as marketing departments, financial department etcetera. By studying three cases instead of only one we hope to receive more extensive results and that our study could be considered more robust (Yin, 2009).

2.4.1 Selection process

The process of selecting cases for investigation began with spanning the research field for suggested theories in Open Innovation. After concluding that there is a very limited amount of studies conducted on Open Innovation in the wind turbine industry or in SMEs , but rather a

quite substantial amount conducted on large corporations, we decided to emanate from suggested theories within Open Innovation conducted on large corporations in order to understand the research question (Yin, 2009). From these suggested theories, we stated an assumption that Open Innovation might be managed differently in SMEs in the wind turbine industry compared to earlier findings, due to their ability to develop highly innovative products despite their lack of resources.

The decision to investigate three cases instead of only one is found in the replication logic. In case studies there is no relevance in performing a statistical sample logic due to the complexity of the research questions, which often contains many variables which in turn make it almost impossible to conduct a sample test. Therefore, it is a question of replication and how many cases we need to investigate in order to validate the suggested theories. The choice of how many cases to investigate is based on the amount of rival theories in the field. (Yin, 2009) Because of the limited number of alternative theories within the context of Open Innovation, new findings are welcomed no matter if they are based on only one or two cases which do not represent a high degree of certainty. Our choice of three cases is based on our desire to achieve an adequate degree of certainty that Open Innovation is managed differently in SMEs in the wind turbine industry compared to larger companies and other industries. (Yin, 2009)

With regards to keeping an open approach to new information and not to be accused of selecting data that would support our theory (Yin, 2009), we will compare our findings to earlier studies. The next step is to formulate selection criteria for how to choose the cases (Yin, 2009).

2.4.2 Selection criteria for cases

2.4.2.1 Definition of SME

The first selection criterion is based on company size. In order to qualify as a small and medium sized enterprise, we applied the European Commission guidelines on how to define SMEs:

CATEGORY	NUMBER OF EMPLOYEES	TURNOVER, OR	BALANCE SHEET ASSETS
Medium sized	< 250	≤ € 50 Millions	≤ € 43 Millions
Small sized	< 50	≤ € 10 Millions	≤ € 10 Millions
Micro sized	< 10	≤ € 2 Millions	≤ € 2 Millions

Table 1: Definition of SME (http://ec.europa.eu)

Accordingly to this definition, we will define a SME as company that have fewer than 250 employees and have a turnover of less than 50 million Euros or have balanced sheet assets of less than 43 million Euros.

2.4.2.2 Definition of Innovative products

We have chosen to define an innovative product as one that can be clearly distinguished from what can be found on the market in terms of design, technology and performance. The product can be distinguished by qualifying to one or more of these criterions. In addition, the product should preferably have been evaluated by experts as an innovative product in order to classify.

2.4.2.3 Determinants of Open innovation

Based on a large number of observations, the researchers Gassmann & Enkel (2010) managed to identify and list the industry and product characteristics which determine if an open innovation approach is suitable. In order to successfully identify appropriate cases to study, these determinants have been considered.

- High product modularity
- High industry speed
- Much explicit and tacit knowledge required
- Complex interfaces
- Creating positive externalities

2.4.2.4 Selection

Given all of our selection criteria, we have identified three companies within the wind turbine industry that fit the profile. These three SMEs have developed unique innovative products using an Open Innovation approach and are therefore excellent cases to investigate. The chosen companies are presented below.

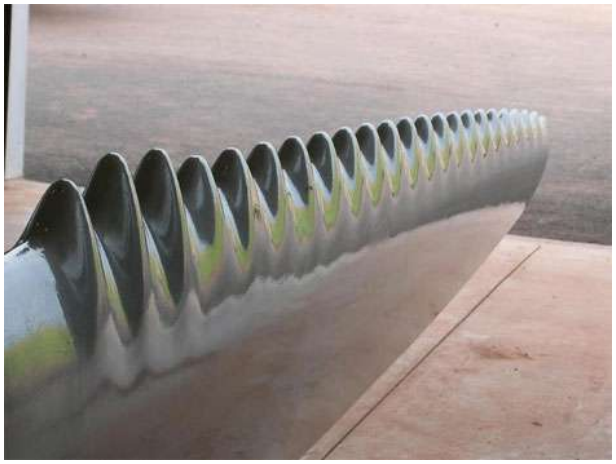
2.4.3 Presentation of cases

2.4.3.1 Vertical Wind AB

Vertical Wind AB is a Swedish company that became operative in 2008 when they commercialized their innovative product: a vertical axis wind turbine (VAWT). They changed the construction of a wind turbine by having a vertical axis that can absorb wind energy regardless of wind direction, instead of the traditional horizontal axis that. The company is a spin-off from Uppsala University, Sweden. (www.verticalwind.se)

2.4.3.2 Whale power AB

Whale Power is a Canadian company that was founded in 2004 by Dr. Frank Fish, Dr. Phil Watts and Stephen Dewar. They have invented Tubercle Technology, which combines the fluid dynamics of the humpback whale fins/flippers with wind turbines and fans. The humpback whale have small bumps, or tubercles, on the leading (front) edge of its fins and the whale tilt the fins in a very steep angle to achieve better lift through the water. Tubercles prevents stalling (when a fin/blade/wing loses its lift power) since it allows for a steeper operating angle for the fin, or blade. This new technology provides stronger blades that meet or exceed any previous performance criteria and are said to be 20 percent more efficient than any existing airfoil. (www.whalepower.com)



2.4.3.3 GGRail AB

Much like Vertical Wind, GGRail AB has also developed a vertical axis wind turbine. Their VAWT outperforms traditional larger wind turbines in a way that they are silent, needs no services and can produce relatively more energy. It is very similar to the one created by Vertical Wind, but in short they differ in placement of the generator and in size/application. (www.ggrail.se)

2.5 Data collection

When conducting a case study, the most important source of information is interviews (Yin, 2009). Interviews are also a qualitative method which is consistent with this study´s approach. To secure that the data used in this study is accurate and reliable given this study´s purpose, we will conduct interviews with primary sources. In doing so, we will limit the risk of collecting data that could misguide us and affect the reliability of this study. This means that we will collect new data that has not been available before to others in form of written transcriptions or documents.

Secondary data in form of articles, presentations from company websites, press releases and literature has been collected in the purpose of compiling earlier research within the field of Open Innovation, present the case companies and to present suggested theories. Furthermore, the secondary data has also been used to confirm and in some cases elaborate on the information given to us by primary sources, this accordingly with the method of triangulation. (Bryman & Bell, 2005) In addition, all of the data has been collected from primary sources, though, this does not mean that the information has only been given to us for this study´s specific purpose and could therefore not be classified as primary data.

2.5.1 Interviews

As mentioned above, this study will use interviews as its primary source of empirical evidence. Using interviews as a source have several advantages; they are targeted and focus directly on the case study topic. Interviews are also insightful in a way that the respondent, in his or her reasoning, make logical judgments on the basis of circumstantial evidence and prior conclusions

rather than on direct observations (Yin, 2009). However, there are some downsides. There is a risk that the interview could be biased due to poorly constructed questions. In order to prevent this, we have conducted semi-structured interviews which have the advantage of being more adaptable and flexible than the structured interview form. A second alternative to using the semi-structured interview form would be to conduct unstructured interviews. However this interview technique is time consuming and might make it difficult to receive vital information for this study´s purpose. Our aim with conducting semi-structured interviews, in which we had a number of main questions, was to get a guided conversation rather than a structured query.

Furthermore, when using interviews as a primary source of information, there might be inaccuracies in the information due to poor recall from the respondent. Though, in our case, this risk is quite small due the fact that this is an ongoing process in a company and therefore not something that happened a long time ago. To reduce the risk of asking leading questions in order to make the respondents tell us "what we want to hear", the questions have been constructed in an open manner.

2.5.2 Interview process

The interviews were conducted with one respondent at time, except for the case of GGRail AB since their closest collaboration partner, FMT AB, also were present. The questions were asked by both authors in this study in order to complement one another when follow up questions were needed and to interpret vague responses. By doing so, we were able to receive more information than if only one of us had asked the questions. Two of the interviews were conducted over telephone and two were conducted face to face. Face to face interviews are more preferable when conducting interviews in the sense that the conversation becomes more fluent and is more like a regular conversation. In addition, the interviewer has the ability, if needed, to note and react on the respondents' body language. However, one of our respondents is located in Canada and our limited resources were an obstacle for visiting him in person. Interviews conducted by telephone have the advantage of that the respondent can´t affect us by appearance or behavior, which is possible when conducting a face to face interview (Bryman & Bell 2005). The duration of the telephone interviews where approximately between 30 minutes and 90 minutes. The two face to face interviews were conducted during half a day where we were invited to visit the respondents.

All of the interviews were recorded and transcribed in order to secure our objectivity and to prevent that subconscious interpretation would affect the information given to us by the respondents. We are well aware of that recording an interview could affect the respondent, but the benefits were larger and after the first interview we were convinced that recording was the best choice in order to capture all of the information.

2.5.3 The structure of the interview guide

The interview guide, presented as an appendix in this study, contains the main questions that were asked during the interviews. It was used as a mind map over which areas to be covered during the interviews and was not followed slavishly. Some questions that where asked are not covered in the guide which is in accordance with the semi-structured interview form. In addition, the questions are open in order to not affect the objectivity of the information given to us. The questions are based on this study´s theoretical framework and could also be related to the six variables described in chapter one. This proves that the questions asked are relevant to this study´s research question.

2.5.4 The choice of respondents

When searching for adequate respondents that were able to answer our questions, we focused our search on finding persons directly involved in the planning and managing of R&D in the case company, preferably CEO's or R&D directors. The persons that we interviewed were:

2.5.4.1 Björn Hellström, CEO and marketing director at Vertical Wind AB

Björn Hellström is one of the founders of Vertical Wind AB and is highly involved in the process of developing the innovative vertical wind turbine. (Interview, Björn Hellström 2010-11-26)

2.5.4.2 Stephen Dewar, President of business affairs and director of R&D at Whale Power

Stephen Dewar is co-founder of Whale Power and has complete insight in all collaborations conducted by the company, from prototype stages to commercialization. (Interview, Stephen Dewar 2010-12-09)

2.5.4.3 Göran Gatenfjord, CEO at GGRail AB

Göran Gatenfjord is founder of the company GGRail and was the person that initiated the collaboration with FMT. He has been involved in every aspect of the collaboration. (Interview, Göran Gatenfjord 2010-12-14)

2.5.4.4 Håkan Anderberg, VP FMT AB

Håkan Anderberg is son to the CEO of FMT and has been involved in the collaboration with GGRail since the first day. (Interview, Håkan Anderberg 2010-12-14)

2.6 External validity

This study is exploratory in nature and the test of internal validity does therefore not apply (Yin 2009). External validity, on the other hand, raises the issue of whether the study´s findings are generalizable to other cases. Critics have argued that a single case study can´t be generalized. These critics normally compare the case study design to the more quantitative survey design where the sample is intended to be generalized to a greater population. However, this logic does not apply and is incorrect when dealing with case study´s. Yin (2009) argues that survey research relies on statistical generalizations whereas case study´s rely on analytic generalizations. This means that the theories and the assumptions that this study is based on could be generalized to other cases with similar conditions. However, if this study´s result shows that the theories and assumptions presented do not correspond to the reality in the cases that has been investigated; new suggestions of theories could be made.

If the suggested theories could explain how SMEs in the wind turbine industry manage Open Innovation, the theories could be transferred and generalized to other cases where the same conditions apply. Conversely, if these theories do not correspond with the cases that we investigate, we will suggest complements that could be transferable to cases that have the same conditions like the ones investigated in this study, i.e. SMEs in a strong growth industry that produces highly innovative products. Some critique could be pointed at the fact that the results of this study are industry specific and that the theories transferability to other industries therefore could be questioned. However, given the very limited amount of studies that focus on industry specifics of Open Innovation, this study should still provide validity in spite of a potential constraint in the theoretical transferability to other industries.

