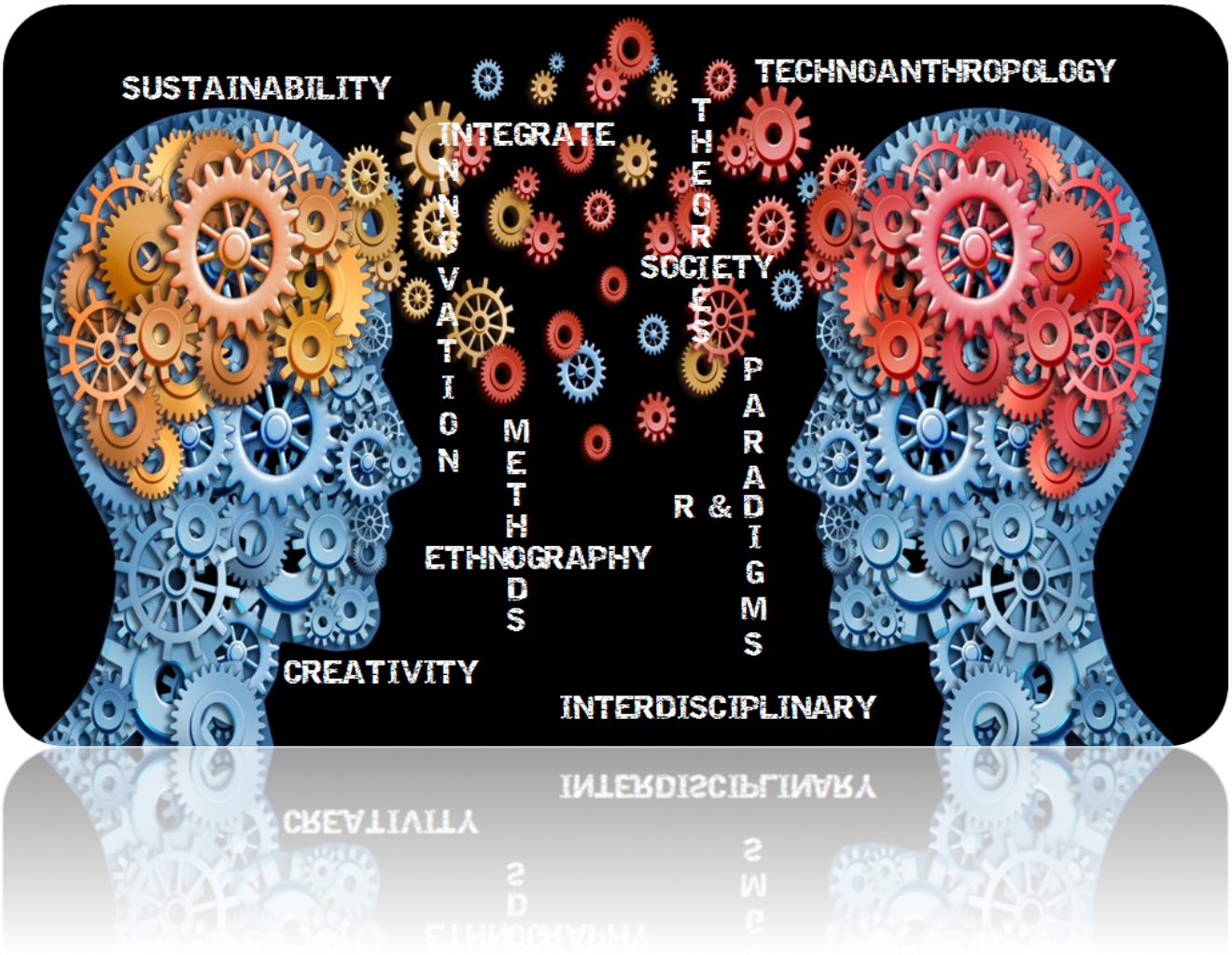
"Creativity is no longer a luxury for the few,
But a necessity for everybody"

(Csikszentmihalyi 2006 p. Xviii)

A Techno-Anthropological Thesis on how Interdisciplinary Approaches can create greater Creativity.



A thesis

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Synopsis:

This thesis examines how the concept of creativity influences the innovative processes in SEV, both on an individual level and on an organizational level. It illustrates how to create an innovative framework from an organizational perspective in relation to radical changes. The source of change is creativity, but in order to understand how creativity creates innovative processes, it is necessary to investigate how creativity occurs and furthermore how it develops into innovation. To do this it is necessary to get below the surface to investigate and get knowledge of the work practices and get a holistic image of the organization examined, which the ethnographic methods have contributed to. SEV's focus area has been on technological innovations, which have been characterized by a monoculture approach. The challenges that SEV will face in their vision 2030 requires not only technological solutions but also challenges of a more social nature. A conceptual model has been designed to support solutions of a more social nature as the project concludes SEV would benefit from moving beyond their own community of practice and become more interdisciplinary in their approach to gain greater creativity.

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Preface

This thesis has been completed at the master's program for Techno-Anthropology at Aalborg University, Denmark during a period from May to January 2018. I would like to thank my supervisor Lars Botin for his constructive feedback and excellent supervision throughout the project. In addition, I would like to thank the organization SEV for opening their organization, giving me permission and opportunity to carry out my fieldwork, including attending many exciting meetings and participating in the opening of Húsagi wind farm. The organization made me feel welcome during a turbulent period. I would also like to thank Roi Joensen, from Hiddenfjord for a day in the field and subsequent interview. A special thanks to Bogi Jensen, Rector of Glasír and former professor at DTU in the Faroe Islands for his contribution.

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Abstract

This thesis examines how the concept of creativity influences the innovative processes in SEV, both on an individual level and on an organizational level. It illustrates how to create an innovative framework from an organizational perspective in relation to radical changes. The source of change is creativity, but in order to understand how creativity creates innovative processes, it is necessary to investigate how creativity occurs and furthermore how it develops into innovation. To do this it is necessary to get below the surface to investigate and get knowledge of the work practices and get a holistic image of the organization examined, which the ethnographic methods have contributed to. SEV's main focus has been on technological innovations, which have been characterized by a monoculture approach. The challenges that SEV will face in their vision 2030 requires not only technological solutions but also challenges of a more social nature. A conceptual model has been designed to support solutions of a more social scientific approach as the project concludes SEV would benefit from moving beyond their own community of practice and become more interdisciplinary in their approach to gain greater creativity.

Reading Guide

In this project, I will refer to sections or chapters by numbers, such as Section 4. The empirical data is used throughout the report as examples to ensure reading quality and to provide a more consistent text. All quotes from both interviews and field notes, including observations and reflections, have been translated from Danish to English.

The project is organized in 4 parts and contains 10 chapters. Part I contains Chapters 1-3, where the problem analysis is presented, followed by the problem statement and the related research questions.

Part II contains Chapter 4. This section describes my methodological approaches in the research and in Part III, Chapter 5; I present the analytical framework that is the underlying basis for the analysis.

Part VI consists of Chapters 6 to 7. In chapter 6, the analysis is presented, including analysis parts I, II, III and VI. In section 7, a Conceptual Framework for Creativity is presented.

Part IV consists of Chapters 8 to 10. In chapter 8, the methods and theories used are discussed along with the results of the research. Which leads to capital 9, the conclusion and in section 10, a perspective on the project is given.

Part I

Introduction & Problem Background

Chapter 1

Introduction

The world's climate change is one of many challenges of today´s society. The water levels in the oceans have risen significantly and carbon dioxide emissions have been established as the source of global warming. Global warming has major consequences and worldwide organisations are trying to find alternative solutions to reduce carbon dioxide emissions. (UNFCCC, 2014) A solution that addresses this issue is renewable energy sources.

The location of the Faroe Islands makes them a mecca for various renewable energy sources. Wind and water conditions make it very attractive to invest in technological alternatives like wind turbines, pump storage and tidal turbines. The alternative energy is both green and cheap and it has raised the ambitions of the Faroese energy company SEV (SEV is establish of the three central islands, Streymoy, Eysturoy and Vágar) SEV has an ambitious goal to become 100 per cent green by 2030. In order to realize their ambition, SEV is working across organizations to develop alternative technological innovation solutions to meet the challenges they face in the transition of becoming 100 per cent green. This requires them to think out of the box. Two of the biggest challenges are the uneven wind energy and the stabilization of their power supply. This project focuses on how the concept of creativity has influenced the innovative processes in SEV and illustrates from an organizational perspective how an innovative framework is created in relation to creativity.

As a Techno-Anthropologist, this field is the core of our competence. Each design process is unique and getting down below the surface is a necessity as well as knowing the work practices. This work will show a holistic picture and an understanding of what lies under the tip of the iceberg (Botin 2013) As a Techno-Anthropologist, there is a broader understanding of the concept of technology. Technology is not limited only to the physical object, technology also refers to the development and use in practice. (Christensen 2013, p. 387) This is where the ethnographic method becomes necessary. Through the ethnographic studies and analytical findings made in this project, it is possible to understand the life experiences. When technology is about understanding artefacts in practice, it becomes clear that an understanding of practice is crucial to the technological processes. Practices are also a basic element for the execution of this project, based on the Techno-Anthropological pathways that have been conducted in the two field studies at SEV in the Faroe Islands.

Chapter 2

Problem Analysis

2.1 Global climate change

Climate change is one of the biggest international challenges we face and there is an international consensus that climate change must be taken seriously, otherwise it will have consequences for man and nature in the future. The world's climate is undergoing a major change. This can be predicted by many factors, and globally work is being conducted to find solutions that can accommodate the changes that occur. (UNFCCC, 2014 p. 3) The changes show, among other things, that the last three years have become warmer and warmer, in fact the warmest we have seen since 1850. The UN's climate panel, IPCC predicts that in the near future, warming over land will be greater than the warming over the oceans. The further to the north you move, the more powerful and faster the warming will be. The effect of heating is already showing by the melting ice and snow in the Arctic. The melting of ice and glaciers combined with increasing ocean temperatures is the reason for the rising oceans. IPCC estimates that water levels in the oceans will continue to increase and that the amount of CO2 emissions can have a decisive influence on how escalating this development will be. It is estimated that 20 per cent of CO2 emissions will be absorbed in the sea, i.e. that the sea helps prevent some of the CO2 from being led into the atmosphere. Unfortunately, the downside is that the absorption of CO2 makes the seawater sour. Consequently, acidification of the sea will continue to increase along the

vast amounts of CO2 being released. The ocean cannot absorb unlimited amounts of CO2, the more acidic the sea becomes, the less CO2 it can absorb. In addition to climate change and rising sea levels, the climate change also has an effect on the world's precipitation patterns, which will have an impact on the surrounding communities. (Http://www.fn.no/Tema/Klima/Klimaendringer)

It is necessary to consider alternative solutions to avoid the worst climate change. This is possible by drastically reducing greenhouse gas emissions and considering how to socially change our thoughts and patterns of actions. (Martin Stendel, Geological News, 2015) Energy production, as mentioned, represents the largest share of global greenhouse gas emissions. The UN Climate Panel recommends reducing the consumption of fossil fuels by switching to renewable energy. These change processes will force organizations within the energy sector to act innovatively; otherwise it may affect their current market position and their future existence.