2.7 Reliability

In order to achieve a high reliability in this study, the method has been described thoroughly where the reader in a distinct and clear way can follow the research conducted for this study. In addition, strengths and potential weaknesses have been addressed with the used method. Every stage in the research process has been described to provide support and evidence so that the study could be replicated. The primary source of evidence has been received from interviews and the main questions could be found in the appendix section. However, information received from individuals is affected by human behavior, which is not static. This means that the information used in this study could differ when repeating the study due to factors beyond our control. When determining a qualitative case study's reliability, it's based on the consistency between the results and the collected data. In order to achieve a high consistency, we recorded all of our interviews and transcribed them.

Triangulation has to some extent been used. To verify that the information given to us is correct, we have also conducted interviews with the collaboration partner FMT in the case with GGRail. This has been done to confirm that they have similar experience of the collaboration. In the other cases with Vertical Wind and Whale Power, secondary data in form of press releases has been used to verify the information and to secure a truthful study. Furthermore, the study has been subjected to critical evaluations by supervisors and fellow research colleagues where potential question marks has been resolved and clarified.

3. THEORETICAL FRAMEWORK

3.1 Choice of theories and theoretical framework

Given the only recent surge in Open Innovation research, it is our opinion that both the reader and we as researchers will benefit from a short review of the Open Innovation paradigm, in excess of the one provided in the introduction. This will not serve any determinative analytical purpose in this study but it should, however, serve as a theoretical backdrop for the continuation of this thesis.

As we have mentioned earlier, the research field of Open Innovation is relatively young and is yet to be imputed with a verified holistic theory. For this reason, the analytical base of this thesis will consist entirely of previous studies where those authors' results and suggested theories and models will be used to analyze the empirical results and to answer our main research question.

In addition, the suggested theories and propositions presented in this section derive directly from the field of Open Innovation and are based on new findings. This is motivated by the fact that Open Innovation is a defined and a new research field and should not be mixed up with other fields. The choice of using these studies as a theoretical frame is motivated by their extensive research and/or the relation to this study´s research question.

3.2 Open Innovation

The traditional view of innovation is that it's a closed process that takes place within the boundaries of the firm in their R&D department. In order to successfully innovate themselves, companies are presumed to be required to maintain strict control over both the creation and the ownership of new ideas and intellectual property (IP). This view, which has dominated most of the 20th century, has been titled the Closed Innovation paradigm. (Chesbrough 2003)

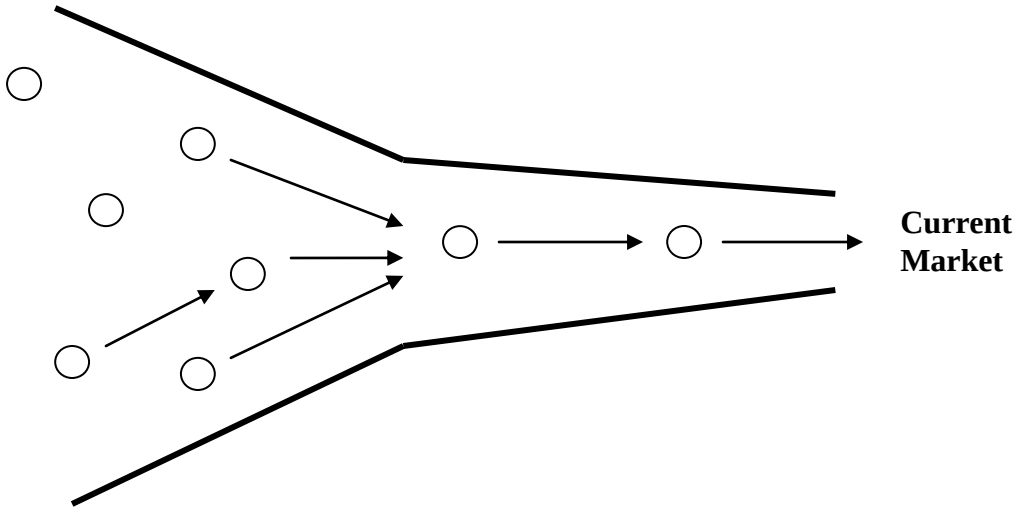


Figure 1: The knowledge landscape in the Closed Innovation Paradigm (Chesbrough 2003)

Figure 1 illustrates how R&D is managed in the Closed Innovation Paradigm. The solid lines show the boundaries of the firm, flow of ideas is depicted by the arrows. However, the concept of the Closed Innovation paradigm was created only after that of the Open Innovation paradigm. Open innovation is a relatively new concept in the literature of innovation and strategic management and it was made popular and later conceptualized by Henry Chesbrough (2003) in his book *Open Innovation: The new imperative for creating and profiting from technology.* Chesbrough argues that the industrial landscape has shifted during the last decades due to shorter product life cycles, escalating R&D costs, increased globalization, and scarcity of resources. These changes has consequently lead to the erosion of the traditional closed innovation paradigm, manly through four factors: increased availability and mobility of skilled workers, rise of the venture capital market, external options for ideas created within the company, and increased capability of external sources. (Chesbrough 2003) New ideas cannot be "stored" in order to be developed later since these ideas inevitably will leak out of the organization. Thus, companies that fail to exploit these ideas will soon find a variation of the same idea produced be one of its competitors. On the other hand, the erosion factors give rise to a wide range of external research opportunities that should be recognized and incorporated by companies in order to develop new products (Chesbrough 2003). The erosion factors has shifted the knowledge landscape to the extent where companies need to look outside their boundaries in order to

increase their innovativeness; what previously was a closed internal environment is today a more open environment.

Chesbrough (2003 p.43) defines Open Innovation as:

"Open Innovation means that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well. This approach places external ideas and external paths to market on the same level of importance as that reserved for internal ideas and paths to the market during the Closed Innovation era."

The flow of ideas into and out of firms is depicted below in figure 2.

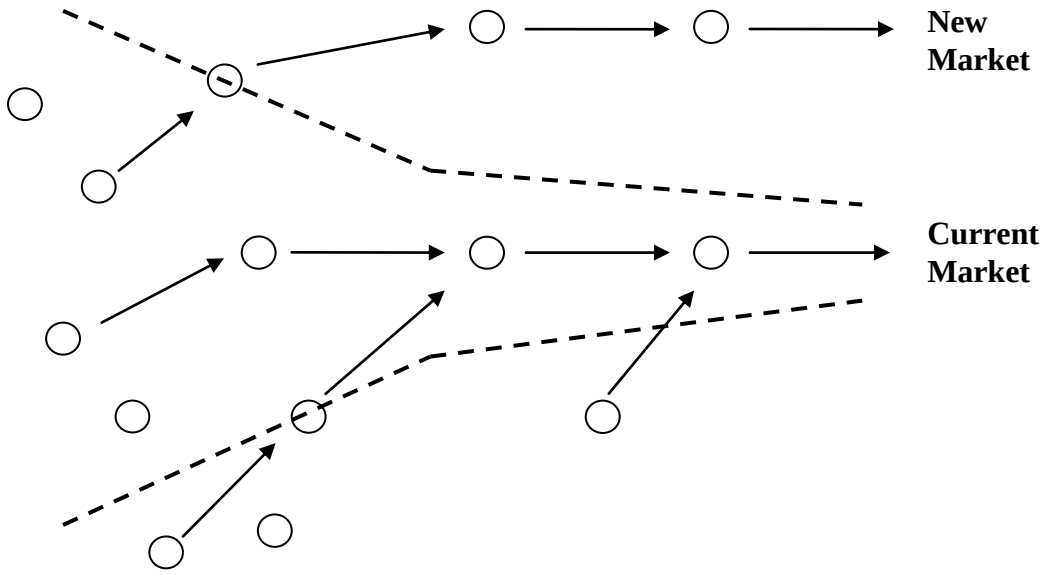


Figure 2: Knowledge landscape in the Open Innovation Paradigm (Chesbrough 2003)

3.3 Towards a theory of Open Innovation - Three core process archetypes

Oliver Gassmann and Ellen Enkel (2010) are two of the first researchers who have attempted to stipulate a theory on Open Innovation, or as the title implies; the first move *towards* a theory. They utilized a database consisting of interviews, questionnaires and workshops that has been gathered over the course of ten years and the sample companies was mainly large multinational

enterprises. To exemplify their results, the authors used IBM Industry Solution Labs in Zurich which demonstrated how the company successfully reacted to and managed the erosion factors mentioned by Chesbrough. The results are summarized in three core process archetypes: *outside-in, inside-out* and *coupled.* Companies often chose one primary core process but also implement some elements from the other two.

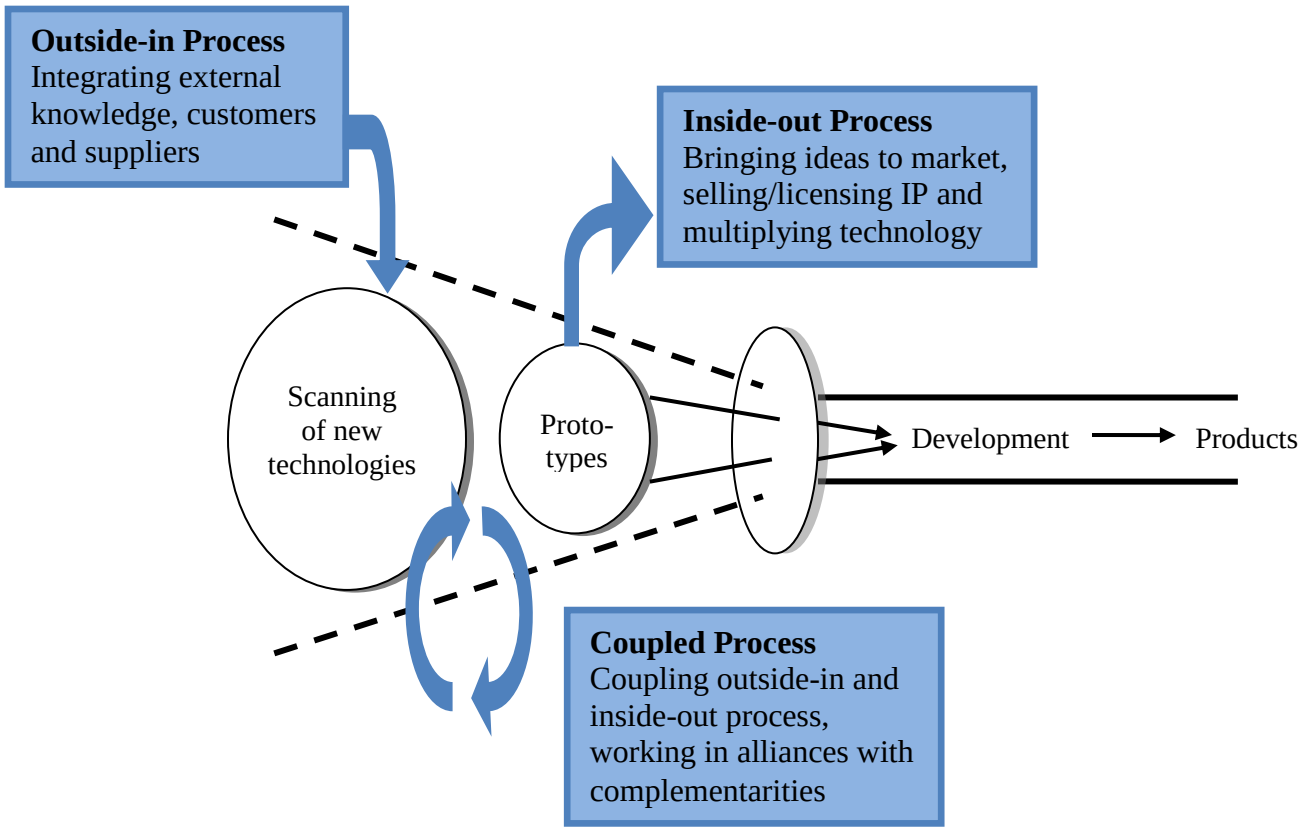


Figure 3: Three archetypes of Open Innovation processes (Gassmann & Enkel 2010)

3.3.1 Outside-in process

When companies decide upon the outside-in process as their core approach, they co-operate with suppliers and customers by integrating gained external knowledge through interaction, listening posts at innovation clusters, applying innovation across industries, buying IP and investing in global knowledge creation. The authors further conclude that investments in external knowledge sources and contact with customers and suppliers are the most important features of the outside-in process. Companies could successfully integrate their own resources with external ones by

extending the development of new products throughout the supply chain, if they possess necessary competence and supplier management capabilities.