2.2 Introduction to innovation

The society is constantly evolving and new technological solutions are implemented across all areas to support the different work practices. The technological changes have given rebirth to the concept innovation. (Finn Kollerup, et al 2005, p.18) The innovative forces of the companies have a decisive factor in transforming and renewing themselves in the globalized and technology-developing market. Companies will have to compete on their capability to innovate, their factors for innovation, and how to convey the innovative processes. (Sundbo 2006, p. 169) Innovation is not only a decisive factor for companies and organizations, but also more holistic for the surrounding community. (Finn Kollerup, 2005, p.18)

It was Joseph Schumpeter, an Austrian economist who invented the concept of innovation in the 1930s. Schumpeter's early thoughts on

innovation are described as a new thinking that brings economic value. (Darsø 2003, p. 2) In new developments or changes in society, companies can go two ways: they can either react adaptively or creatively. By agitating adaptively, the company usually reacts and adapts to changes along the way. Companies that choose a new road, and new strategies, will actively motivate and this creative process will change the business forever. Schumpeter refers to this action as a creative destruction. (Schumpeter 1942, p. 83). The automobile industry's market development resulted in the disappearance of the use, and the need for carriages; this is an example of creative destruction. The automobile industry is not an isolated example of creative destruction at workplaces. By 1900, almost 40 per cent of the American population worked in agriculture. Only a century later, the figures fell to just two per cent. There is a huge fall in farm workers and one of history's biggest cuts, yet the United States produces more meat, grains, vegetables and dairy products than they have previously produced due to innovative solutions in agricultural productivity. (Cox and Alm 2008, p. 3)

In recent times, creative destruction can also be seen in industries with very fast product development, where dominant market players need to continuously renew and reinvent their products, and without the dominant positions the companies cannot succeed. A process that causes high development costs. An example of this is the launch of Apple's IPhone. It was a radical innovation when it first hit the market. If Apple does not continuously renew, innovate and develop their product versions, the products will become obsolete and other competing players will challenge or take over their market position. Each time this renewal occurs, the former product actually loses value, leaving only the latest product desirable.

Briefly, two types of innovation are distinguished - incremental and radical innovation. As described with both the appearance of the automobile and

Apple's launch, they are examples of radical innovation that required new knowledge, resources and a vast technological change. Incremental innovation is described as small on-going innovations, build on current knowledge and resources already known to the company. (Kollerup and Thorball 2005, p. 50)

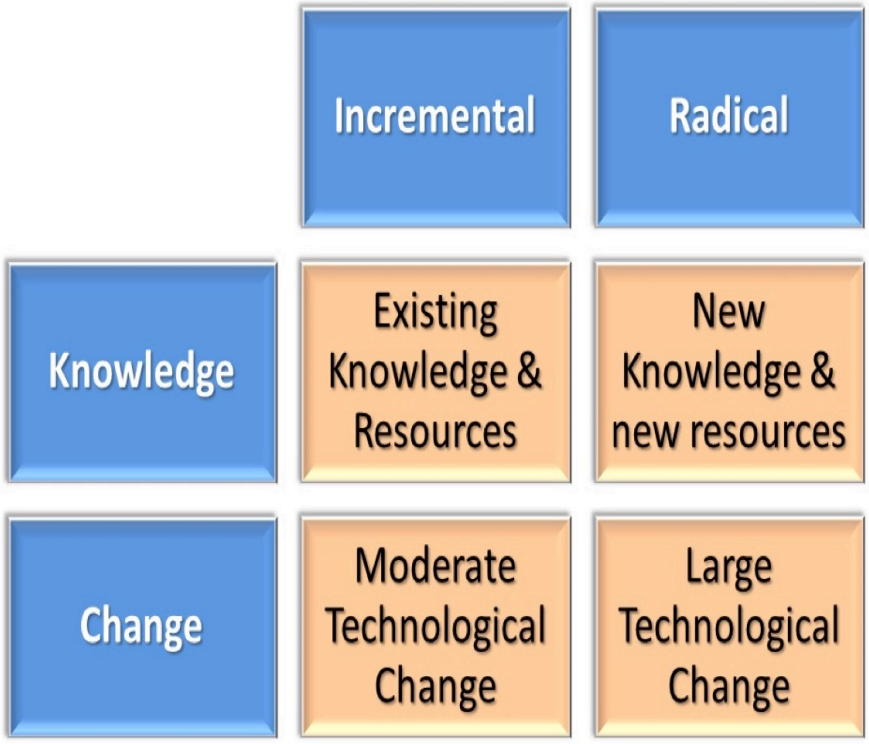


Fig. 1 Incremental and radical innovation distinctions (Kollerup and Thorball 2005, p. 49)

In the project, the concept of Innovation will be used on the basis of Schumpeter's interpretation, as an innovation that produces economic value (Schumpeter, 1942 p. 83). In the next section, a review of different innovation approaches will be presented. To visualize the various scientific acknowledgments in the theory of innovation, the concept of Kuhn's paradigm has been used. (Sundbo 2006, p. 171)

2.2.1 Basic concepts in the literature of innovation

Thomas Samuel Kuhn was an American physicist, historian and philosopher of **science**. Kuhn is the father of the concepts paradigm and paradigm shift in science philosophy. In *The Structure of Scientific Revolutions* he goes against the so far prevailing view of what science is and how it is developed. The natural sciences are described from what Kuhn calls a paradigm. The paradigm sets the limits for what you can see and what questions you can ask. (Kuhn 1962, p. 6). Kuhn's paradigm is used in its original meaning and can be described as how a phenomenon is recognized within a particular scientific world, viewed in the light of the considerations and norms that are valid, and forms the theories and methods within the common basic value. It is often seen that a paradigm wants such dominance, but when it comes to the phenomenon of innovation, it is not quite as simple, as the concept of innovation is challenged by other recognitions and explanations. Based on Jon Sundbo, there are currently three basic concepts in the innovation literature; The Entrepreneur Theory, the Technology-Economic Theory and the Strategic Innovation Theory. (Sundbo 2006, p. 171). Furthermore, another innovation theory is flourishing. RRI, Responsible Research Innovation. RRI will be described along with Sundbo's three basic views and included in the model of innovation approaches at the bottom of this section. Today, there is no dominant paradigm to describe the phenomenon of innovation. The four approaches each provide suggestions for how to create innovations according to the reality and starting point. In other words, a situation has arisen where a paradigm has been challenged in its position and thus loses its power, its dominance; Kuhn calls this *a revolutionary situation.* (Sundbo 2006, p. 171) To clarify the differences in the paradigms, a presentation of the four approaches will be discussed in the next chapter.

2.2.2 The basic paradigms in innovation theory.

Entrepreneurs

It was the economic growth wave that, around the nineteenth century, created the entrepreneur's basic perception. Growth was created by individuals who founded new businesses that quickly grew large and created significant economic growth. Due to the time and opportunities in the market, the entrepreneur quickly gained a crucial role in the early innovation theories. Although Gabrial Tarde (1895) a French sociologist was the first to connect social changes and individuals' intentions with innovations, it was the previously mentioned Joseph Schumpeter (1934) who with his release, *The Theory of Economic Development*, developed the theory of entrepreneurship. (Sundbo 2006, p. 172) The entrepreneur wants to create a position for himself and create business activity through innovations. These innovations can be devised on the basis of their own or others' ideas. The downside of innovations is the risks that come with it. These risks always want to be minimized as entrepreneurship. As mentioned earlier, innovative initiatives often lead to breakthroughs in the economic world, which creates some form of chaos, but this chaos also creates economic advancement, as Schumpeter refers to as creative destruction (Sundbo 2006, p. 172).

Technology economic perception

The technology-based economic perception got its breakthrough in the 40's and 50's when a new wave of growth emerged. This changed the smaller entrepreneurship companies into major technology companies, which in the composition were characterized by a large number of engineers and other technically trained staffs. The companies began to analyse how they could promote their operations by developing new technologies. As a natural transition to this, the technological factor became part of the new perception of innovation. Unlike Schumpeter's exploitation of new markets, *"technology-economic theory is predominantly push-oriented - the technological innovations create the innovations. However, a fast-paced market demand was also quickly introduced, is also crucial for innovation development "* (Sundbo 2006, p. 174) it was only in the 1970s and 80's that the technology-based economic perception emerged and had its paradigmatic status. (Sundbo 2006, p. 174) Bang and Olufsen is an example of a company that took the technology economic approach, pioneering many of their products, just like Steve Jobs has been with his development of Apple products.

The strategic perception

Unlike the two basic views that have just been reviewed, the basic idea of strategic innovation differs from being "manifested as a single theory." (Sundbo 2006, p. 174) The market is being saturated; therefore, market growth does not end the same way anymore by creating a new business, as it was the case with the entrepreneur, or as in the technology economy perception, developing new technological innovations. If companies are to have favourable conditions on the market, it is necessary to develop new products. In order to innovate, it is also necessary to create a new market. Although the strategic approach differs from the other two approaches, threads can be drawn to both the entrepreneur theory and the technology-economic theory based on the strategic basic theory. Where entrepreneurial theoretic theory focuses on networking and

entrepreneurship, the technology-based emphasis lies on some of the same values, networks, and user relationships as well as the involvement of technology development in their strategic goals for the company. The strategic paradigm, however, is opposite the technology-economic predominantly pull-oriented. The market becomes dominant for what innovations are needed as a whole in both technological and non-technological processes, and there is generally a great focus on user involvement. (Sundbo 2006, p. 176) It is crucial for companies to constantly search for new trends, and new markets with possibilities for further innovation. This is seen, inter alia, in the elderly care industry, where new technologies are being implemented to improve the elderly's everyday livelihood and, in particular, meet the lack of personnel in this field.

RRI - Responsible Research Innovation

Responsible research innovation is in the Horizon 2020 Work Program 2016-17 Science with and for society described as*; "an approach that predicts and assesses potential impacts and societal expectations with regard to research and innovation with the aim of promoting the design of inclusive and sustainable research and innovation"* (European Commission 2017, p. 43) RRI is crucial to address the major challenges our society faces with today's climate change, aging populations and mass immigration. With today's knowledge society requires research and innovation that is designed in collaboration with the citizens' expectations and values. RRI has social and ethical controversies and dilemmas in their loop and RRI works from an open and transparent perspective. They aim to build a more inclusive, smart and sustainable society that focuses on the major challenges we are facing today (Owen et al. 2012, p. 753).

The four paradigms are fighting each other with their individual perceptions of being dominating as paradigms. It is therefore necessary to relate to different types of innovations and bare in mind that they have

different goals (Drejer et al. 2005, p. 58) The following table is with inspiration from Sundbo made to dissolve their basic views, differences and common goals. (Sundbo 2006, p. 179).

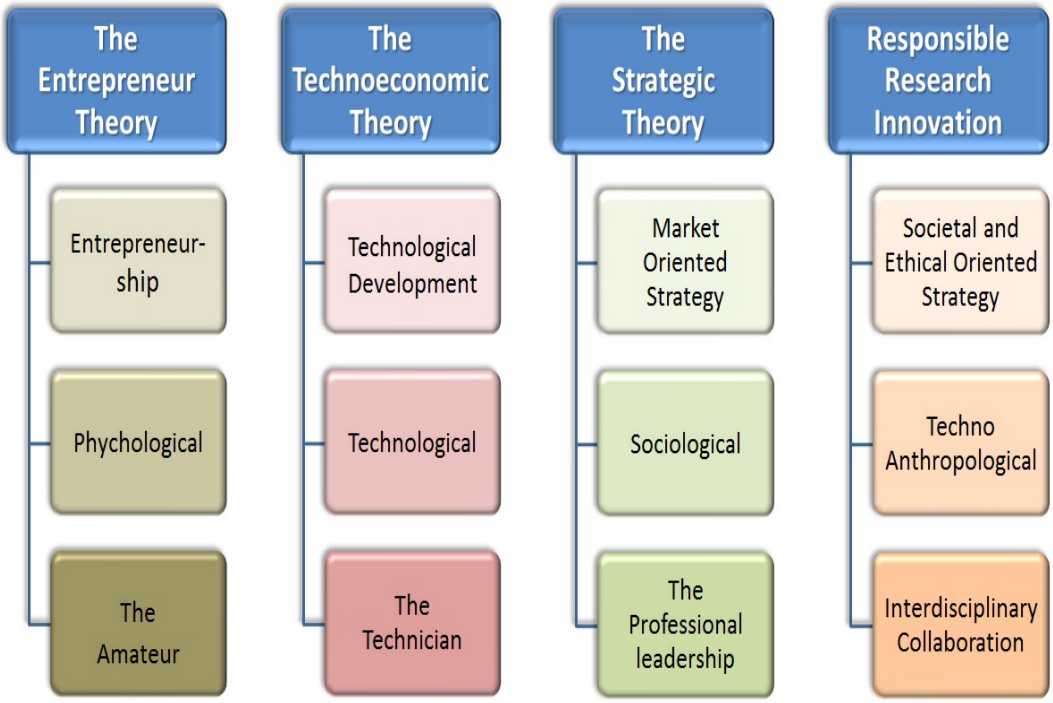


Fig. 2 Basic views, differences and common goals (Sundbo 2006, p. 179)