From the supplier perspective of the value chain, companies can enhance the buyers' product by involving the suppliers in an early stage and contributing their capabilities to the innovation process. The gains from this involvement range from earlier identification of technical problems and availability of prototypes, to better utilization of internal resources, access to supplementary products and services and reduces technical and financial risk. The gains from early customer integration are also identified and the authors point to the fact that customers has moved from being passive recipients to being more active and demanding in the product development. By involving the customers in the innovation process, companies are able to derive the customers' needs before they are aware of them. This can be accomplished for example by establishing focus groups, partnership with key customers or interaction with lead users, a concept developed by von Hippel (1986) who argues that some customers are more suitable than others when developing new products. Further external sources of knowledge include the in-licensing and buying of IP (patents).

Based on their empirical data, Gassmann & Enkel also identifies certain industry and company characteristics that they have found to be present in companies that adopt the outside-in process of Open Innovation. These characteristics and a summary of the outside-in process are presented in the table below.

CHARACTERISTICS	**OUTSIDE-IN PROCESS**
Low tech industry for similar technology acquisition	Earlier supplier integration
Act as knowledge brokers and/or knowledge creators	Customer co-development
Highly modular products	External knowledge sourcing and integration
High knowledge intensity	In-licensing and buying patents

Table 2: Outside-in process (Gassmann & Enkel 2010)

3.3.2 Inside-out process

Companies that adopt the inside-out process as their core strategy focus on externalizing their innovations and knowledge in order to bring ideas and new products to the market. This can be achieved more concretely through out-licencing and selling IP or multiplying technology which transfer new ideas to other companies. Cross industry innovation is the most apparent example of an inside-out strategy and it can often increase a company's revenues quite substantially. For example, Viagra was initially developed to control blood pressure but became a huge success as a sexual aid. In addition to commercializing internally created ideas on other markets or in different industries, Gassmann & Enkel further proclaims outsourcing as a way of transferring knowledge and ideas to different environments. Outsourcing can be beneficial to a company since they can gain access to new knowledge areas, increase their flexibility and focus on core competencies.

By choosing the inside-out strategy as the core process of Open Innovation, companies can reduce their fixed R&D costs as well as share the risks. Furthermore, the lack of a suitable brand on a specific market gives companies incentives for using the inside-out process when they have core competencies for development and commercialization.

As with the outside-in process, the authors identified a number of characteristics within the companies that they found to be using the inside-out process. These characteristics, along with a summary of the inside-out process are presented in the table below.

CHARACTERISTICS	**INSIDE-OUT PROCESS**
Research driven company	Bringing ideas to market
Objectives like decreasing fixed R&D costs, branding, setting standards via spillovers	Out-licensing and/or selling IP
	Multiplying technology through different applications

Table 3: Inside-out process (Gassmann & Enkel 2010)

3.3.3 Coupled process

The coupled process is a combination of the two already described processes where companies gain external knowledge through the outside-in process as well as bring new products to market through the inside-out process. This combination is achieved through co-operation with other companies in strategic networks. Co-operation is usually defined as a long-term interaction between parties that aim at joint development of knowledge. In order for new ideas to be created successfully, a give and take of knowledge is essential, which in turn means that coupling of the outside-in process with inside-out process is important. The success is further based on the company's ability to localize and integrate the right collaboration partner that can offer the knowledge needed in order to excel in the own industry.

Most companies that adopt the coupled open innovation process strive to set new standards or a predominant product design. In addition, valuable input for co-operative innovation can also be found in alliances with complementary partners. All of the characteristics and a summary of the coupled process are presented in the table below.

CHARACTERISTICS	**COUPLED PROCESS**
Standard setting (predominant design)	Combining outside-in and inside-out process
Increasing returns through multiplying technology	Integrating external knowledge and competencies
Alliance with complementary partners	Externalizing own knowledge and competencies
Complementary products with critical interfaces	
Relational view of the firm	

Table 4: Coupled process (Gassmann & Enkel 2010)

3.3.4 Competencies related to Open Innovation

In addition to the three identified core process archetypes of Open Innovation, Gassmann & Enkel have identified specific capabilities needed by firms to successfully implement an open innovation approach.

Absorptive capability (outside-in process): Given the increasingly expensive and sophisticated technology knowledge creation, companies need to be able to recognize, assimilate and commercialize new external information in order to heighten their innovative capabilities.

M*ultiplicative capability (inside-out process):* In order for companies to exploit their internally created knowledge, they need to possess capabilities to multiply and transfer its knowledge to the external environment. To successfully commercialize new ideas, companies need to codify and share its knowledge with external entities.

Relational capacity (coupled process): In order to enable joint development, companies need to maintain and build new relationships within the network of partners. Relationships with competitors and complementary companies can be viewed as a prerequisite and an important asset to successfully link the processes of an open innovation strategy.

3.4 Challenges of Open Innovation

Joel West and Scott Gallagher (2006) have researched the Open Innovation paradigm in the context of Open Source software and communities. The empirical data is primarily gathered through interviews with 47 informants over the course of two years. Even though the study is conducted with an Open Source perspective, the authors also discuss the evidence to how their implicated theory can be applied to other industries as well. Their results consist of three core challenges to managers who adopt an open approach to the innovation process, as well as suggested solutions on how to manage these challenges. The presented challenges and solutions show some resemblance to the process archetypes and capabilities stipulated by Gassmann & Enkel (2010), but the work of West & Gallagher are more focused on the managerial challenges and the management of IP.

The authors found three core challenges that arise when integrating internal and external sources of innovation: *maximization, incorporation* and *motivation.* Furthermore, their results suggests four strategies in order for firms to overcome these challenges, or rather how firms should be organized and managed in order to successfully adopt an Open Innovation approach. Based on their inherent drivers, these have been divided into two groups, structural approaches; where

pooled R&D/product development and *spillovers* are included, and product-centric approaches; where *selling complements* and *donated complements* are included. However, given the cases/companies that we study and the industry that they operate in, the *selling complement* and *donated complement* strategies will be left out of our theoretical framework since they are not applicable and hence serve no analytical use.

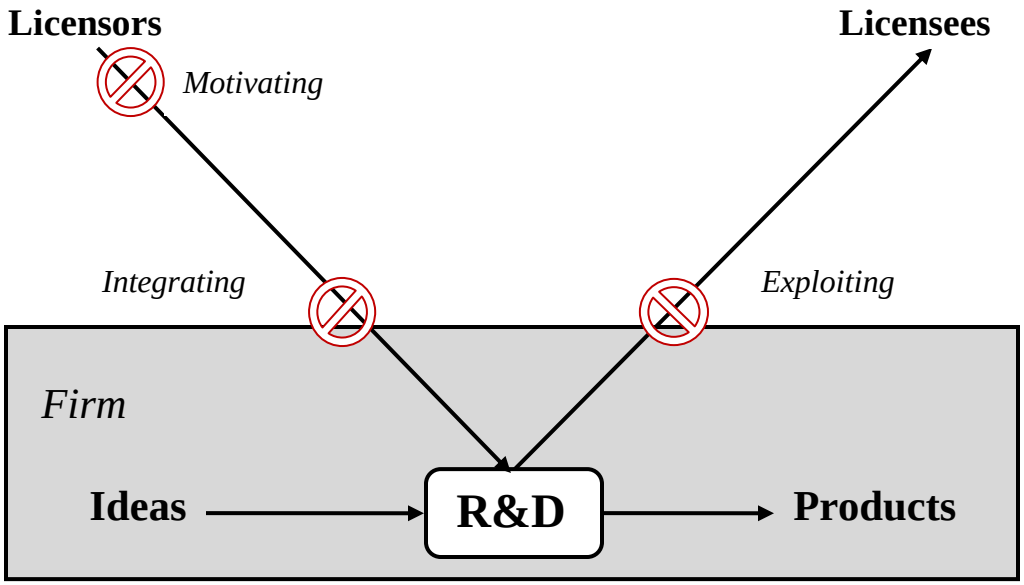


Figure 4: Challenges of Open Innovation (West & Gallagher 2006)

3.4.1 Challenges

3.4.1.1 Maximization

Maximization refers to the challenge of maximizing the returns of the company's internal R&D capabilities and innovations by diversifying the exploitation of intellectual property resources. These can be summarized as:

- Internal commercialization of internally generated innovations
- Edifice absorptive capacity to identify external innovations
- External commercialization of internally generated innovations
- Generate IP that indirectly increases returns through spillovers and sale of related products

The authors conclude that firms need to overcome a variety of these challenges in order to be successful open innovation approach.

3.4.1.2 Incorporation

In order for companies to gain from external innovations and information, they first and foremost need to be able to identify them. Secondly, companies need to maintain its absorptive capability to understand them in order to later be able to integrate the external knowledge with internal innovations. However, incorporating external sources of innovation often include some organizational and political challenges with regards to corporate culture and willingness to accept "not-invented-here".

3.4.1.3 Motivation

West & Gallagher argues that previous research within Open Innovation unwittingly have assumed that external sources to innovation simply will arise with a steady stream. Consequently, the authors emphasize the managerial challenge of motivating organizations and individuals to generate knowledge spillovers. Why should firms share intellectual property that possibly will be made available to rival companies? The traditional Closed Innovation model solved this through extrinsic compensation whereas the Open Innovation model relies upon intrinsic elements of motivation.

3.4.2 Strategies

3.4.2.1 Pooled R&D or product development

One suggested way for organizations to manage the challenges of open innovation is pooled product development or cooperative research. This strategy often helps to reduces R&D costs and the researchers further conclude that it can be beneficial for firms in industries with tough vertical relationships, higher risk, dependability on advanced science or where the company can't appropriate spillovers from their own research. Companies within the pool maximize the returns of their innovation by contributing specialized knowledge towards a common goal, co-operate in supporting that goal and at the same time compete in selling their own products. This strategy often requires the companies to change their organizational culture to some extent; an open corporate culture is needed to reap the benefits of shared R&D.

3.4.2.2 Spin-out

Open Innovation through a spin-out can enhance the potential of IP that is not creating any value within the company. A spinout is defined as a situation when a company separates an internally developed project from the organization and making it externally visible, but still maintains its operational involvement. This strategy addresses the challenges by for example helping the company establish their technology as standard or attracting complements that improve the technology. The authors further suggest that this strategy is best suitable for large companies that possess large innovation budgets with technologies that are locked up in laboratories.

3.5 The selection of partners in non-equity bi-lateral alliances

Garcez et al. (2010) investigated the partner selection process in non-equity bi-lateral alliances and presented evidence from a case study, conducted on Brazil's leading petrochemical company. They found that companies select partners depending on the frequency of the project and the characteristics of it. The collaboration partners were universities, competitors, customers, suppliers, and research institutes. Below follows a summary of their findings.

3.5.1 When to choose the different collaboration partners

The decision to collaborate with universities is based on the project characteristics which often are related to breakthrough projects or basic science. The purpose with the collaboration is to receive the expertise that the university has in the specific project area. In order to choose the most adequate university and gain access to their capabilities, companies carry out analysis and expertise mapping prohibiting that expertise's overlapping between universities.

The process continues with an initial workshop where the project research line is presented for the universities. After that, the university suggests departments and researchers best suited to the specific project. The intellectual property rights are shared between the partners and are negotiated before the project starts. The project often concerns basic science in opposite to research institute which are more focused on applied science, i.e. platforms of products or processes. In addition, the contrast between the two partners is that the research institutes do not have the capabilities for basic science because of their lack of PhD´s researchers. Their advantage is in general their technological capabilities instead of the human capital.

When choosing to collaborate with customers the main purpose is to gain market knowledge and be able to access new markets. In addition, the case company saw a possibility to gain access to complementary technical resources that could be provided by the customers. However, the company needs to give resources to the customers in order to benefit from the collaboration. The project core focus is to launch the product national and downstream in order to establish a platform in the industry. If we contrasting customer collaboration with supplier collaboration, they found that the collaboration is based on the opposite. Here, the parent company supplies the market information and the suppliers supply the technical resources that are focused on improving products. The core characteristics of the projects are upstream and medium scale.

When collaborating with competitors the core focus is on making incremental improvements on existing products and processes. In order to do so, the parent company needs to gain access to raw material and similar resources. The scope of the project is large and the aim is to reduce risks by sharing financial resources.