2.2.3 Innovative processes with creativity as a key concept

Innovations can, as described above, be technological, social, and organizational, and consist of products, processes or market innovations (Sundbo 2006). However, according to several voices in science, including Schumpeter (1934), Amabile (1988) and Cskiszentmihalyi (1997) there is a key concept, which is an important factor for successful innovation - the concept of creativity. Therefore, creativity should be regarded as a crucial element in organizational innovation. Without creativity, it would not be possible to develop and implement innovative processes. (Amabile 1988, p.123). This places great demands on businesses. *"In the future, organizations will see themselves as dynamic, shifting, temporary, and open to networks that are configured to the present situation and task"* (Drejer et al. 2005, p. 13)

2.3 SEV – The research field of study

An organization that has implemented the dynamic and changing element is the Faroese energy company SEV. SEV is a municipal community co-owned by all the municipalities of the Faroe Islands and hence the Faroese people. The municipalities of the three central islands Streymoy, Eysturoy and Vágar helped establish SEV in Vestmanna on October 1, 1946. It is a company based on solidarity and is a democratic organization. It is a non-profit organization and today one of the Faroe Islands largest organisations. SEV is committed to provide energy to all citizens of the community, including companies and organizations 24 hours a day. SEV is the sole responsible for all power supply and power quality of the Faroe Islands. The Faroe Islands is an isolated community and the possibility of buying electricity from neighbouring countries does not exist. It is the responsibility of SEV to have sufficient capacity to keep

the system continuously running, to solve technical problems and problems. (Formal Interview Tejri, 2017)

Later in Chapter 6.1, SEV's organizational structure will be included. For many years, bureaucracy has been the organizational form and foundation of the industrial community. (Balle Hansen, 2013) This also applies to the organization SEV, utilizing a highly classical bureaucratic organization, where the big decisions are taken at the top, and migrated down through the organization.

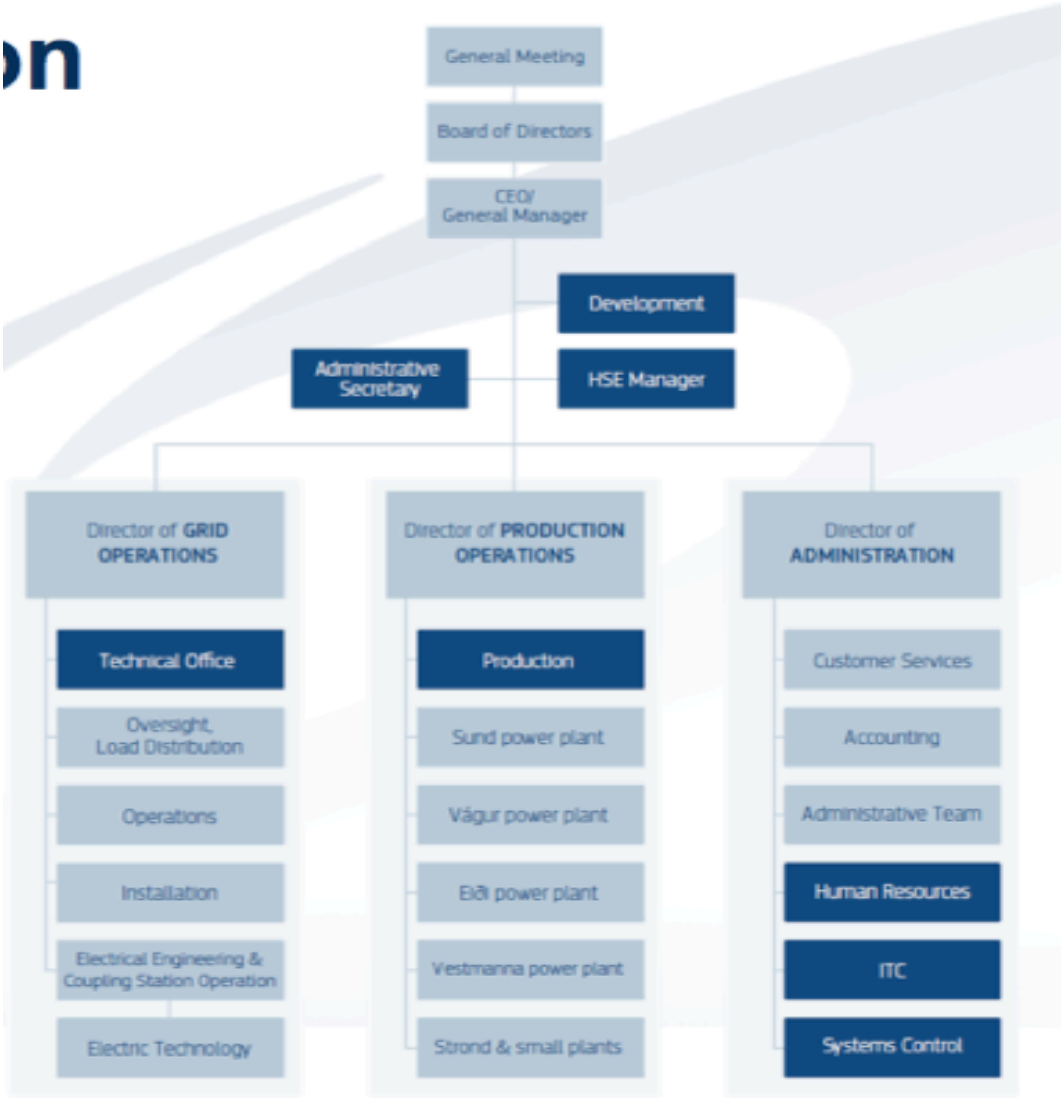


Fig. 3 SEV's organizational structure (SEV 2017)

The Faroese society has always been very innovative. They have moved from agriculture to technological fishing over a short period of time, and the development has been fast. (Interview Bogi Jensen 2014, p. 2). The Faroe Islands are very favourably located in the Atlantic Ocean making it possible to be more innovative and utilize new technological measures in relation to water and wind energy.

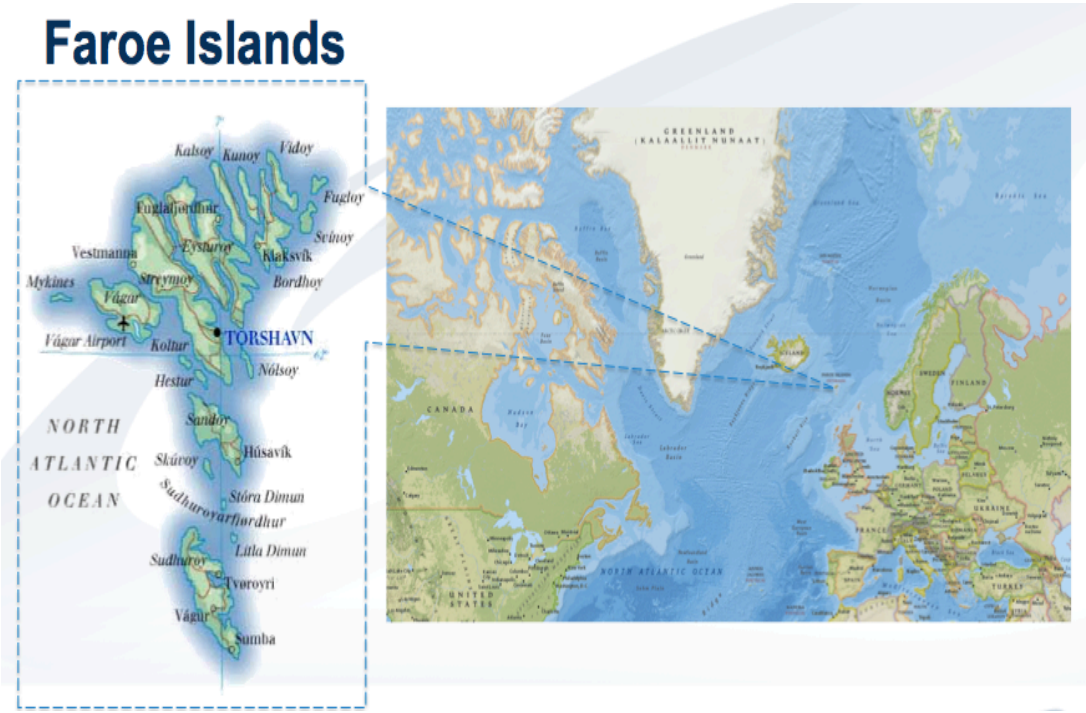


Fig. 4 Faroe Islands location in the Atlantic Ocean (SEV 2017)

The location has helped help to visualize the potential of a more environmentally efficient technological transition. SEV has collaborated with several different key players to provide innovative technological solutions to help them meet their vision of being 100 per cent green in 2030.

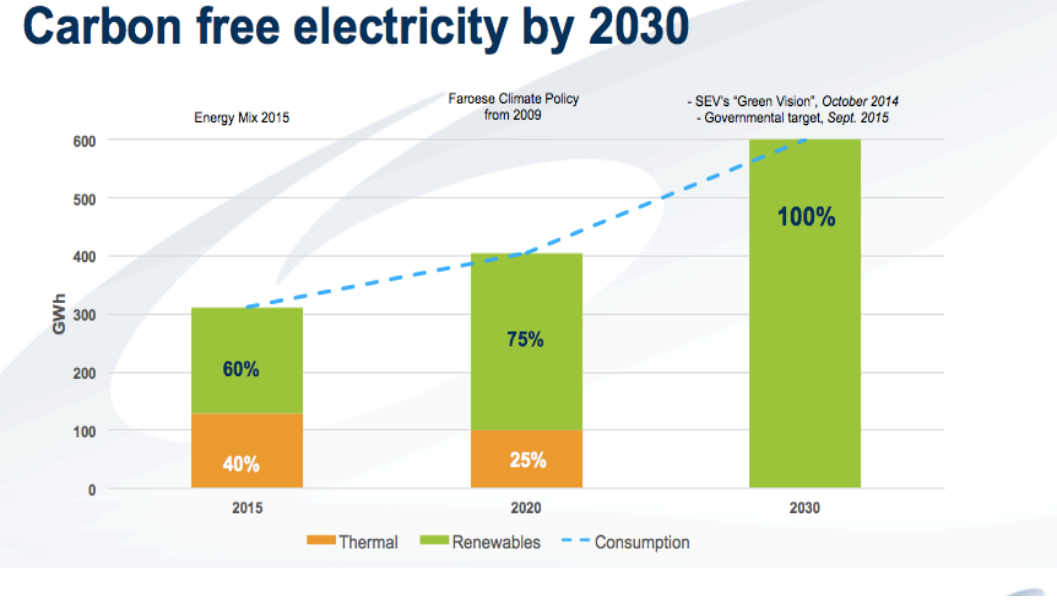


Fig. 5 Picture of vision 2030 (SEV)

Today about 60per cent of SEV´s produced energy comes from renewable sources. (Interview 1 Tejri 2017, p. 10) This new world of alternative solutions for electricity generation makes it possible, but also necessary to develop new technological and innovative solutions. And according to SEV's visions by 2030, the solutions as mentioned can be found in the surrounding nature.