Overall, the process and the search criteria based to find partners are in a first stage based on the characteristics of the project. In a seconded step, the search criteria are based on trust between the parent company and the collaboration partner. Previous successful collaboration partners are seen as a starting point when searching for partners due to the reassurance that the organizational culture and other organizational differences won't be an obstacle for the parent company during the collaboration. The trust is defined as the collaboration partners' attendance to project terms, flexibility to adjustments in these terms, the trust in the partner regarding its own competencies, their ability to be innovative and finally their confidentiality. However, to reassure that they have chosen the right collaboration partner, the parent company creates blogs and practice communities where they could evaluate the collaboration before they decide to go through with it.

A summary of their findings are presented in the table below.

TYPE OF PARTNER	MAIN DRIVERS FOR COLLABORATION	MORE FREQUENT TYPE OF PROJECT	MAIN CHARACTERISTICS OF THE PROJECTS
Competitor	Access to similar resources	Incremental innovations	Big projects International agreement
Customer	Access to complementary resources and new markets	Radical innovation for opening new markets Product platform for new markets	National or international Downstream
Supplier	Solutions and improvements for products and services	Product and service platforms	Medium project (capital) Medium uncertainty Upstream
Research institute (RI)	Access to complementary or similar resources	Product and service platforms	Application focus Orchestration behavior – RI linking university efforts
University	Access to complementary resources (knowledge) Faster the development	Basic science or radical innovation first development	Long-term High uncertainty

Table 5: Partner selection (Garcez et al. 2010)

4. EMPERICAL RESULTS

4.1 Vertical Wind

4.1.1 Intent of opening up the innovation process

Vertical Wind is a spin-off from Uppsala University, where a group of scientists researched and developed a new form of wind turbine technology. The whole idea of a vertical wind turbine is sprung from collaboration between Uppsala University, Energy Potential AB and Uppsala University Utveckling AB, the latter is still a partner in Vertical Wind AB.

According to Björn Hellström; to continue the collaboration with other companies was a natural thing to do. The intent of collaborating with other companies was based on the vision to create a wind turbine that was very customer oriented and could meet the demand from their customers. The specifications were important. In addition, Vertical Wind's intention with collaborating with larger energy providers was also to create reference clients with whom they could validate their concept. This is because of the novel technology that Vertical Wind use in their wind turbines. Hellström also talks about the benefits of collaborating with the clients in an early stage of the innovation process. He states the following:

"If they are involved in an early stage of the design, you could cut a lot of the development time. We don´t need to design one prototype and then do everything all over again if the first one did not live up to the customers' expectations and demands."

In the quote above, Hellström also mentions the development time as an incentive to engage in collaboration with the customers in an early stage. Furthermore, he says, by involving the customers in the innovation process, we as a company could get a greater insight to what the market truly demands, information that Vertical Wind do not have and which is quite hard to reach.

4.1.2 Collaboration partners and search criteria used to find partners

The main collaboration partners that Vertical Wind has chosen to work with are Uppsala University, E.ON, Falkenberg Energi AB and Ericsson AB. Because of the fact that Vertical Wind is a spin-off from Uppsala University, the continued work with the university was a natural

thing to do, according to Hellström. The collaboration with Uppsala University works in a way that when scientists at the university discover something that might be relevant for the wind turbine industry, they contact Vertical Wind and explore if the company wants to further research this area. If Vertical Wind finds the ideas interesting, they could later on finance further research within that field. The collaboration with Uppsala University is therefore a part of the initial stage of the innovation process. The goal is to bring new ideas to vertical winds product pipe-line that later on could be commercialized.

In a later stage of the product development, Vertical Wind searched for suitable customers and suppliers in order to develop a prototype, in collaboration, that is market oriented. The process with searching for suitable partners began with the fact that they needed some reference customers. According to Hellström, it was time consuming and quite hard to find the right collaboration partners. He expresses the following criteria as important when searching for partners:

"They should be relevant; a real customer; they should be interested and have the right competence; and be able to pay for it."

Furthermore, Hellström says, you need to find collaboration partners that you can rely on and that thinks that this project is exiting and interesting. This is very important for Vertical Wind because of its size as a relatively small company which cannot afford to start a process against a partner if something goes wrong. He compares Vertical Wind's situation to a larger company and indicates that a larger company could spend more resources on processing the disagreements, where a small company have to abort the collaboration and search for new partners.

4.1.3 How to attract collaboration partners

The continuation of the collaboration with Uppsala University came easy because of the fact that the founders of Vertical Wind had worked there as scientists. As a result of the good relationship with the university that they have built over the years as employees, there was no complication after the spin-off for future collaborations. However, when attracting larger companies as

Ericsson and E.ON, you need to have something new and interesting to offer them, Hellström says. The collaboration with Ericsson was initialized by a consultant working for Ericsson at that time. He was involved in trying to identify different alternative energy sources for the company's base stations and had heard about the research conducted at Uppsala University.

According to Hellström, he thinks that the main driver for Ericsson to collaborate with Vertical Wind were the fact that they had a very innovative product that they could not find anywhere else. In addition, he also thinks that there is an image [brand] advantage for Ericsson to get involved in wind energy, which is an environmentally friendly alternative to other energy sources and that it fitted with their general business model. According to Ericsson, the vertical wind turbine will be used in their award winning Tower Tube for optimizing low-cost mobile communication. The benefits with using Vertical Winds turbine are the environmental friendly advantages and the possibility to use the power source in urban environments. (www.ericsson.com)

Generally speaking, Hellström states, if you can present the idea that shows the specific benefits for the company that you intent to collaborative with, in an concrete manner, it is easier to attract them. They often want some guarantees of that the project will be profitable for them and that it works. It is therefore important when contacting companies that you have a patented technology that will work. According to a press release issued on E.ON's website, they wrote the following statement that could be related to Hellström opinions:

"Vertical Wind gives the project credibility due to their patented technology and connection to the Center for Renewable Energy Transformation at Uppsala University" (www.eon.se)

Falkenberg Energi also comments the advantages with Vertical Wind's innovative product and relates it to something that is very actual and present in the world today; to create effective renewable energy sources. In addition, they see it as their mission to help commercialize the wind power industry further:

"To find sustainable solutions for energy production is something that we work hard to find in the energy business (...) … This project will also create possibilities to make the wind energy more commercial in the future" (www.falkenberg-energi.se)

4.1.4 Challenges of Open Innovation and how to manage these challenges

As mentioned earlier, Vertical Wind was in need of suitable collaboration partners with whom they could develop a prototype. Given the complexity of the innovation and the specific qualities they searched for in a partner, the process of identifying and engaging with partner was a rather time consuming process. To find collaboration partners that could live up to these criteria, one of Vertical Winds founders, Mats Leijon, had over the years created a broad network of contacts within the business society due to his research at Uppsala University. His work within the field of electricity and generators has given him contacts with energy companies. These personal contacts were the key to overcoming the challenge of identifying suitable collaboration partners, according to Hellström.

Another challenge for Vertical Wind's Open Innovation process is related to the management of the collaborations. Since they mainly have collaborated with larger companies, the differences in organizational management is a barrier which needs to be carefully assessed in order for a relationship to work; *"the biggest challenge is that large companies have a completely different rhythm than small companies".* Hellström explains these concerns further by saying:

"A large company might think it's fast to make a decision within six months, but a smaller company might not even exist in six months if the decision isn't made today."

The challenge lies in how to converge and join two different organizational structures; one strictly hierarchical and one more open and flexible. To overcome this challenge, Vertical Wind has insisted on conducting regular meetings and evaluations of the ongoing project together with the collaboration partner. Hellström further stresses the importance of that the entrepreneurial company, i.e. Vertical Wind, are given the authority to make day-to-day decisions without involving the collaboration partner. Without this necessary responsibility delegation, the time constraints of the project, which often is very noticeable, becomes a significant challenge which

could danger the entire collaboration. In addition, he also argues for consistent follow-ups of the budget. According to Hellström, the budget serves as an important tool in achieving congruency between the company's different organizational structures and rhythms.

"...it's vital that the collaboration partner, as well as Vertical Wind, is truly committed to the agreed upon budget."

4.1.5 Management mechanisms - trust versus control?

As described above, Vertical Wind faced some challenges in their collaborations with E.ON and Ericsson because of the size of these companies. Hellström points to the differences in management that they have experienced depending on which collaboration partner they have worked with. When engaging with a large company, like E.ON, the bureaucratic nature of such a large company dictates the type of management that one can expect when collaborating with them. Hellström explains that when Vertical Wind have collaborated with a large company, the management mechanisms have been based almost entirely on control and the budget have played a critical role in the management of such a collaboration.

"...larger companies are in general more control based, in terms of budget and so on - this is transferred to the management of the collaboration."

Hellström contrasts the collaboration with E.ON and Ericsson to the one they have with Falkenberg Energi and some of their suppliers. Even though negotiations, budgets and contracts still play an important role, he concludes that their collaboration with Falkenberg Energi is more based on trust than on control. Since it's a smaller company, you always know who's in charge and it's easier to build a relationship and the entire collaboration process on a solid ground, he argues.

As mentioned in the section of "collaboration partners and search criteria's", it's important to find collaboration partners in who you can rely on. Even though if a contract exists between the collaboration partners, that for example stipulates the terms and consequences if you do not live up to these terms, it is hard for a smaller company to start a process. Hellström indicates that it

takes time and resources that a smaller company as Vertical Wind might not have, therefore it is very important to collaborate with a company that shares your visions.

4.1.6 Intellectual Property rights

Vertical Wind's view of patent and intellectual property rights is that it's a vital component of not just the collaborations, but of the company itself. Before they moved from an idea based spin-off project to a registered operational company, they filed for patents in order to protect their innovation. In Swedish patent legislation there is an exception from the main rule which stipulates that an employee at a university or similar teaching institute own the rights to his others own invention; if employed at a company this right would otherwise accrue to the employer (1 § 2 st. (Lag (1949:345) om rätten till arbetstagares uppfinningar (Law of right to employer's inventions)). By this law given exception, the inventors could apply for the patent and later have it signed to their newly founded company.

Hellström further explain the importance of patents and comprehensive contracts for collaborations to even be manageable. To be able to engage in collaboration with an outside party you have to provide some form of guarantee of that future profits and IP ownership won't be jeopardized by a patent infringement or the lack of said patent. The main purpose of a patent, in Vertical Winds point of view, isn't therefore only to protect the innovation from competitors, but also to provide this guarantee to the counterpart.

"...it's necessary to protect yourself, patent wise, and to set up well composed contracts in order to attract and engage other companies."

During the interview with Hellström, he speaks about the need to have a contract that clearly states how the profit from the project should be divided among the collaboration partners. In the case with E.ON and Falkenberg energy, which are customers to Vertical Wind, the contract stipulates that all rights from the joint development of the prototype should go to Vertical Wind.

4.2 Whale Power

4.2.1 Intent of opening up the innovation process

Dr. Frank Fish, biologist and fluid dynamics expert, is the president and co-founder of Whale Power. It all started when Dr. Fish studied the humpback whale flippers, which have bumps on the leading edge of their flippers. He soon discovered that the flippers had some unconventional drag characteristics in that they appeared to delay stall by increasing the stalling angle, which is when the flipper, or wing, loses its lift. He knew that he was on to something big and soon teamed up with Dr. Philip Watts and Stephen Dewar to create Whale Power.

"The first thing that is unusual about this is that the technology is truly fundamental in terms of physics. It's at the heart of so many different machines it's ridiculous

Whale Power's main driver for opening up the innovation process was consequently to assess the possible different applications of this innovation. Dewar also points to the fact that this discovery is rather unconventional in a sense that the generally accepted view is that a rotor or a wing needs to have a smooth and plane leading edge and Whale Power has collaborated with third party sources in order to educate people and to get their innovation acknowledged.

Furthermore, the intentions of opening up the innovation process are related to economical constraints. Dewar explains that by involving outside sources, Whale Power is able to increase their R&D budget significantly. At the same time, he continues, this provides them with the necessary cash flow center that they need in order to collect overhead. Also, by not keeping the entire process locked up in-house, the company is allowed to maintain their core staff and competencies.

While wind turbines are very popular today, Dewar says, most of them are in industrial scale. For Whale Power to conduct experiments on that scale, it's a million dollar investment just to construct it and an additional million dollars for the testing cycle which means that it's a very expensive R&D project for a company of this size.