Fig.6 The Source of Vision 2030 (SEV 2017)

SEV operates with several forms of renewable energy sources, including water turbines and wind turbines. Their first wind turbines were implemented in 2003, with more running today, including a large wind farm with 13 wind turbines from Enercon in Húsahagi, implemented in 2014. (Interview 5 Tejri 2014, p. 2)

Fig. 7 Neshagi Wind farm (SEV 2017)

Fig. 8 Husahagi wind farm (Fieldwork 2017)

As an organization, SEV has faced the requirements of switching from traditional linear operations to more dynamic, innovative and creative operations. It has required and still requires many new and innovative solutions to handle the massive change and complexity this transition entails. The below picture highlights the different technologies SEV sees as the solution to reach their target in 2030 (Track 1) some of the technologies are still in the developing phase and SEV has the opportunity to affect these in the development cyclus. The second track reveals the need for users to cooperate in the future. Heat pumps and electric cars can be important players in the utilization of renewable energy produced by new technologies .

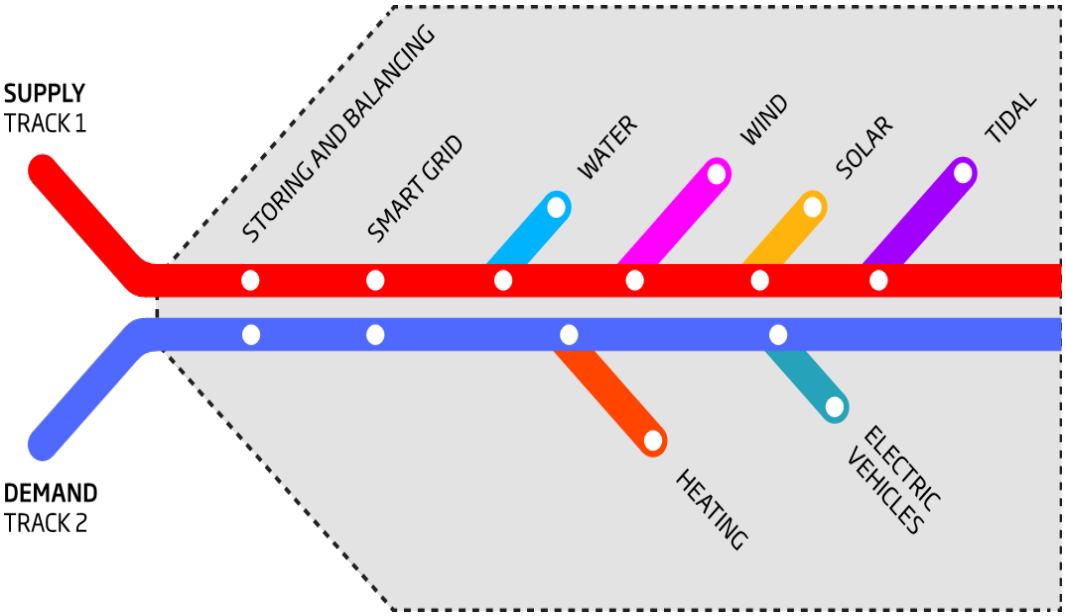


Fig 9 Overview of Tracks 1 and 2 (SEV 2017)

2.3.1 Supporting Technologies and solutions for the future

As one of the initiative they have made, SEV has established a working group in collaboration with, Danish Energy to seek innovative solutions and supporting technologies that can help them meet their goal in 2030

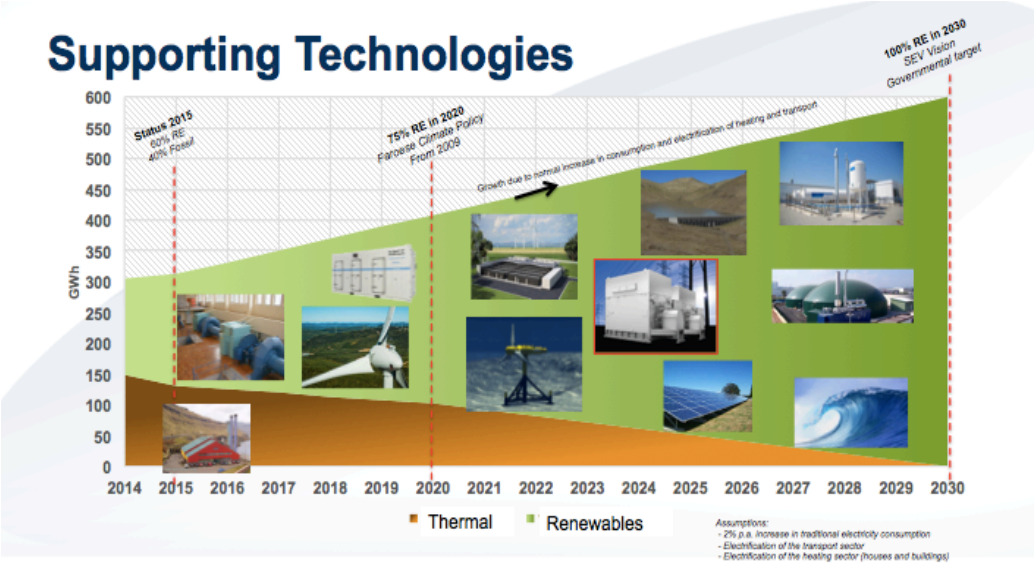


Fig. 10 Ongoing support technologies and solutions for the future (SEV 2017)

SEV is working on finding solutions that exploit the wind energy being produced. They are looking at how to fit the energy to maximize its utilization, by implementation of heat pumps. They are working on maximizing the amount of storage needed to exploit the energy generated by the wind turbines. A major challenge is the wind during winter time, where the weather is powerful and unpredictable. In addition to the strong winds during winter, there's almost no wind in the summer, resulting in less energy during this period . A solution to this challenge could be solar energy. (Bogi Jensen 2014, p. 1)

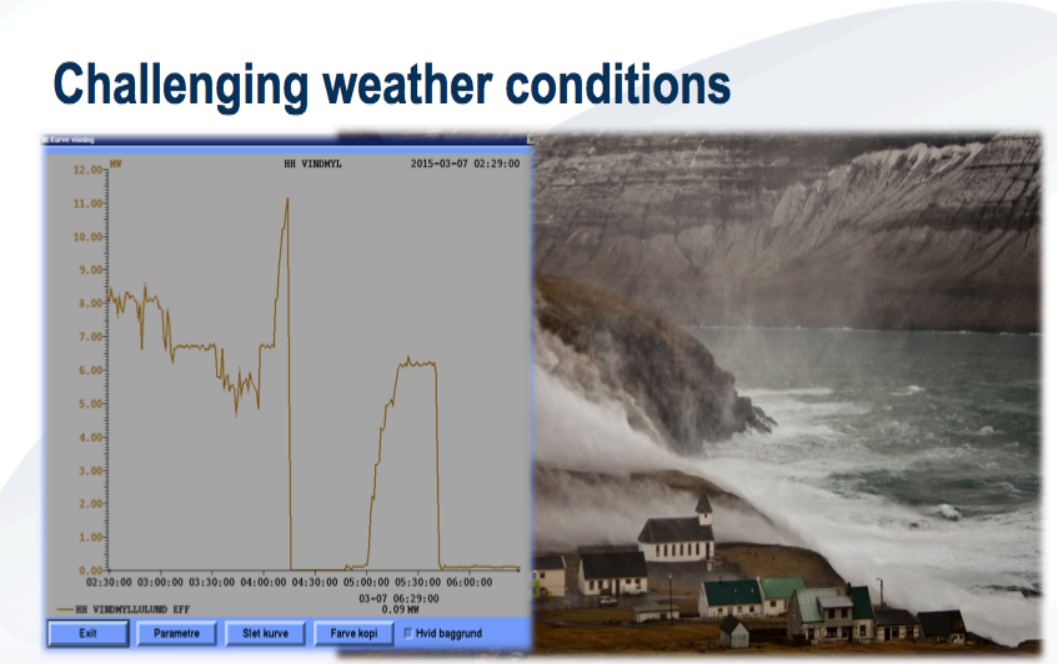


Fig. 11 Graph showing the changing wind force. (SEV 2017)

SEV also have pump storage. Pump storage is a kind of hydropower plant. Water is pumped up in highland lakes in winter taking advantage of the heating energy during summer, where the wind turbines do not produce sufficient energy. A way to store and save energy. The problem with this solution is the requirement for large dams. This solution requires raising the water level by up to 18-20 meters, which may course other environmental problems. (Bogi Jensen 2017 formal conversation) Alternative technologies being researched are solar cells. However, the wind and weather conditions of the Faroe Islands are very demanding for such technologies, and the concern is whether the solar cells can withstand these conditions. (Bogi Jensen 2014, p. 1) As described above SEV is working from a broad spectrum and are following several tracks . This is the reason for having started their new R&D department, seeking innovative and keen-sighted short & long-term solutions. (Tejri Interview 1 2017, p. 7)

2.3.2 Power hub

The intelligent electrical system “Smart Grid” is an example of an innovative solution that the Faroese energy company has tested in cooperation with DONG Energy. Smart Grid collects, monitors and manages the various components that involve production, transmission, distribution and consumption. (Hassan and Radman, 2010) In collaboration with DONG Energy, SEV has prepared a project called GRANI. It is a cross-cutting strategic partnership that has the common goal of innovating, developing and testing of specific new technology. (Interview Tejri 2014 p. 1) It is a collaboration between SEV, DONG Energy and three other companies Kollafjord, Bakkafrost and Hiddenfjord. At SEV, it was decided to implement DONG's Power Hub with the goal to become more aware of how POWER HUB works in a closed electrical system.

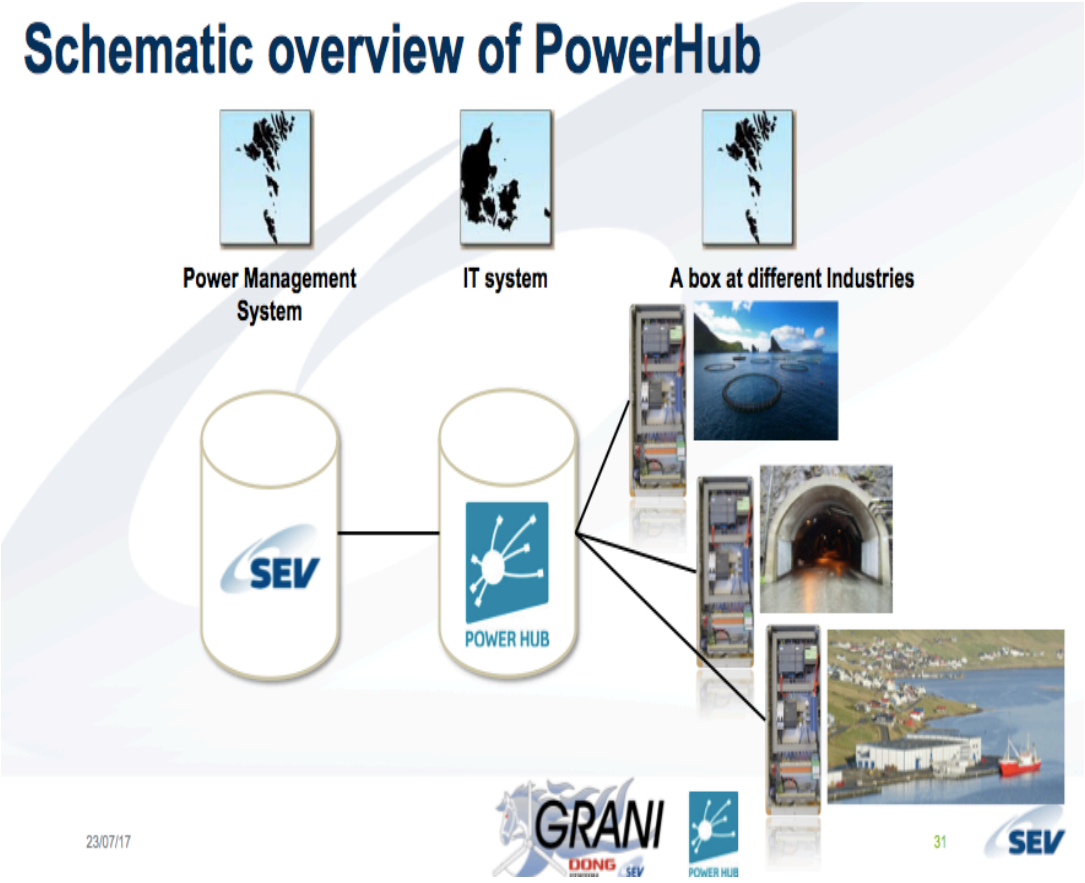


Fig. 12 Schematic overview of the project GRANI (SEV)

Power Hub is part of a Smart Grid and is a virtual power plant technology that, through the use of consumption and production capacity, helps to ensure a variable and robust power supply. This is a very relevant feature when the grid is charged with more renewable energy (Power Hub.dk). This is of interest to SEV, as Power Hub can help in making SEV's grid more flexible and to ensure a stable security of supply, which in turn can help prevent various interferences on the grid or at worst blackouts. (Interview Roi 2017, p. 24) Technically, Power Hub works by relieving the system when disconnecting any load. A given example is that if SEV is to deliver approx. 20 megawatt, which is their estimated overnight consumption, they must meet this energy level. This can be done, for example, by the use of diesel engines, water or wind. If the diesel engine covers 12 megawatts (d1), d2 can be an additional machine in Klaksvig, covering 2 megawatts and the third power source is perhaps a water turbine (V) supplying the remaining 6 megawatts? This insures a 20 megawatts running setup. In case of a breakdown of one of the machines at SEV , an error message will appear in SEV´s security system, covering the whole plant to prevent and minimize damage, for example, cams being overloaded. Such machinery breakdowns occur 4-10 times a year. A machinery breakdown will result in an imbalance in consumption, and in the given example, only 8 megawatts would be produced, resulting in a blackout. When one of the machines *falls out*, (language of the profession), SEV does not have sufficient backup reserves to maintain the balance in the system. In order to avoid these blackouts, supporting turbines could be started to supply the now lost 12 megawatts. . The problem with this solution is the efficiency curve of such a machine, the machine performs best at 80 per cent. That's its specific fuel oil consumption ratio, max. performance with min. fuel consumption. I.e. if SEV kept their machines on standby and had them running below best performance level they would suddenly face increasing oil consumption and costs.. By connecting the Power hub to their system, the machines

can run at the optimal levels, using less power. In practice, this means that they relieve the system by spreading the load to one of the three connected companies.

If we look at, for example, Kollafjord, they have a consumption that fluctuates depending on the stage of their production. They demand loads of power freezing fish when Trawlers lands their catches. Of course, there´s also a general consumption of energy for light, heating, machines etc. , but most of their energy consumption is by freezing. It is powered by generators. In this case the Power hub is focused on the consumption for freezing only, meaning SEV can save on consumption for a shorter period without affecting the rest of the production and thereby relieve the system to avoid blackouts.

The same scenery applies to the other two companies, Hiddenfjord and Bakkefrost, who are also connected to the Power Hub. Collectively they have a strong backup power supply within the three companies. Separately the companies are not affected by any decoupling and the only physical change is the implementation of Power Hub. An example of this is seen in the picture from Hiddenfjord.

Fig. 13 Power hub at Hiddenfjord. (Fieldwork 2014)

In 2014 Hiddenfjord produced approx. 4 million small salmon per year and they are dependent on a stable energy supply. Hiddenfjord's salmon lives a large part of their life's on land. They start up like small salmon weighing just a couple of grams, and then go into big tubs until the size of a kilo when they are put on to sea. (Interview, Roi Joensen, 2014 s 1).

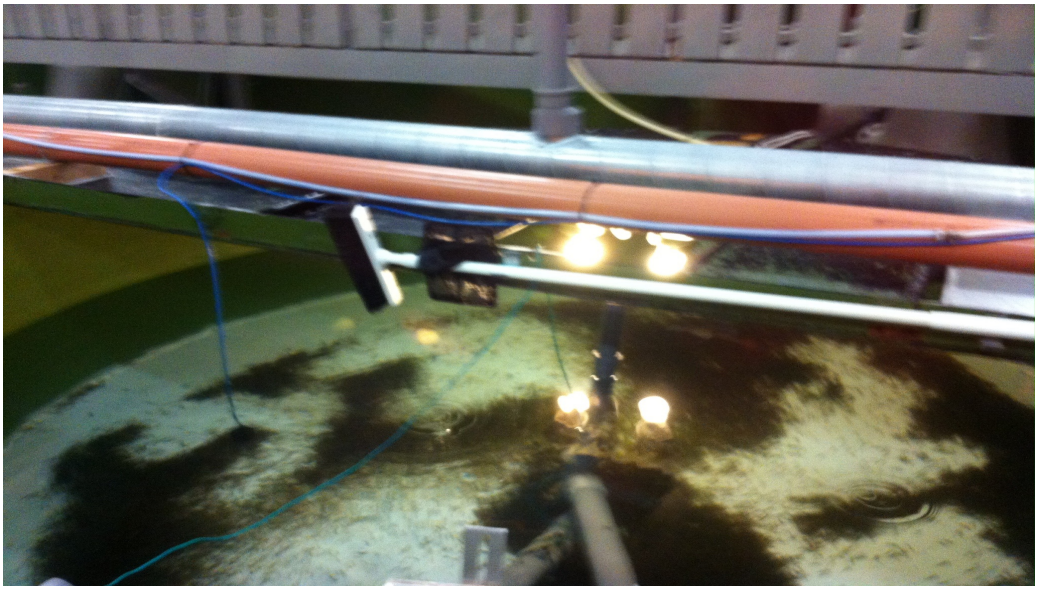


Fig. 14 Small salmon of approx. one gram (Fieldwork 2014)

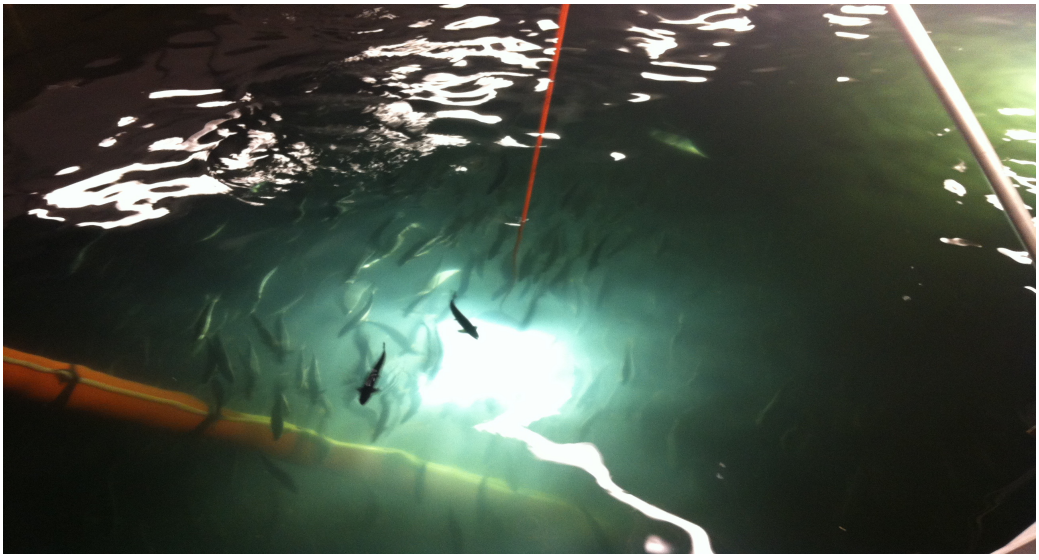


Fig. 15 Big salmon in tube (Fieldwork 2014)

This type of production makes the company very vulnerable to power failure. As Hiddenfjord has increased the salmon life cycle on land, they have equally increased the risk of something going wrong in their production, such as power failure. 1 hour power breakdown will result in a systems restart, and loss of the entire production, a very factual and expensive process. In order to ensure the production, and to prevent “fall

outs", Hiddenfjord has installed 6 generators for independent power supply, if necessary. (Interview Roi 2014 s.).

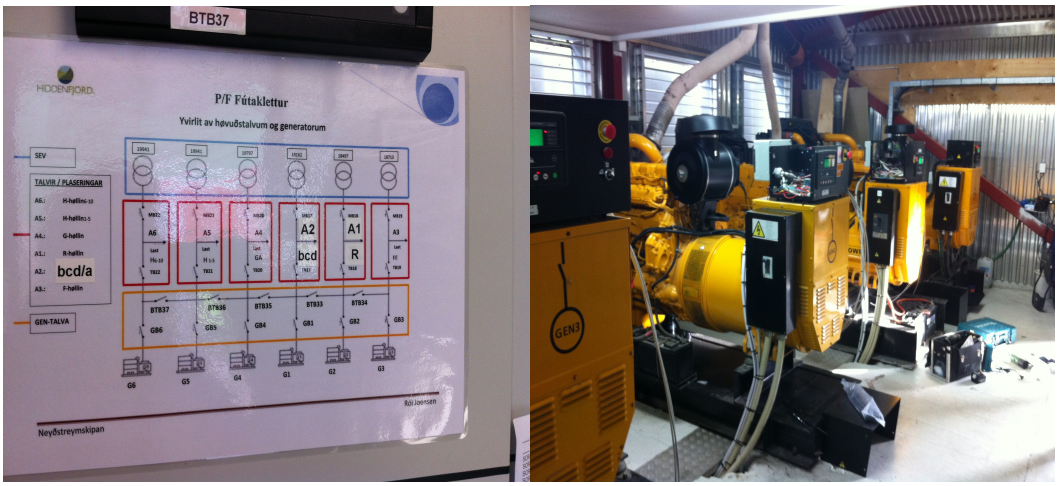


Fig. 16 Generators at Hiddenfjord (Fieldwork 2014)

As the Power Hub is connected with Hiddenfjord, it is possible to try to prevent a blackout, which, needless to say, has many advantages for Hiddenfjord. The Power Hub can help prevent a blackout by connecting the 6 generators to stabilize the network. Power Hub is therefore an extra important insurance for Hiddenfjord (Interview Roi Joensen 2014 p. 1)

The technological possibilities are constantly evolving and today a battery system can handle the same function as the system described above. This enables SEV to stay connected to their customers at all time. In theory a battery can have a capacity of 12-15 megawatts, and thereby an attractive solution for SEV to be looking at . (Interview Tejri, 2017)

2.3.3 LEMS

The Power Hub is just one example among many innovative projects that SEV has been involved in. Another and highly relevant innovative cross-cutting project that SEV has played a major role in is the development of LEMS, the Local Energy Management system. It's about wind energy. The wind supplies an unstable input as earlier described and illustrated below, the LEMS battery system stabilizes instability. When the wind increases up, the battery usage decreases and vice versa. This results in a less steep curve. (Interview 2 Tejri 2017 p. 1)