"...we can't do everything ourselves, we're a small company here."

4.2.2 Collaboration partners and search criteria used to find partners

"...any collaboration combination you want, they all happened"

During the initial stages of the research and development process, Whale Power collaborated mainly with Universities and Research Institutes, such as the Duke University, MIT, Cornell, Harvard School of Advanced Engineering, and the Naval Academy. This included everything from obtaining whale carcasses to dissect and involving naval and bio-mechanic experts to prototype construction and wind tunnel tests. Most of these collaborations were made possible through the personal networks and recognized positions of the company's founders, Dewar concludes.

As mentioned earlier, Whale Power was in need of getting their innovation further researched and acknowledged as not only working concept, but also as a fundamentally new discovery. Therefore, they searched for external collaboration partners who could provide the company with the knowledge needed to scientifically establish their innovation, Dewar indicate. Given their limited economical resources, the company was able to obtain grants from the Ontario government, Ontario power authority and the Canadian ministry of national resources. This enabled them to initiate the construction of a rotor prototype in collaboration with scientists at the Naval Academy, which they also tested and verified in a wind tunnel.

The next step for Whale Power was to assess probable types of applications where their innovation could be suitable. During this stage, the company collaborated with scientist, potential customers and suppliers within fields and industries such as wind turbines, compressors, mixers, fans, kinetic energy et cetera. At the same time as assessing where this could be a good business opportunity, Whale Power was very keen on not involving too big of a company, like an aircraft company, which might force them to sell out their innovation.

"We did some calculations about five years ago, and we came to the conclusion that these kinds of rotors are central to about half a trillion dollar worth of equipment sold each year. There are niches within this opportunity that are bigger than some industries"

They were, however, approached by some of the major manufacturers and electricity distributers with the aim at commercializing their wind turbine. As mentioned earlier, developing a full scale wind turbine is a very expensive R&D project which means that Whale Power needs, and searches for, collaboration partners who possess the appropriate manufacturing capabilities as well as the economical resources necessary to develop this innovation further. However, due to the recession of the global economy, the negotiations with suitable collaboration partners have come to a halt.

"...the financiers are gone, throughout the Western world major companies have been shutting down their plants so it's not a good time to put in two and a half million dollars on the first stage of development."

Instead, Whale Power began searching for something that takes a lot less capital to initiate. They soon localized a small company in Ontario, Enviranorth, who manufactures and distribute rotors mainly used in different forms of fans. The two companies were introduced via their mutual Intellectual Property rights lawyer. Enviranorth provided them with a budget and a vision of what they wanted to have modified. The collaboration has resulted in a completely new manufacturing process for the new rotor blades as well as a tripled sales income. In addition, the collaboration has opened the door to other collaboration partners in related industries, in excess of the fan and wind turbine industry.

4.2.3 How to attract collaboration partners

"Frank has brought along some outstanding engineers … we have to bring together combinations of talents to put this together."

Regarding the collaborations with universities, different research institutes and academies, Whale Power has been able to attract this kind of external knowledge through their web of personal contacts. During the first year in business, the company struggled immensely with attracting investors and possible collaboration partners. Dewar attributes this reluctance from external parties to the uniqueness of their innovation; *"the standard response was: No way, not*

possible." In order to attract collaboration partners, Whale Power needed to get the innovation scientifically verified and its performance established and they accomplished this by convincing fellow researchers and associates.

The collaborations with customers, suppliers and manufacturers have been managed through licensing agreements which in turn attracts the partners through financial incentives. In addition, depending on the industry characteristics, Dewar concludes, the innovation itself can attract collaboration partners. The partnership with Enviranorth is a good example of this; they operate on a market with a technology that is presumed to be in a steady state which can't be improved upon. When introduced to Whale Power and their innovation, they saw the potential of developing this further in collaboration by retrofitting the existing blades with a new technology.

Furthermore, as Whale Power continued to involve additional external sources into their innovation process and thereby increasing their openness, they have reached a greater success in attracting collaboration partners.

"*...as a result, getting our message across to people is getting easier, a number of our clients are coming to us now... we hear from people from all over the world, regularly. "*

4.2.4 Challenges of Open Innovation and how to manage these challenges

Dewar concludes that one of the biggest challenges for Whale Power was related to the technical aspects and mainly arose during the later stages in the innovation process. During the start up years, their main challenge was how to get external sources interested in collaborating with the company. Given the rather radical design of the innovation, experts and advisers at large companies were skeptical which meant that Whale Power was unable to commercialize their innovation outside the company. To overcome this challenge, they utilized their personal connections in the scientific community and got third party sources such as Cornell, MIT, and Harvard Business School of Advanced Engineering to perform studies on the innovation in different applications and later publish the results in leading scientific journals.

"We have had to do a major education job to get people to understand what we are doing and how well it works, so you see, this isn't your usual business problem... in some cases, people we've tried to get in touch with have studiously ignored us for years."

The next challenge relates to the sheer size of R&D project that is required to assess and develop a wind turbine in full scale; each different project and application has to be developed individually. Given their economical constraints as a smaller company, they need to engage a larger collaboration partner with the necessary resources. However, the size of the project and the collaboration partner can be a drag in itself. Dewar recognizes the contradiction in this statement; they need to incorporate external collaboration partners, but the collaboration in itself can cause the project to increase in scale which makes it harder to manage it in general. To overcome this challenge, Whale Power has focused on continuity in the innovation process by continuously meeting with the collaboration partner in order to maintain control of the project.

4.2.5 Management mechanisms - trust versus control?

Whale Power establishes licensing contracts with all of their collaboration partners. As mentioned earlier, the collaborations have a tendency to grow rather substantially and Dewar explains that comprehensive licensing agreements are vital in order to oversee and maintain control and also to delegate responsibilities.

"They [Enviranorth] are licensees, they provided us with a budget and the equipment that they wanted to have modified. We then re-engineered their blade and hub system in collaboration."

The company was in the heat of negotiation with some of the biggest energy suppliers for a collaboration project to further develop and commercialize their wind turbine when the recession hit and the collaboration was terminated. They witnessed a number of competitors and customers who lost a lot of money since their partners suddenly couldn't pay. Consequently, these rough years have shaped Whale Power's protective perspective when it comes to contracts and licensing agreements, Dewar explains.

4.2.6 Intellectual Property rights

When Whale Power was created by its three founders, they immediately filed for a patent. Dewar stresses the importance of protecting your innovation from competitors and larger companies that might try to buy you out. This was a subject that was touched upon and mentioned several times during our interview and Dewar often came back to the importance of consistently filing for a new patent when you make progress that isn't yet covered.

"...before we got into broader extensive research with other people, we filed for a patent."

Dewar continued by proclaiming that patents are vital in order to make any profit at all. Without a strong patent, Whale Power might have been incapable of engaging in collaborations since all of their licensing agreements are based on the protection of their patent. Furthermore, it is Whale Powers firm belief that they their innovation is a truly fundamental discovery in terms of physics which increases the need for patent protection.

4.3 GGRail

4.3.1 Intent of opening up the innovation process

Göran Gatenfjord is CEO of GGRail and he discovered the huge potential of having a vertical wind turbine instead of the conventional horizontal wind turbine. After searching the web, looking for prototypes of this vertical construction, he found a Chinese company that had manufactured one. He bought the prototype with the purpose of securing his supply of energy, thereby becoming independent from the larger energy corporations. However, after he bought the prototype, he discovered that everything was wrong with the construction and nothing worked. He then decided to learn the complex theory about vertical wind turbines in order to get them to work. He accomplished this by localizing people around the world that possessed this vital knowledge and later incorporated this into the company.

During this process he came across several obstacles. In order to construct a new wind turbine he discovered that optimal construction should be made of steel. In addition, to fully optimize the capacity of the turbine, he needed the wind turbine to reach a higher altitude. Gatenfjord himself did not have access to this sort of steel construction nor did he have the resources or the

knowledge to build it. Without these resources the project was unable to continue. So the intent with opening up this innovation process was based, in this aspect, on the need of incorporating knowledge about steel constructions and gain access to steal resources. FMT, which is a global player in the steal construction industry, was chosen to be the collaboration partner.

Furthermore, the intent of opening up the innovation process was also motivated by the shortened development process. He speaks in terms of that the collaboration with FMT has also been financially motivated. By collaborating with FMT, GGRail did not need to spend money on employing personnel that have the knowledge of steel constructions. This has saved him a lot of money and time. Gatenfjord expresses the following:

"If we did not have started this collaboration, I would have been forced to spend money on employing personal and been forced to work around the clock, and I still would not have gained the same results and speed. "

4.3.2 Collaboration partners and search criteria used to find partners

Initially, GGRail turned to EON, which is large energy provider in Sweden, with a request of connecting the Chinese wind turbine to their energy net. They was faced with huge resistant for this request. According to Gatenfjord they resisted this because of the potential loss in market share and profit, if this new innovative turbine would have worked. The resistance from EON expressed itself by a long bureaucratic processes where Gatenfjord was forced to send in several copies of his request and each time they claimed it was inadequate or that something were missing for EON to go forward with the request.

According to GGRail, EON could have profited as well from this innovation without any major commitments. By allowing customers to install wind turbines at their home, the electrical losses in the grid are reduced and therefore EON as an energy provider can deliver energy with increased efficiency and smaller losses. It wasn't until Gatenfjord used his personal connections with one person in the top management of EON that they considered allowing his request. This was also after he publicly discredited EON in a film clip that he publicized on GGRail's website.

The story with EON affected GGRail's search criteria that they used to find other collaboration partners. The company focused on searching for collaboration partners that could provide them with the knowledge and resources they needed to complete the new turbine. The knowledge and expertise was quite hard to find due to the lack of research in the academic world that focused on advanced turbulent flow. Normally, this type of research is conducted in universities that focus on laminar flows, Gatenfjord explains.

In addition, they searched for partners that had the same values, i.e. entrepreneurial and innovative and could work hard to make this project work, disregarding the initial costs. Due to the bad experiences with EON, they chose to search for smaller companies that were less bureaucratic. Gatenfjord also expresses skepticism against collaborating with larger companies. According to him, larger companies have a tendency to focus on the money rather than on the innovation and completing the project. In addition, Gatenfjord states that he also has a lot of mistrust towards their way of managing collaboration; he expresses some concerns about being ripped off and put aside from the project after the project has begun.

Furthermore, it is clear that GGRail's search for partners has been affected by past experiences, not just from a collaboration perspective, but also from a relational perspective. He expresses the following regarding this issue:

"I have worked for and with many companies and the one thing that really irritates me is when a economist is in charge over the research. Their only concern is to make money and reach the budget for the next quarter. Innovation does not work in that way."

By this, Gatenfjord indicates that his search for partners is affected by if there are economics that runs the company. By using his network of contacts he came in contact with a local politician in Malmö, Sweden, who recommended him to contact FMT.

4.3.3 How to attract collaboration partners

Gatenfjord means that in order to attract collaboration partners you need to identify companies and individuals that share the same values as you do; people that think the same and speaks the same language.

"If you find these people, they see the same potential in the innovation as you do."

FMT agrees and adds that their business today is dependent on the airline industry and the ferry industry, which in turn are dependent on the energy prices, specifically the oil prices. If the oil prices would increase rapidly or if the oil supplies would diminish, both the airline industry and the ferry industry would face severe difficulties. Hence, FMT would also be affected and risk going out of business. In order to secure a sustainable growth and future for FMT, getting involved in an alternative business could be the key. FMT builds innovative mechanical solutions needed for the wind turbine and the potential for renewable energy is huge, they continue. Håkan Anderson, FMT, talks about the potential of a wind turbine that could be owned by private persons or small enterprises. He gives an example of this potential by referring to the automotive industry, which is shifting from being dependent on oil to electricity. He states, when the electric cars takeover, more people would feel the need to recharge their car in their home and by building a wind turbine they could do so and be self providing their own home with electricity at the same time.

Håkan at FMT adds that it was not just the business opportunity that made him convinced to engage in the collaboration. He says that he also had a personal interest in the product and that he felt that GGRail's idea had a real potential. FMT is a medium sized company that operates on a global market, but he emphasizes that they have not lost their innovativeness due to their growth. He continues with explaining the benefits with working with a smaller company. Among other things, he states that a larger company has more difficulties with maintaining an innovative climate and he compares FMT to Thyssen Krupp, which is a company in the same industry as FMT, and argues that they, due to rapid growth, has not produced any innovative solutions at all lately. The reasons for this, he explains, is that a larger company suffers from economic based control systems and is too hierarchical. When Gatenfjord knocked at FMT's door they directly

saw the opposite from larger company and were therefore convinced to engage in collaboration with GGRail.

4.3.4 Challenges of Open Innovation and how to manage these challenges

Both GGRail and FMT talks about the benefits of working with each other and emphasizes the advantages with collaborating with smaller companies. However, during the collaboration they have faced some challenges that they needed to overcome. Often they have different opinions of how things should be done and managed. One example of this was when they identified a problem with the strength of the wings. GGRail had one opinion of how they should solve it and FMT had a different one. To solve disagreements you need to have a continuing open dialogue where you give and take. The most important thing in collaboration is that you can be open with each other and speak your mind, they both conclude.

To prevent that conflicts in the collaboration arises, it is important to have a shared vision from the start. You need to see the bigger picture and focus on the main goal; smaller disagreements are unavoidable but you need to deal with it right away. Both GGRail and FMT continue with saying that disagreements could also be a constructive way of finding new solutions to an existing problem. You look at the problem in a different way and get new perspectives, FMT states:

"Many small steps are more important than the larger ones(...) continuity and openness is the key to progress and overcoming challenges"

Furthermore, they see the benefits with not having to operate by a strict time frame that would pressure them to find a solution that possibly would not be the right one. So, when a challenge arises (often, they are technical in nature) they could spend many hours in finding the exact solution to that problem. The key is hard work and never to give up and the "give and take" relationship is essential. GGRail continues with saying that if we were overseen by a large corporation, this project would have been shut down a long time ago.

4.3.5 Management mechanisms - trust versus control

The collaboration between GGRail and FMT is based on trust as a management mechanism. When we asked them the question on what grounds they thought an optimal collaboration should be based on, the answer was mutual: *"Trust!"*

It was then quite clear that they did not like any other form of control during their collaboration. One of the main reasons why they have not engaged a third party during this stage of the collaboration is that they did not want any other form of collaboration where the collaboration is based on profit. Gatenfjord expresses the following:

> *"No, we don´t want it. You could say that it's a fundamental decision that we have made. We absolutely don´t want that because if we do that an economist will enter and start counting money again…"*

FMT adds to the discussion that a third party could contribute with additional financial resources, but if they would engage a larger company that could give them financial resources, they will try to take over the project. In addition, FMT says that there are no guarantees that the money will keep on coming. If FMT than have made them self dependent on that resources it will be hard for them to continue on their own. FMT concludes by saying that you do not know when the money stops coming, so by collaborating with GGRail, a company that we can trust, it's better for us because we could spend the time needed so solve a problem without having to worry about being shut down.

4.3.6 Intellectual Property rights

Even though the collaboration between FMT and GGRail is based in trust, they both agree that there need to be some sort of contract that outlines the collaboration. In their case, they have a contract that stipulates how they will share the profit from the innovation. Gatenfjord adds that there have been no lawyers involved when setting up this contract; both parties have agreed on the terms without any discrepancies. When we asked about how they look at intellectual property rights in general, we got a quite interesting answer. FMT states that during his time on the company they have filed many patents over the years and he he's not convinced of that is the

best way for a company to evolve and develop. To file for patents takes time and money and this could interrupt the development in a company. He continues with saying that they have been in many intellectual property rights trials and when that occur, it interferes with the development in a company and everything stops.

According to FMT, you need to shift the general focus from protecting your innovations at any cost, to focus more on the continued work with the innovation. He states a quite clear metaphor to this fact:

"If you are the fastest at running 100 meter, you don't stop and try to file a patent on that you are the fastest; instead you try running even faster!"

With this he means that the focus should instead be on continuously improving your products and be one step ahead of the competition. So if the competitors would copy your innovation, you should already be one step ahead of them. However, Gatenfjord adds, that you do need to have a patent to fight of competition and that they eventually will file for a patent on this innovation.

5. ANALYSIS

The empirical results have been divided and presented under the six variables that this study is based on. However, these six variables have in some aspects been analyzed as a whole that aims at explaining the research question of this study. This implies that the six variables are interconnected and that the analysis should be viewed from a holistic perspective. Furthermore, the cases will be analyzed and presented using a cross-case method in order to more efficiently analyze connections and differences between the three cases and to draw conclusions.

5.1 Intent of opening up the innovation process

When analyzing the three cases that we have researched, the intentions to opening up the innovation process are similar. In addition, the incentives could also be related to the possible gains that the case companies recognized with an open approach to innovation. In Vertical Wind's (VW's) case, the intentions were to develop, prove and establish their technology. In order to do so, they needed some reference clients that could supply financial resources and knowledge about the specifications of the product and market. Furthermore, the intent was also to shorten the development of the prototype and to make sure that the prototype met the market demands. If we relate the empirical results from the case of VW with the suggested theory by Gassmann & Enkel (2010) we can conclude that VW mainly have used the outside-in process in that they engaged in early supplier integration and customer co-development where they sought to integrate external knowledge. This indicates that the theory can be transferable to SMEs to a certain point. However, Gassmann & Enkel (2010) focus on the integration of external knowledge as the incentive to adopt the outside-in process whereas our empirical results indicates that the intentions of opening up the innovation process through an outside-in strategy also includes the need for and integration of financial resources. This could be a consequence of being a small enterprise where the company have an idea, but lack the funds to develop it further.

Furthermore, VW's intentions of opening up the innovation process were also to prove and establish their technology. This can be viewed as standard setting which Gassmann & Enkel (2010) attributes to the inside-out process where companies accomplish this through out-licencing of IP rights. However, our results indicate that companies also can strive to accomplish

this through the outside-in process by creating a reference which can prove the technology and later become a new standard.

The intention of opening up the innovation process in order to prove and establish the technology is also found in the case of Whale Power (WP). Given the uniqueness and novelty of their invention, WP was in need of scientific and commercial acknowledgment. However, the conditions are somewhat different than for VW. In WP's case, the innovation is believed to have a wider range of possible applications. The potential of the innovation is therefore larger and in order to prove the potential, they needed to involve several outside parties, such as Research Institutes, Universities, suppliers and customers. As in VW's case they initiated the process and sought to integrate external knowledge and suppliers as well as co-development with customers which corresponds to the outside-in process. Moreover, WP have out-licensed their IP and multiplied the technology through different applications which, if analyzed from Gassmann & Enkel's (2010) suggested theory, implies that the company have adopted a coupled process since they have combined the outside-in with the inside-out process. The benefits for WP when using the coupled strategy corresponds to those presented by Gassmann & Enkel (2010), which are for example that WP are able to profit from their innovation on a market that they previously could not reach.

One interesting aspect of WP is that the wide market potential of their innovation was made realized to them only after opening up their innovation process. By collaborating with outside parties in the development process, new applications appeared that were not thought of in an earlier stage of the product development. If we compare this to Gassmann & Enkel's (2010) theory, they argue that a company can use the coupled process in order to multiply their technology. This corresponds to the case with Whale Power and the theory of the three core processes archetypes could hence be transferable to this particular case in this perspective. However, one of the main intentions for WP to open up their innovation process is related to the financial constraints they face as a SME and as we concluded in the analysis of VW, the theory of the core process archetypes do not include the financial aspects as a common characteristic.

When analyzing the third case, GGRail, there are some similarities in the intentions of opening up the innovation process as in VW, and to some extent WP. The financial aspect is strongly highlighted as an incentive to collaborate with external parties since GGRail, as a SME, lacks the necessary financial resources needed to develop the product. In addition, the intentions of opening up the innovations process in GGRail are related to the need to integrate external knowledge resources in terms of laminar flows and steel constructions. Based on this, we can conclude that GGRail mainly have adopted the outside-in strategy in combination with some elements of the inside-out process. The company incorporated external knowledge of laminar flows and presented their idea to FMT, which provided knowledge and resources necessary to construct the wind turbine, in order to bring it to the market.

In summary, if we analyze and compare the different characteristics of the three core process archetypes from a wind turbine industry and SME perspective, we can conclude that the financial aspect has been one common denominator amongst the three case companies; the development of a wind turbine is a very costly and resource demanding project which explains the small companies search for financial resources. This indicates a potential shortcoming of the suggested theory by Gassmann & Enkel (2010). This characteristic, the need for and the integration of financial resources, have been mentioned as an important incentive by all three case companies, independent of chosen core strategy of Open Innovation. Moreover, we also identified one additional core process characteristic that we found to be representative for all three cases investigated; the "marketing" effect. This refers to the companies intentions to create an awareness and acknowledgement of their invention by opening up their innovation process through collaboration with external sources. According to the cases investigated, the companies sought to scientifically and commercially establish their inventions. By collaborating with larger companies, SMEs could possibly gain the benefits from larger corporations repute and creditability.

Based on the analysis of the above variable, we suggest the following additions to Gassmann & Enkel's (2010) theory of The Three Core Process Archetypes of Open Innovation. As mentioned above, the identified additional characteristics are independent of chosen core process archetype.

CHARACTERISTIC	CHOSEN CORE PROCESS
Need for financial resources	Independent of chosen process
Marketing effect	Independent of chosen process

Table 6: Suggested additions to the theory of core process archetypes

5.2 Collaboration partners and search criteria used to find partners

Vertical Wind has primarily chosen to collaborate with customers and universities. Their search for suitable customers to collaborate with was based on the collaboration partner's financial ability and their devotion to the project. In addition, VW sought to gain access to customer information and to use this information to develop a prototype that met the specifications given by the customers. These results are supported by the findings of Garcez et al. (2010) where they conclude that companies collaborate with customers mainly to gain market knowledge in order to adapt the product according to the customer's specifications. The project aimed at developing a prototype that should be launched on a new market and were quite radical in nature. This is therefore not a project that has a high frequency which makes the selection process of partners highly important. Garcez et al. (2010) findings are similar and could in this aspect be transferred to the case of VW.

Continuing the analysis with assessing the collaboration with Uppsala University we can distinguish that they have a long-term collaboration with them that manifests itself in that the university conducts basic science, partly financed by VW. However, interesting with VW is that they are a spin-off from the university which makes the relation to the university quite good. This could result in more benefits in comparison to other companies that work with universities. Furthermore, the close relationship to the university could also minimize the "not invented here" principle, which according to West & Gallagher (2006) is one of three challenges of Open Innovation, called incorporation. This means that transaction costs and disputes could be minimized which in turn could raise the efficiency of the collaboration. Garcez et al. (2010)

means that companies need to conduct initial workshop's in a first stage to be able to evaluate the collaboration, this is not necessary in this case.

The devotion and the collaboration partner's participation were highlighted as very important due to the fact that a small company like Vertical Wind does not have the time or resources to process disagreements. Based on this, the criteria to find partners where expressed quite clearly by Hellström; they should be devoted, relevant customer, have the necessary finance capacity and have the right competence.

WP has had much collaboration during the company's trajectory. Everything from research institute's to customers. In their case, they needed different collaboration partners depending on in which stage the product development were in. In the beginning they searched for partners that could scientifically establish their innovation, which were universities and research institute. The research conducted could be interpreted as basic science. In a later stage, WP collaborated with potential customers in many different industries in order to assess the market potential for their product. Relating this to Garcez et al.'s (2010) findings, there are some similarities, for example, the need to gain new market access and information.

WP aimed at getting their innovation acknowledged by educating their collaboration partners. Along the way the range of application grew and the market potential was realized through their collaborations. It became a network affect where the collaboration, and the success of that collaboration, led to another. The search for collaboration partners was eventually reversed; other companies searched for them. The conclusion that could be made from this is that once the innovation and the technology have been acknowledged, the collaborations come naturally. However, to be able to commercialize the wind turbine they needed a large company in order to receive the right manufacturing capabilities and complementary resources. This collaboration could be classified as supplier collaboration and corresponds to the findings of Garcez et al.