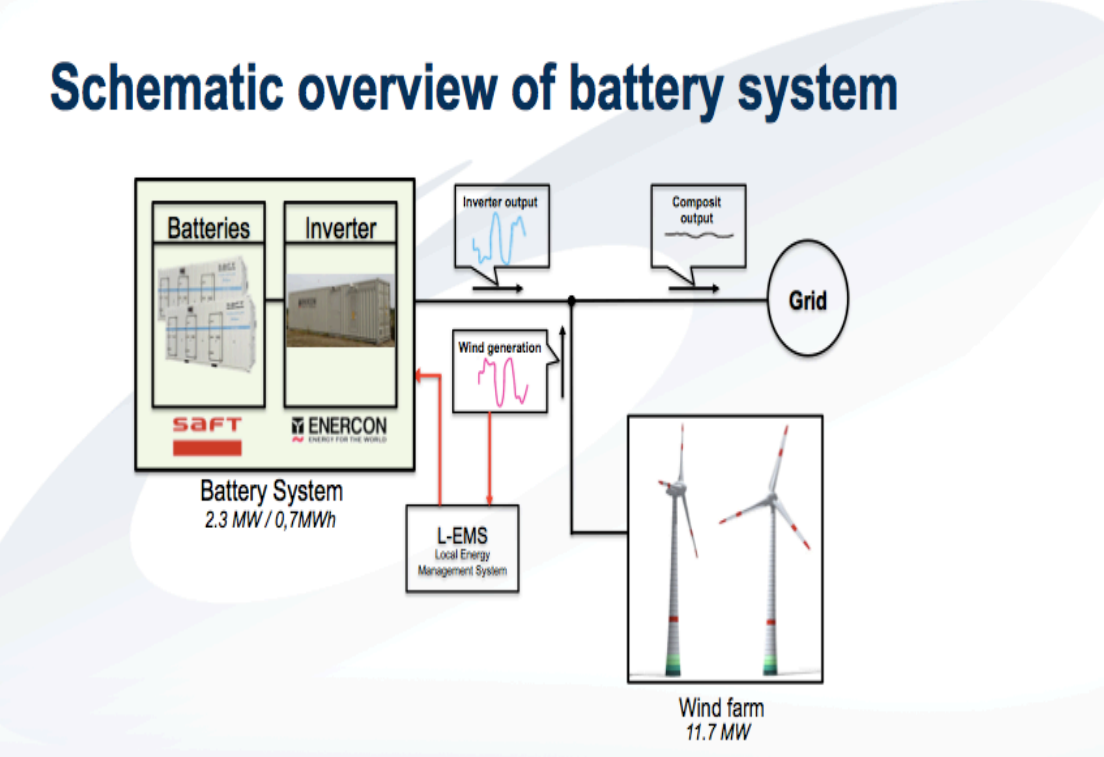


Fig. 17 Overview of the LEMS battery system (SEV 2017)

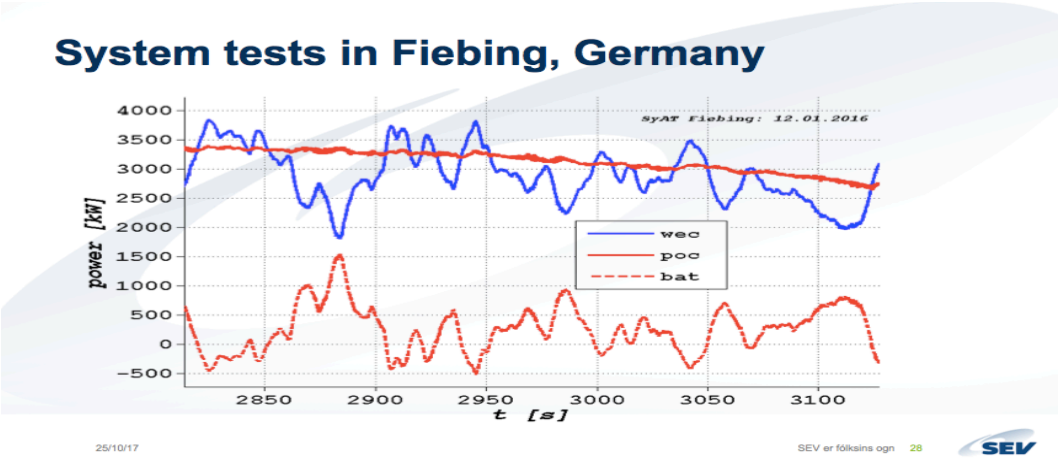


Fig. 18 An example of how LEMS stabilizes wind energy before it goes online (SEV 2017)

LEMS measures the wind output by milliseconds, and via complicated algorithms, the battery works opposite the levels to create stability.

LEMS has been developed in collaboration with Enercon. SEV has made the requirements for Enercon. Part of the development has taken place in Germany with Enercon. As this system had not yet been invented, SEV seized the opportunity to participate in the project. The battery system is a an Enercon prototype, so in order to finalize the product, it was important for to document the process. LEMS is a good example of the concept of intellectual property. I.e. that Enercon retains the rights to a portion of the total product and SEV is provided with a system. I.e. Enercon has been developing the system and SEV has purchased the hardware. (Interview 2 Tejri 2017 p. 2)

Fig. 19 LEMS battery system at Húsahagi Windmill Park in Tórshavn (SEV 2017)

The battery is only connected to this wind farm. If SEV chooses to set up additional wind turbine parks, they would need to implement it with a new battery system. The development of LEMS has taken about 4 years, and for SEV's, it is not only a solution to Húsahagi, but an enabler for expanding many more wind turbines. (Interview 1 Tejri 2017 p. 4)

Chapter 3

Problem Statement and Solution Scope

3:1 Problem Statement

The introduction has shown how emissions of co2 affect our climate and the consequences of the global warming. It has also been highlighted how companies through innovative initiatives explores alternative solutions to climate changes. As far as the Faroe Islands are concerned, they are very far in the process of transitioning into a more green energy production, and today half of their produced energy consists of renewable energy. This is only possible because they have understood how to utilize the resources usable from their location in the Atlantic Ocean with the associated favorable wind and water conditions. Throughout history, the Faroe Islands have been open for transformation with regards to new technological opportunities. Chapter 2 has described how they went from agriculture to high-tech industrial fishing production, and the main focus of the project is SEV's transition from traditional energy operations to greener and more sustainable operations. This transition has piqued my curiosity and as a Techno-Anthropologist, my craftsmanship, and my competencies in the execution of technical analyzes with technological science issues.

This project will examine the meaning of the concept of creativity in relation to the innovation processes that takes place at SEV, both on an individual level and on an organizational level. The Problem Statement is as follows:

How can creativity promote technological innovation processes in the organization SEV, and how can the collaborative approaches support these processes?

Three research questions was asked in order to cover the scope of the Problem Statement:

- Which role do individuals play in innovation processes?
- What significance does the surrounding environment have on the promotion of creativity?
- How can interdisciplinary cooperation open for creativity?

3.2 Solution Strategy

To get an insight into the organizational framework at the Faroese energy company SEV and their innovative processes, two field studies have been conducted in the Faroe Islands. These field studies have had broad intentions. First of all, to get a better understanding of the technologies, the organization utilizes a more holistic view to gain insight of their culture and work routines. The field study is based on the Techno-Anthropology toolbox, where different anthropological methods have been utilized to collect data including observations and participatory observations with the aim to answering the Problem Statement. I have been following the project manager for Grani throughout the course, and his daily work at SEV. I have commenced a short field study at Hiddenfjord, one of the companies having implemented the Power Hub solution, to gain insight of Power Hub and its importance for Hiddenfjord as a company. I was also invited to the opening of SEV's new wind farm in Húsagi. An event with 300 guests from all over the north.

The fieldwork at SEV provided me with the opportunity to get an insight into the organization, the surrounding culture and insight into the different routines of some of the employees. In addition to various observations, different qualitative research interviews have been conducted, wherever considered relevant and meaningful to elaborate on a technology or a phenomenon. Interviews have been conducted at SEV, but also at Hiddenfjord to get an insight into the technology implemented in conjunction with SEV. In addition, two interviews have been conducted with a professor at DTU to gain a more holistic view and a small insight into Faroese environmental technology development.

Part II

Design of the Field Study

Chapter 4

Techno-Anthropology and ethnographic methods

4.1 The Techno-Anthropological fieldwork

The Techno-Anthropologist plays a major role in building bridges between technology producers and the scientific approach and those who work with knowledge, innovation and communication. Building bridges and the development of new technology requires, on one hand, understanding of technological innovation, design, application and implementation, and on the other hand knowledge about needs, attitudes, values, action patterns, cultural codes, etc. in organizations and their surrounding community. (Børsen 2015, p. 36) In order to visualize these actions and chosen concepts, it is necessary to dive into the Techno-Anthropological toolbox. This method section is inspired by Anthropology, but formed by Techno-Anthropology. It will take into account the anthropological methods and the knowledge that can be generated from them and which, as a Techno-Anthropologist, can help opening up the field of study. The methods will reflect the Techno-Anthropological path and the footprints marked in the field. To get an insight of an organization and try to understand and visualize the innovative and creative processes *"one must take a place in the world of investigating".* (Kirsten Hastrup, Ind i verden, 2010 p. 10) One of the primary methods of achieving this is by performing fieldwork, where the Anthropologist places herself in the community that is studied and forms part of everyday life.

In the classical fieldwork, the Anthropologist examines the field for months, today this is different, the Anthropologist works not only in exotic foreign cultures, but as society constantly changes, also with contemporary development. This explosive continuous change enables the anthropological eyes to see phenomena, new trends, etc. in organizations and companies. Hastrup also emphasizes, that it is not the duration or geographical location of the field study that is crucial. The crucial part is the empirical material being in place. (Hastrup et al., 2011 p. 31)

4.2 Access to the field

If you, as a researcher, wishes to gain access to the field, it is important not only to do your research and studies from the sideline, but to actively participate as a researcher in the activities within the organization. (Wadel 1991b). Because I attended many meetings in connection with my fieldwork, it was not easy to participate actively and on equal foot with all people observed. Wadel describes that access to the field, inter alia, achieved by allowing yourself to act as a beginner and through that direction learn to act and become a part of the studied field (Wadel, 1991b, p. 37). This I also learned in my fieldwork where I helped at meetings arranging paper, pins, coffee, fruit etc. This approach made it easier for me getting closer to the employees and to gain access to the desired field areas. Despite willingness and kindness to make me feel comfortable within their organization, I felt uncertain about the field as a whole, including the recognition of my study and the overriding awareness and personal pressure, that the fieldwork would contribute constructively both to the organization, but also to the recognition of own will and desire to promote my field as a Techno-Anthropologist.

These considerations affected the performance of my own role; Literature became my main point of view when the uncertainty for my role was apparent. In the book *Ind i en verden* (2010), Kirsten Hastrup describes the project of an Anthropologists knowledge of the reciprocity and dynamics between the individual merchant and the complex social community. "*This project can be developed in countless concrete ways and unfolded in all corners of the world: but all are the very ordinary life as it is perceived and perceived by people themselves "* (Hastrup, 2010, p. 9). This particular quote became my rescue when I sometimes found myself lost in the contrast between my Techno-Anthropological approach and SEV's approach (Reflections Field Study 2017)

4.3. Ethical considerations on fieldwork execution

The aim of my thesis is to open the concept of creativity and innovation and to explore the frameworks, competencies and organizational structures within SEV. This cannot be done without a fieldwork. And the fieldwork would not be useful without informants. The informants give life to the field being researched. They contain the composition of elements that nurture the Techno-Anthropological work, and they help in getting the Techno-Anthropological workmanship and empirical material to flourish. The informants have formed the foundations of this project. They have participated with great enthusiasm and interest. They have kindly let me into their everyday lives, having forged a mutual trust between them and I, which has given me a great insight into the organization and their creative and innovative processes. This trust was not only between Tejri, the and myself. This trust was spread to other employers, and I was considered a kindred spirit, and fortunate to be looked well after, also outside of the company. This reflected in SEV loaning me a company car during one of the weekends I was there making it possible for me to get around the islands and explore other SEV technologies in the surrounding

community. During my fieldwork, I have empathized to my informants, that for ethical reasons, they would be anonymized in the thesis. However, there was never a reason for concern, as most informants preferred their real names to be mentioned. They all took pride in their organization and encouraged an open dialogue with the outside world regarding the knowledge they produce. It is a familiar problem within the qualitative research, to make the informants understand the importance of the qualitative methods, as well as understanding the perspective of the information being used. (Brinkmann & Tanggaard, 2010 p. 452)

Protection of informants, their physical and social well-being, both qualitatively and subsequently through anonymization, is one of the most important obligations of the Techno-Anthropologist (Hastrup 2011, p. 43) As a researcher, you never know what appears under the interviews, or what direction they may take.

This was a lesson learned during one of my formal and very unconventional interviews in the cockpit of an Atlantic Airways airplane. The pilot was the owner of a few wind mills and very proactive in terms of renewable energy and seeking alternative innovative possibilities for the Faroe Islands. He was the first person to have three big windmills running, and he claims to be the one kick-starting SEV into their transition for a more sustainable energy strategy. He stopped half way through our interview and said very directly: *"This we are talking about now, is between you and me".* Without interfering or violating my powers, this conversation led to further considerations , namely different power relationships that could harm the informants or put them in a vulnerable situation. (Formel Interview Petur Joenson 2014)
It is my duty and responsibility as a researcher to take the ethical measures regarding the safety of my informants into consideration and it has been decisive for my decision. Based on careful consideration, I have

decided not to anonymize all of my informants and respect the individual choices they have made.

4.3.1 Participant observations.

Participant observations differ in the way that the data generated will be experienced with the informants either as participants or as observant. It puts you in the center of the action and lets you collect the date you want. (Hastrup 2011, p. 31) It will always be exposed to different situations when performing participatory observation. *"Practically speaking, the ways will vary from situation to situation, such that in some situations you participate fully in the activities that are taking place and experience them on your own while others are on the sidelines and more closely observe what people do"* (Hastrup, Rubow & Tjørnhøj-Thomsen, 2011, p. 62).
The participatory observation was supplemented by several interviews, both as independent research interviews, but also as follow-up interviews on phenomena and other subjects deemed necessary to further elaborate on as described by Hastrup et al. *"The insights of the participant observation can thereby support qualitative interviews by creating substance for the questions to become more relevant and they can contribute material about relationships that relate to the empirical context, but not mentioned in the interviews precisely because they are taken for granted"* (Hastrup, Rubow & Tjørnhøj-Thomsen, 2011, p. 63)

4.3.2 Interview

As mentioned above, the interviews has been used for collecting data. I have used Semi structured and informal interviewing techniques. The informal interviews have been used to create confidence with the informants, and in addition, they have served as means to gain hands-on insight of the processes within the organization. The semi structured interview has been used to provide insight into the organization as a whole and also helped to clarify the understanding of the innovative processes. Some of the interviews have been more technical than others and therefore recorded on audio files, to prevent the loss of important data. Unfortunately, my interview with Petur from Atlantic Airways was hampered by poor sound quality caused noise from the cockpit and the plane itself. Combining the two methods, participant observation and interviewing may be advantageous as knowledge gained from the field can be supported by one or more subsequent interviews, contributing significant new data on phenomena, or relationships concerning the field studied, but not appearing in the interview, perhaps due to conditions that are considered to be taken for granted or because the informant did not think that it could be of interest in the given context. (Hastrup, Rubow & Tjørnhøj-Thomsen, 2011, p. 63).

Part III

The analytical framework

Chapter 5

Analytical framework

5.1 Creativity in an individual and social context

This chapter will focus on, *A model of creativity and innovation in organizations*, written by Teresa Amabile, considered to contribute to a broader understanding of how social cohesion in organizations has influence on development of creativity. The social focus can be found in Csikszentmihalyi's *The Systems Model of Creativity as well as in* Lene Tanggaard's *Theory of Creativity*. Csikszentmihalyi emphasizes three basic elements, *culture, society and personal background*.

From this, it can be interpreted that he sees the creativity as a social process. (Phillip Mclnyre, The Systems Model Of Creativity: Analyzing The Distribution Of Power In The Studio, 2008, p. 2)

In Lene Tanggaard's theory of creativity, she points out that creativity cannot be created by individuals alone. It is in the social context that the framework for creativity is formed (Tangaard 2008 p. 33). Both Amabile, Csikszentmihalyi and Tangaard both aim their research to find answers to the social contexts significant impact on creativity in organizations.

5.2 The creative individual - A model of individual creativity

Teresa Amabile articulated the component theory of creativity in 1983. The creative process is based on two assumptions. Ranks of today's small creative approaches to creativity that create the great influence either in terms of an invention or great work of art. In addition, Amabile has an underlying assumption of the different degrees of creativity for the individual. (Amabile 2012, p. 1)

5.2.1 Dimensions of creativity

According to Amabile, any organization must prioritize creativity and creative tendencies in organizations. Creativity is the basic element for the creation of innovative processes. She describes how creativity is promoted through the three components, domain-relevant skills, creativity-relevant skills and intrinsic task motivation. (Amabile 1988, p.130 to 131). Based on the schematic model, there are three main components that can promote individual creativity. The most important area of the model is the centered part where creativity has the best possibilities to flourish. The greater the overlap, between expertise and utilization of this expertise through creativity thinking skills and motivation, the greater the creativity and innovation (Amabile 1988, p. 157)

Motivation is the most important of the three components, as Amabile argues that motivation is the catalyst for innovation (Amabile 1988, p. 133)

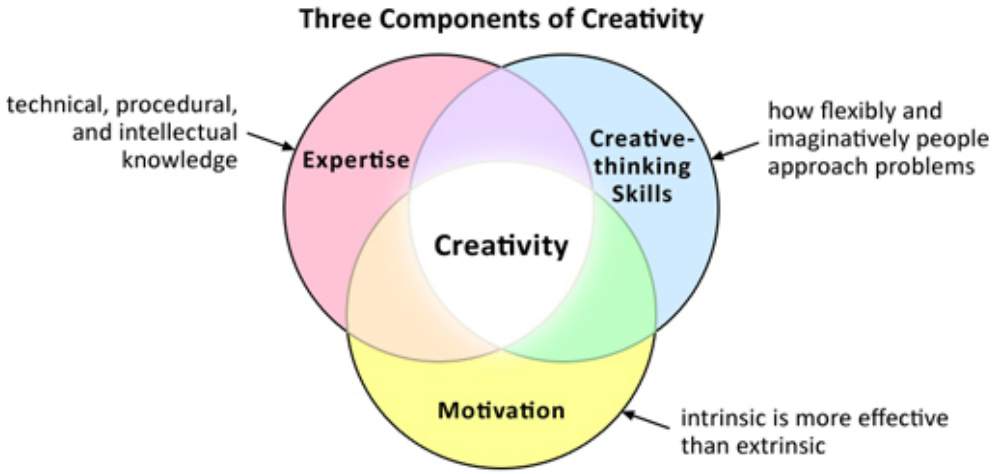


Fig. 20. Three components of Creativity (Amabile 1988, p. 157)

Domain-relevant skills

Domain-relevant skills cover the individual's expertise in a given domain, such *as talent, knowledge, technology* and *professionalism.* This is a basic element for innovations to occur in a particular domain. The individual has a set of different cognitive paths he can choose to solve a given problem or to perform a given task. The set of these paths may be bigger or smaller, even for all of them, they must solve a given problem. The more paths an individual has, the greater their ability to think *out of the box* in the solution of various issues. Newell and Simon describe these sets of different paths as a "network of possible walks (Newell and Simon, 1972: 82) in (Amabile 1988, p. 130)

Creativity-relevant skills

Here is "something extra" to the creative performance. For the individual who has the right reasons to pursue an activity and the domain relevant skills, this performance will be technically good and acceptable. However, it is not enough for Amabile with this high level of skills if you have work

on a creative task. It is with the creative cognitive skills that she calls creativity-relevant skills that this path becomes visible. A path that leads to fierce new ways to think *out of the box* coupled with ways to explore them and find new cognitive paths that can promote an energetic and creative pursuit of one's work. (Amabile 1988, p. 131)

Intrinsic task motivation

The third and last component is intrinsic task motivation and covers the individual's inner motivation. Motivation is the engine. Without motivation it would not be possible to perform creative actions, no skills in domain skills or in creativity skills could compensate for missing or non-existent motivation. (Amabile 1988, p. 132) It is the motivation for the task that determines the extent to which creativity-relevant skills in domain-skills and creativity skills become part of the creative solution. In addition to the individual competencies, motivation is also strongly influenced by the surrounding working environment. (Amabile 1988, p. 133)

Extrinsic motivation

Secondly, there are individual reasons for performing a given task. The feeling of motivation depends on external social and environmental factors. An example of this is when an external subject is set. It can be a reward, a competition or a group prize. This creates an external motivation. It is not part of the task solution, but is being introduced as part of the social environment. In the component theory of creativity, this is a key element in the fact that the actual task motivation is central to individual creativity. (Amabile 1988, p. 134)

5.3 Creativity and the surrounding culture

In addition to Amabiles component model, Csikszentmihalyis, *The systems model of creativity* will be presented in the next section . The model covers some other factors that promote creativity. Csikszentmihalyi focuses on three basic elements, *culture, society and personal background*. He emphasizes that creativity must be interpreted as a social process. (Phillip Mclntyre, 2008 p. 2) Based on the model, the concept of culture is compared to the domain, society is compared by field. These are external factors that will always affect the last element of the personal background that covers the individual.

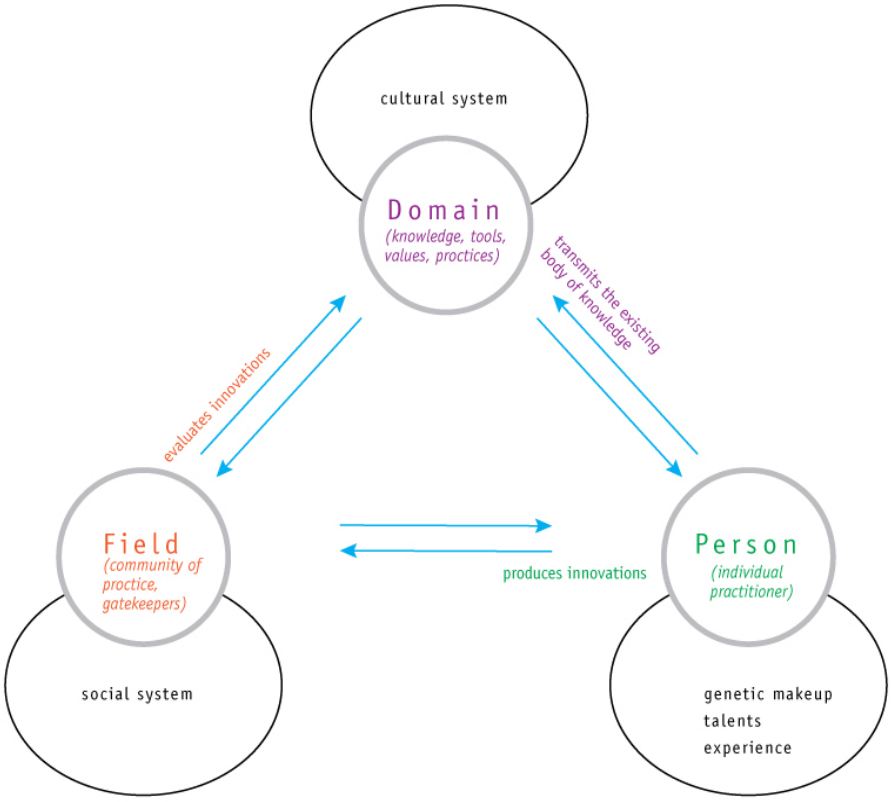


Fig. 21 The systems model of creativity Csikszentmihalyi (Mclntyre 2008 p. 2)

It is the dynamic operation between the three elements that create creativity. The system between a field that contains symbolic rules, a person who brings news to the domain and a domain that recognizes and validates innovation. (Csikszentmihalyi 1997, p. 6) in (McIntyre 2008, p. 2). The model should be seen dialectically - one component is not more important than the other. The three main systems are dynamic and are constantly interfered by each other. However, it should be emphasized that each of the three components is necessary in the creative process, but they are not sufficient in themselves to produce creativity. (Csikszentmihalyi 1988, p. 329) in (McIntyre 2008, p. 2).