Continuing the analysis by looking at GGRail, we can distinguish some differences between their way of searching for partners in comparison to VP and VW. GGRail's search criteria are based on their past experience with other companies. The initial problems they had with the larger

electricity company EON made them suspicious against working with other large corporations in a later stage. Personal values were the core criteria when searching for suitable collaboration partners, but knowledge and resources were of course an important aspect as well. The search for partners seems to be quite random. GGRail did know what they wanted in a partner but not how to identify them. Like in the case with WP, personal connections were the key to finding the right partner. This raises questions of SMEs ability to network; FMT were introduced to GGRail by a local politician that shared GGRail's values of further developing the wind energy. To be able to sustains and find these connections seems to be quite unique for SMEs in comparison to larger corporations. One possible explanation to this could be in their genuine interest of the area and their entrepreneurial spirit. The founder of GGRail, Gatenfjord, has put a lot of money and time in to the project and he was determined to succeed.

The question of choosing the right collaboration partners were in GGRail's case very important because they knew that their innovation could take years to commercialize. If they had turned to a larger company in an initial stage, which often are driven by economical incentives, the project might not even been initiated, or if it had; shut down due to the fact that it has been a long process that have demanded a great deal of financial resources.

In general, when SMEs in the wind turbine industry search for partners, there are often a certain randomness that in the end determines the collaboration partner; even though the specific characteristics of the collaboration partner still apply. This has been the case in Whale Power, GGRail and Vertical Wind. This might be explained by the resistance they face in the beginning when they are forced to prove their product and acknowledge the technology. By networking and seeking connections with a wide variety of companies and institutes, they finally get the technology acknowledge and when that happens, new doors open up which leads to different collaborations with partners they had not thought of or that wasn't available to them in an earlier stage. The full scale of the market potential seems to be apparent only after receiving new knowledge from other collaboration partners.

The process with finding the right collaboration partner and realizing full scale of the market potential could also be seen as a modified "trial-and-error" process where SMEs are networking

with many different people and organizations until they finally find someone that shares their values and acknowledge the market potential. Furthermore, the big difference between larger corporations when they search for partners is the fact that they at first look for competencies and the type/scope of the project. SMEs, on the other hand, search for collaboration partners that can acknowledge their innovation and share their values.

5.3 How to attract collaborations partners

A common factor in almost every collaboration and strategic alliance is that it is based on a give and take relationship; you need to give something in order to receive. This fundamental basis is also true when SMEs attract collaboration partners in the wind turbine industry. However, because of their limited financial resources, SMEs do not always have a successful prototype to present to the potential collaboration partner who makes it hard for them to prove that their innovation actually works and that it could be profitable. In order for a company to take the risk and engage in the collaboration, they need another form of indicator. One common denominator for VW and WP were the patented technology which made the larger corporation believe in the project. In WP case they received money from the government in order to build the prototype, but the principle is the same.

Additionally, as mentioned in the previous part, it is also hard to recognize the potential in an innovation at first and that it many times appears in a later stage. It is therefore hard to attract the very first partner/s if they can not directly benefit from the innovation. In VW case, they attracted Ericsson due to a coincident since they at that time were searching for alternative energy sources. They therefore could direct benefit from the innovation. The get this first collaboration, SMEs scans their network and connects with several different parties in order to finally localize the right one that shares the same values. But after the first connection and collaboration has been established, marketing effect kicks in and spreads the word to other companies that in a later stage realize the potential and are willing to engage in collaboration. This was the case in WP. They struggled in the beginning but after a few years several companies turned to them instead. Regarding GGRail, when they initially contacted E.ON they did not want any part of the project but after pressure they realized the potential of the innovation and became more than willing to get involved in the project. This was also after GGRail had

engaged in collaboration with FMT. GGRail and FMT have a policy in that they will not collaborate with any other partner, but they still have the possibility to do so.

If we more deeply analyze what factors that made FMT interested in collaboration with GGRail, we can conclude that they saw the potential of the innovation. They could not directly profit from it but they recognized that it was a possibility to secure their business in the future if there were to become changes in their environment. Gassmann & Enkel (2010) call this capability absorptive capability and argues that it is crucial for the success of an Open Innovation approach; the ability to identify, recognize and apply new information in the organization. Our empirical evidence shows that this absorptive capability is crucial during the initial stage of the negotiations of the collaboration. Both parties need to recognize the potential for the collaboration to succeed and develop further in to a joint project, as it did in FMT and GGRail's case. However, it is easy to say that some companies have this capability and others do not; there are in fact more aspects in involved. Our findings point to the fact that even though companies see some potential in the innovation, they need some guarantee that it works.

In summary, our analysis indicates that there are three types of attraction types in this aspect. The first type relies on the acknowledgement of that the innovation has market potential and do not need further guarantees. This is normally the first partner that SMEs collaborate with. The second type of attraction relies on patent and the market potential. The third type needs conformation from previous collaborations which often are larger corporations that focus primarily on profit. At this stage, SMEs are being contacted by them and not the other way around.

PROCESS	HOW SMES ATTRACT COLLABORATION PARTNERS
Stage 1	Utilizing personal network of connections, few interested collaboration partners. Shared vision and realized potential of invention is enough for the partner to engage in the collaboration.
Stage 2	More potential collaboration partners appear outside SMEs personal network. Patent, market potential and/or (creation of) prototype required of partner for engaging in Open Innovation collaboration. Wider range of possible applications for SME.
Stage 3	A wide range of different parties appear as potential collaboration partners. Larger companies engage in collaboration based on previous successful collaborations and other factors mentioned in stage 1 and 2. Partners find and engage SMEs, i.e. marketing effect. Very high range of possible applications in different industries for SMEs.

Table 7: Empirical evidence on how SMEs attract collaboration partners

5.4 Challenges of Open Innovation and how to manage these challenges

When analyzing the empirical results from this variable, it becomes evident that all three companies to some extent have faced similar challenges and also have overcome these in comparable manners. VW's main challenge concerns the issue of localizing and engaging a suitable collaboration partner. The company was in need of reference clients with whom they could jointly develop the innovation in order to prove the concept and this search process was time consuming. If analyzed from the theory presented by West & Gallagher (2006), this problem can be viewed as incorporation and a motivational challenge.

The challenges are also related to the capabilities stipulated by Gassmann & Enkel (2010). VW struggled with localizing and motivating the large corporations needed for the future development. The company managed this challenge through a sufficient absorptive capability, utilized by the personal network of contacts that the company founders possessed. GGRail also faced some obstacles in localizing the external knowledge that they needed. Given the complexity of the underlying science of their wind turbine, the company took advantage of personal contacts gained from years of experience, i.e. absorptive capacity.

The challenges of incorporation and motivation were also present in WP. Once again, the use of a broad personal network of contacts was utilized in order to motivate external sources as well as to identify, understand and incorporate the external knowledge. As the only case company in this thesis to have out-licensed their IP, WP also faced the challenge of maximization. As described in chapter three, the challenge of maximization is focused on how to best exploit the internally created ideas and innovations outside the boundaries of the firm by out-licensing and selling IP rights. If we relate this to the multiplicative capability from Gassmann & Enkel's (2010) theory, which in part stipulates that companies need to codify their ideas, we can conclude that WP have accomplished this by overcoming the challenges of incorporation and motivation from West & Gallagher's (2006) study, i.e. to identify and motivate external sources to conduct research and thereby have the invention acknowledged and codified.

West & Gallagher (2006) lists pooled R&D / product development alongside spin-off as key strategies in order to overcome the challenges of Open Innovation. As pointed out, VW is a spin-off from Uppsala University where the university's holding company remains a part-owner of VW. By separating the invention from the university and having its holding company contribute funds, and thereby embracing the Open Innovation concept, they are able to manage the challenge of maximization and exploitation, which is consistent with the theory of West & Gallagher (2006). However, the pooled R&D / product development strategy is in our opinion not transferable to SMEs, at least not in its current wording. Our empirical results indicate that SMEs in the wind turbine industry manage the challenges of Open Innovation by identifying and engaging with smaller constellations of collaborative groups or pairs, whereas pooled R&D / product development implies larger groups of partners (competitors), initiated by larger companies. This is most likely due to the fact that SMEs don't have the sufficient resources necessary to contribute to larger pool of product development.

Just as West & Gallagher (2006) argues, the challenge of incorporation often demands organizational and cultural changes, in terms of openness, in order for companies to be able to incorporate outside sources of information. Even though this "sub-challenge" is something that all three case companies has expressed as a hindrance, our results implicate that SMEs rather have to manage the organizational challenge by adapting the collaboration to larger company's

bureaucracy and rhythm than to merely increase their openness. WP managed this by asserting continuity in the innovation process and the collaborations. GGRail solved this by simply avoiding collaborating with larger corporations. VW overcame this challenge by insisting on regular meetings and that they, as the entrepreneurial company, was given the authority to make day-to-day decisions. In addition, VW assumed the position as project managers in their collaboration with EON and Falkenberg Energi, which also can be viewed as a way to manage the challenge of organizational differences by shifting the adaptive responsibility to its counterpart. They further stress the importance of shared visions and goals for the collaboration to be successful, a view that is consistent among all three case companies. In turn, this highlights the significance for SMEs to localize and collaborate with suitable partners; a challenge which all companies in this study have managed through an extensive network of personal relationships.

5.5 Intellectual Property Rights and Management mechanism - Trust versus control

Since the empirical results from the variables Intellectual Property rights and Management mechanism - Trust versus control, has proven to be very closely related and similar in content, we have chosen to analyze them together. In doing so, it is our belief that this will enable us to reach a more comprehensive and comparative analysis.

When examining the results we can observe three very distinct views of managerial perspectives which we have illustrated on a spectrum of trust versus control (see figure 5 below). GGRail emphasizes trust as the very foundation on which any successful collaboration rests on. This approach is confirmed by their closest collaboration partner, FMT. We can conclude that their mutual trust based view of IP rights and organizational management seems to be based on past occupational experiences in combination with an entrepreneurial mindset. The focus of GGRail's innovation process is dependent on engaging with congenial collaboration partners rather than to file for protective patents.

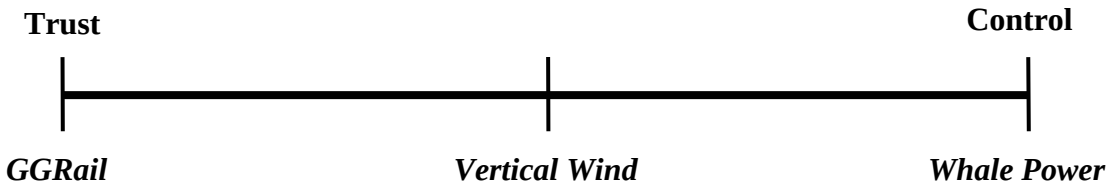


Figure 5: Spectrum of management mechanisms

Whale Power, on the other hand, is according to our analysis placed on the opposite end of the spectrum. Their take on IP rights and management mechanism is, in contrast to GGRail, based entirely on licensing agreements, contracts and patents, i.e. control. Just as in the case of GGRail, WP's perspective seems to be shaped by past experiences. On the other hand, this might also be explained by the broader range of applications that WP's invention is believed to be applicable to, which consequently means that they have a larger number of potential threats they need protection from. However, the company also points to the patents role in collaborations, or rather for a potential collaboration; as a guarantee. This view of the patent as a guarantee towards potential collaboration partners is also shared by Vertical Wind, who by our analysis is placed in the middle of the trust versus control spectrum. VW differentiates the degree of trust versus control depending on the size of collaboration partner. When collaborating with a larger company, the need for contracts and control is greater than when engaging a smaller company where the relationship takes a more trust based form. They do, however, maintain the budget as an important control mechanism, but VW also explains that the budget is decided through negotiations which make it an interactive form of control.

During the course of our interviews with the three companies, we haven't been able to identify any specific characteristics of the wind turbine industry that could account for these observed differences in IP rights and managerial perspectives. On the contrary, the differing perspectives rather seem independent of industry and country and almost entirely connected to the founders' individual experiences and general view of organizational management. This implicates that we can't draw any general conclusions concerning the degree of trust versus control and management mechanisms for SMEs who open up their innovation process.

6. CONCLUSIONS

This study has researched how SMEs in the wind turbine industry manage Open Innovation by studying and analyzing six variables. The empirical findings of this study has been compared and analyzed based on previous research and their suggested theories within the field. The purpose of this study has been to expand the knowledge with in the field and explore if the suggested theories presented in chapter three are transferable to SMEs in the wind turbine industry. Our empirical results implicate new findings in different aspect on how SMEs manage Open Innovation.

SMEs in the wind turbine industry initiate an Open Innovation approach with other collaboration partners with the intentions to gain financial resources or complementary knowledge and resources. Market information and knowledge is also an objective in order to receive the right product specifications. Furthermore, acknowledgement for their invention and prototypes has also been a driving force when implementing Open Innovation. The new findings in this aspect are that this study can point to the fact that SMEs, in comparison to larger corporations, implement Open Innovation as a strategy to gain financial resources in order to develop a prototype or to produce/commercialize their innovation. Previous studies has left this aspect out due to the natural assumption that larger corporations often have the financial resources in place and are more interested in sharing and reducing the costs of R&D. Through this analysis we have found implications to that the suggested theory of the three core process archetypes by Gassmann & Enkel (2010) needs to be extended in order to increase the transferability to SMEs. We have concluded that the need for financial resources and the marketing effect are important characteristics and we have also found them to be independent of chosen core process.

When SMEs search for suitable collaboration partners the partner's ability to supply financial resources is therefore a crucial criterion when deciding to initiate collaboration. However, factors like complementary knowledge are also important. The empirical evidence also showed that SMEs search for partners that shares their visions and therefore realizes the potential of the invention. Given the financially limited resources of a SME, they often contribute with the technology, the invention and the related knowledge to the collaboration. Consequently, this

leaves the larger part of the financial responsibility to the other collaboration partner. As a result, the collaboration partner needs some kind of guarantee that the project will be viable and profitable. In an initial stage, SMEs cannot normally give this guarantee, which limits their selection options. Therefore, SMEs search their networks of personal contacts in order to find suitable partners that agree to the terms and share the same vision. Based on our analysis, the existence and use of personal contacts and relationships has been proved to be crucial for the successful implementation of Open Innovation in SMEs. This is most apparent during the initial stages of the innovation process, where personal contacts has proven to have a tendency to share the same visions and realize the market potential without any further guarantees.

According to our findings we have been able to identify and distinguish three different types, or stages, in the process of attracting collaborations partners, as illustrated in Figure 6 below. In the initial stage, a SME does not have a wide variety of collaboration partners to choose from due to the fact that their technology or invention lacks a tangible guarantee of that it will be profitable. SMEs manage this search problem by utilizing personal connections and applying a modified "trial-and-error" model where they contact different potential partners and evaluates if they share their vision and realize the potential. Due to the personal relation to these potential partners, normally for one of them, the market potential of the invention is enough to engage in the collaboration. In a second stage, when SMEs have been able to acknowledge the invention i.e successfully build a prototype or patented the invention, new potential collaboration partners appears. This becomes a possibility to multiply the range of applications of the technology by entering further collaborations. The new potential collaboration partners are only apparent in this second stage due to the fact that they now have a guarantee in the patent. If the collaborations have been successful in the second stage, a third category of partners will consider entering the collaboration with SMEs. These potential partners are often larger companies and in this third stage, these potential partners are the initiators and contact the SMEs and a wider range of possible applications open up. This, however, assumes that the product has a wide market potential. These different stages of attracting collaboration partners are illustrated below.

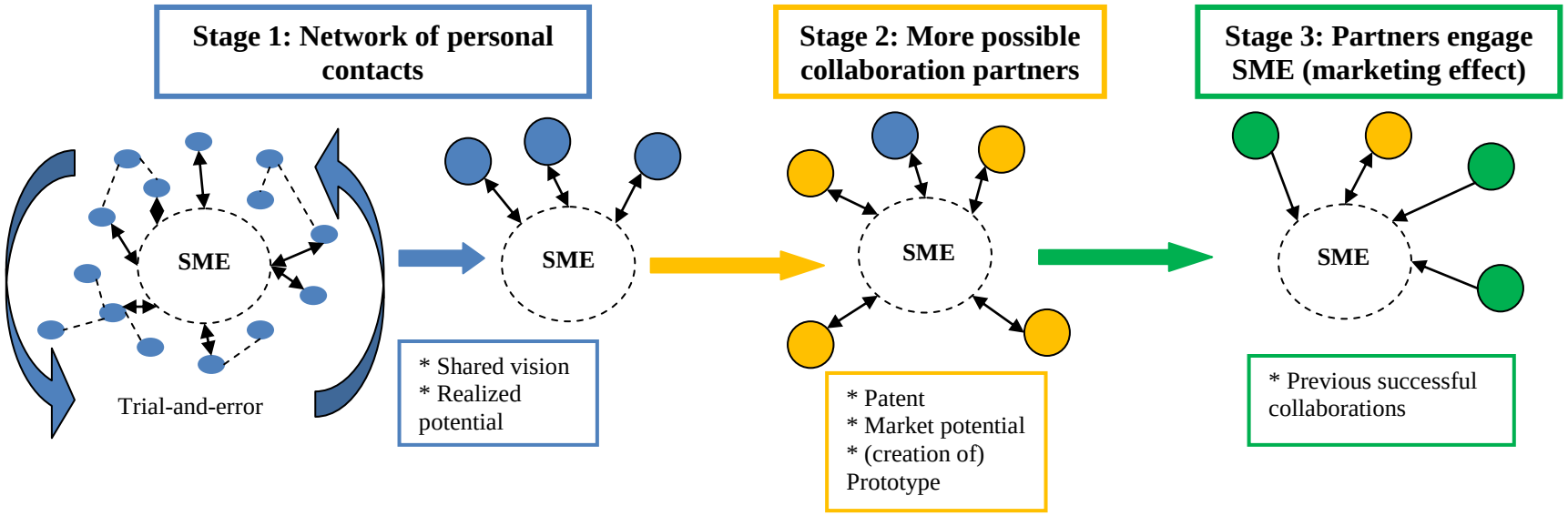


Figure 6: Different stages of and driving forces in attracting collaboration partners

As discussed in our analysis and in the sections above, an extensive network of personal contacts are vital for SMEs who adopt an open innovation approach, especially during the initial stages of the innovation process when they need to have their invention acknowledged and proven. However, this increases the importance of being able to recognize and assimilate external sources of knowledge as well as to motivate these sources to contribute. Given the resource constraints of SMEs, we can conclude that these absorptive, multiplicative and relational capabilities become more important to possess and manage for SMEs than for larger corporations due to the challenge of identifying and attracting a suitable collaboration partner. The empirical results of this study are thus consistent with the challenges in the theory presented by West & Gallagher (2006), although their importance is concluded to be higher for SMEs. The management of these challenges, according to the suggested theory, are, however, not fully transferable to SMEs. West & Gallagher (2006) argues that companies manage the challenges of Open Innovation through pooled R&D / product development or spin-outs. Our empirical results, on the other hand, indicate that SMEs first and foremost manage these challenges by utilizing their network of personal contacts. This is also related to the "trial-and-error" model discussed earlier and this management-collaboration relationship is illustrated below.

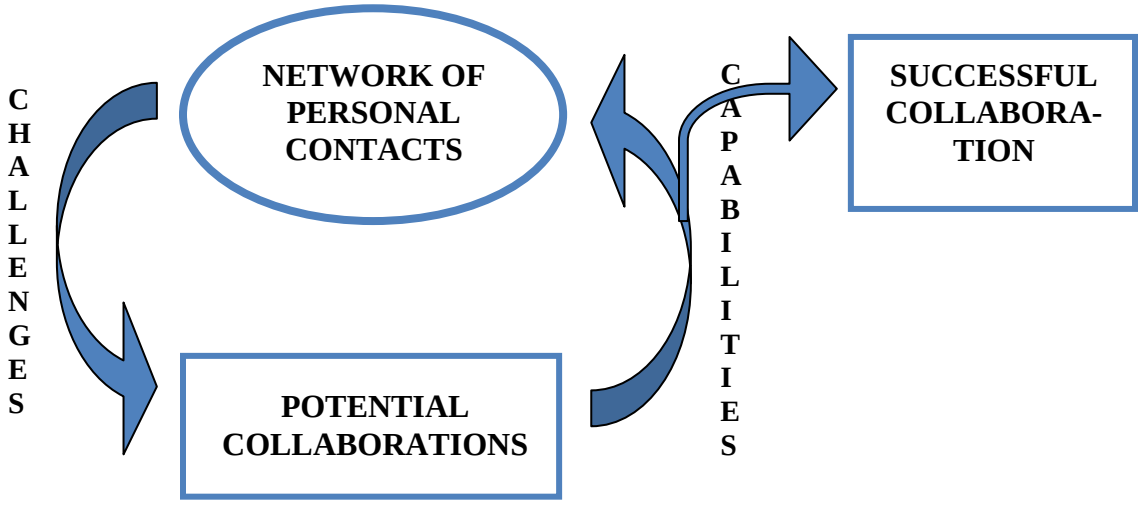


Figure 7: Management of challenges

We have also been able to conclude that SMEs manage the organizational challenges of Open Innovation by emphasizing continuity in the innovation process, consistent meetings and, among the three cases, a differing degree of trust versus control of the management mechanisms and IP rights. Furthermore, the management of the Open Innovation challenges can, once again, be linked to the relative importance for SMEs to localize and engage suitable collaboration partners due to their limited resources.

The more practical implications of this study's result are that when SMEs adopt an Open Innovation approach, their personal network of contacts determines in various degrees, the success of the transition. Therefore should SMEs that are considering transition from a closed innovation paradigm to an open one consider if they have the right contacts to be able to do so. To patent the technology or the innovation has also been proven to be important in order to attract and engage in collaboration with larger companies. However, the most important success factor is to identify and select collaboration partners that share the same vision and therefore are able to see the same potential in the innovation as the company that supplies the idea. Additionally, engaging in Open Innovation is not a static transition; further collaboration arises through previous ones and the range of possible application for the innovation could increase depending on collaboration partner. Finally, to engage in Open Innovation collaboration could also be a strategy to explore the market potential of an invention and to gain reference clients that could lead to acknowledgement and commercialization of the invention.

6.1 Limitations and suggestions to further research

This study prepositions that SMEs manage Open Innovation differently due to their size and limited resources. This has been proven in this study in some aspect of the open innovation process. An analytical generalization is therefore possible which means that SMEs in a strong growth industry overcome challengers and finds suitable collaboration partners through their network of personal contacts. However, like many other studies, this one also has its limitations. For example, the empirical evidence in this study has been collected from interviews with companies within the wind turbine industry. Therefore the empirical evidence could be linked to the specific circumstances in the wind energy industry and the results transferability to other industries could be questioned.

The time and resource constraints have to a certain degree also affected the extent of collected empirical evidence. However, it is our belief that the information collected shows enough evidence to draw conclusions in the specific industry and served the purpose of complementing current suggested theories in order to receive a more comprehensive view of how SMEs mange open innovation.

Further studies should thus focus on exploring the transferability of this study's results to other industries were SMEs have adapted an Open Innovation approach. New findings, as the need for financial resources and marketing effect, should be researched in order to establish their reliability. This study also presented findings that the personal network of SMEs is the key to successfully overcome the challenge of identifying and attracting suitable collaborations partners. Furthermore, studies should focus on researching the network of SMEs in more detail by for example applying a network based theoretical framework.

This study has also primarily focused on the perspective of the company that developed the invention or the technology, which in this case are the three case companies GGRail, Vertical Wind and Whale Power. Their collaboration partners have in some cases been researched using second hand sources, which mean that their view on how the collaborations have been managed could in some aspects differ. Complementary studies taking the perspective of the "non innovation company" could clarify possible differences.

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Appendix: Interview guide

Presented below are the main questions that we based our interviews on. Since the interviews were conducted under semi-structured conditions, we adapted the follow-up questions depending on the answers we were given. The sequence of the main questions was also adapted as a result of the answers. Every interview also contained some standard introductionary information, such as:

1. Presentation of the authors and the thesis
2. Purpose of the study
3. How the information will be used
4. Permission to record interview
5. Information about the respondent

Main interview questions

- Who did you collaborate with and why?
- What was the intent of the collaboration/s?
- Did you use any specific search criteria's to find collaboration partner/s?
- What made the partner/s convinced to engage in collaboration?
- How did the collaboration/s work out?
- What were the biggest challenges of the collaboration/s?
- How did you overcome these challenges?
- How would you describe the management mechanisms of the collaboration/s?
- Who filed for patent/s? Who owns the patent/s?
- Is it necessary to file for patent/s or are there other ways to protect the company and the results?