To explain the different contexts of the model, Csikszentmihalyi has made use of a metaphor. He describes how a fire can be equated with the understanding of creativity. They have both factors that must be present to achieve either a fire or creativity. Thus, in the case of a fire, there must be some flammable material, oxygen and fire. Without any of the three main components, it would not be possible to make a fire. The same goes for creativity. Csikszentmilahyi points out that you often tend to look at the fire as a cause of fire. This he sees as being problematic. As in the same way scientifically, often the concentration is on individual persons when researching creativity (Csikszentmihalyi) without consideration for the social and cultural aspects of the creative process. If you want a real understanding of creativity, it is necessary to investigate the complexity and dynamics between the three components. (Csikszentmihalyi 2004b, p. 6) in (McIntyre, 2008 p. 3).

The domain in the model covers the symbol system that the individual uses within their work area. The symbol system consists of the conventions, the divisions of knowledge, the system of symbolic codes and techniques that the individual has to embrace in order to create creativity. (McIntyre 2008, p. 3).

The person brings personal life experiences, their interest and unique features into the system. It manifests itself in their talent and they are therefore more receptive to acquiring and using specific domains within its field (McIntyre 2008, p. 4)

The field represents the social organization. The organization consists of a hierarchy of different persons and groups, which will all, affect the knowledge system. In addition to sharing of knowledge, the organization also contributes to the creative process by determining the direction of the organization. Do they want to go incrementally or will they choose a radical direction (Csikszentmihalyi 1997, p. 44) The organization will often either have a conservative approach or a more open and experimental approach. (McIntyre 2008, p. 5).

Both Csikszentmihalyi and Amabile have in their choice of concepts of personal background and domain-relevant skills, emphasized that the development of creativity for some comes more naturally than for others.

Furthermore, Amabile focuses on the emergence of creativity in everyday actions and what impacts the social contexts on creativity.

In the book *Creativity in Context*, Amabile describes how she, in her research, has come to a fourth element that relates to creativity. (Amabile 2012 p. 2) In addition to the three individual components, domain-relevant skills, creativity-relevant skills and task motivation that have been described, she adds *the social element*. Now Amabile believes that creativity can only flourish if all four components melt together. (Amabile 2012, p. 2) *"Creativity should be highest when an intrinsically motivated person with high-level expertise and high skill in creative thinking works in an environment high in support for creativity"* (Amabile 2012, p. 2)

This is supported by Csikszentmihalyi *"(...) we have to abandon the Ptolemaic perception of creativity, where the person is at the centre of everything for a more Copernican model, where the person is part of a system of mutual influences and information"* (Csikszentmihalyi 1997, p. 58) in (McIntyre 2008, p. 3) According to both Amabile and Csikszentmihalyi, the social environment plays a role in relation to creativity and from the review of their theories, it is assumed that the social context has a major impact on the creativity processes in the organizations.

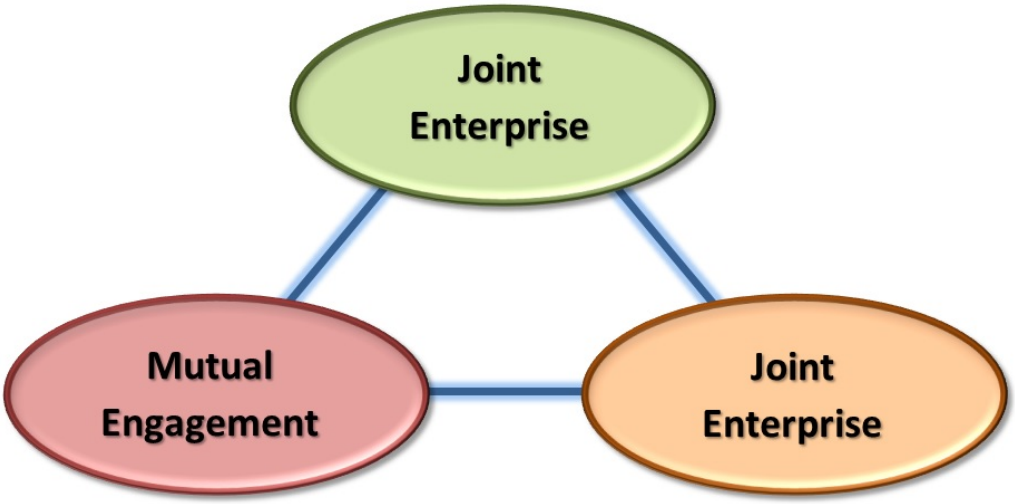
5.4 Community of Practice

Lene Tanggaard also sees creativity as an act of social interaction across companies and educational institutions (Tanggaard 2008, p. 35). The social learning theorists Etienne Wenger and his communities of practice has inspired Tanggaard. The situational perspective presents is based on both an inspiration from Wenger's community of practice and Csikszentmihalyi's concept of apprenticeship. (Tanggaard 2008, p. 46) The concept of apprenticeship describes how *knowledge, experience* and *know-how* are transferred from generation to generation (Tanggaard 2008, p. 46). Tanggaard's research is based on how new ideas arise and in which context they occur? According to Tanggaard, it is a prerequisite that we learn from a master and that revolutionizing a field can only happen at the moment you know the field really well. (Tanggaard 2008, p. 47) Tanggaard's idea that one can first revolutionize a field, the moment you know the field really well, complements Csikszentmihalyi's thoughts about the symbol system of culture.

”But, of course, the information that will go into the idea existed long before the creative person arrived on the scene. It had been stored in the symbol system of the culture, in the customary practices, the language, and the specific notation of the domain. A person who has no access to

this information will not be able to make a creative contribution, no matter how able or skilled this person otherwise is. One needs to know music to write a creative symphony" (Csikszentmihalyi 1997, p. 51)

Tanggaard's community of practice is based on Wenger's social theory of learning.



Model inspired by Learning in Community of Practice (Wenger 1998 p. 73)

Community of practice by Wenger is described as:
"We all have a sense of belonging to practise environments. At home, at work, at school, in the context of our hobbies - we belong to a given time to many different communities of practice. The practice environments, we belong to, changes in the course of our life (...)" (Wenger 2004, s. 16) Communities are described by Wenger as learning stories. The learning story creates a boundary compared to other practice communities. This limit should not be seen as isolated from the outside world, as the community will always find a way to maintain it's important connections. (Wenger 2004, p. 16) Wenger expresses the need for different practice communities to operate both individually and across people. This

resonates Tanggaard's concept of crossing borders. By crossing borders, she believes that the community of practice has to move across workplaces and education programs. (Tanggaard 2008, p. 35). In order to create creativity in practice, the knowledge that is within a field plus these crossing borders must be present, Tanggaard points out. In this development it is also necessary to acknowledge that one cannot be competent and creative in all practice areas, and Tanggaard also points out the importance of daring to cross boundaries and asking unexpected questions in the new practice communities. (Tanggaard 2008, p. 74). According to Tanggaard, you are most creative if absorbed by a particular practice and participates in different practice communities or is in conjunction with different teaching practitioners. (Tanggaard 2008, p. 47)

Part VI

Analysis I, II, III and VI

Chapter 6

Analysis

6.1 Analysis Part I - The organizational structure of SEV

The first part of the analysis will is based on SEV being viewed from an organizational perspective. The section will discuss the organization's structure and analyze how these structures affect the creativity of SEV. The analysis is based on the German sociologist Max Weber and his classical bureaucratic organization, where the biggest and heaviest decisions are taken at top level and moves down through the organization via chain of command (Weber 1994). SEV's hierarchical formal structure, presented in section 2.3, leans on the bureaucratic model of Weber.

Despite the fact that the organization, in theory, has a very bureaucratic structure, they actually operate from a structure being both very conservative and more open as well, depending on the circumstances. .

"Our organizational structure isn't actually flat, but hieratically divided into departments and sub departments, although it does allow us to communicate across levels, making it all look more flat on a daily basis" (Interview 1, Tejri 2017, p 8).

Prior to SEV's change of Command in 2008, the organization was governed top down via chain of command, making the organization less creative.

"Yes, the structure is different and (...) the former director was micro managing, leaving little motivation and a constant feeling of being monitored (...)" (Interview 1 Tejri 2017, p. 7)
Prior to 2008, there was no room for long-term and innovative thinking; there was not much room for *"creative long-term thinking"*.
(Interview 1 Tejri 2017, p. 7)

Innovation was not a priority and the main purpose of the operations in SEV was merely to have the organization running, delivering power to the sockets, a rather reactive and not very proactive way of operating, with limited considerations for future challenges. . (Interview 1 Tejri 2017 p. 7)
Too many hierarchical layers can hamper the decision-making and, as Tejri describes, it's difficult within the fixed routines and procedures to find peace and resources to handle new ideas and input.

Henry Mintzberg, a Canadian professor in leadership and organization, has categorized five different bureaucratic organizational forms that appeal to all bureaucratic organizations. Mintzberg also describes the heteronomy of Weber's well known organizational form, as being a structure of slow innovation (Mintzberg 1983). This is one of the disadvantages Tejri points out with the old director, the structure being too conservative. It did not give employees the opportunity to come up with new ideas and solutions within the organization. The quote below is an example of how the bureaucratic structure can decrease innovation.
"(...) Working on the Grani project, I was supervised by the head of department who was also responsible for the operations, a strategy that I opposed (...) when I asked for his opinion on the 2020 tide, he had little time for the subject, because his focus was on narrowed down to having a station operational within a week (...)" (Interview 1 Tejri 2017 p. 8)

The bureaucratic organizational structure in this case, is an obstruction that prevents the company staff from thinking out of the box, Weber's words on bureaucracy:
"It constitutes an iron cage that in a number of contexts inhibits the organization's unfolding potential and alienates the individuals who are the human resources of the organization" (Andersen and Kaspersen, 2009 p.)

Today, new realities prevail at SEV. The organizational structure is the same, but directive personnel are now more open to innovative suggestions from all employees. This resonates to one of Mintzberg's five different bureaucratic organizational forms, the adhocracy.
"SEV has evolved from an operating organization into being an innovative project organization (...) it takes time and visionary thinking to create sensible solutions for the Faroe Islands" (Interview 1 Tejri 2017, p. 7)

Today, SEV has a R&D department, directly underneath the director. This department is on par with the operations department, but they are organizationally separated. The idea of the development department is to have an open dialogue within the organization. There are numerous skilled employees within the organization and the development department is the right place to vent their ideas.

Mintzberg sees such divisions as rewarding to innovation as they allowing collaborating smaller project groups to share knowledge and learning within specific areas of specific innovation projects. (Mintzberg 1980, p. 329)

" (…) The support staff gains in the most influence in the organization, not when it is autonomous, but when its collaboration is called for, in decision making, owing to its expertise" (Mintzberg 1980, p. 329)

This is also evident for the organization SEV.

"It is time for us to focus on the tides. (...) We have discussed it for years, but we ought to take a more active approach. We should launch a project to investigate the potential for the Faroe Islands - what technologies that should be utilized and the estimated costs?" (Interview 3 Tejri 2017, p. 3)

Summary

It has been possible for SEV to maintain the bureaucratic structure of their organization, where decisions are still taken and utilized from top down. However, new leadership, have enabled them to form a framework freeing them from the bureaucratic iron grip. They have achieved these changes through dialogue and by establishing a development department that allows the organization to innovate and come up with new ideas without initially having to surpass it to the top. . This makes it possible to experiment and play with new ideas and technologies, and furthermore enables small project groups to immerse them in internally, but also externally. Changing the procedures has brought a lot of new knowledge to the organization.

Teresa Amabile describes how the individual creativity and power is needed to create innovations within organizations. This is also apparent in small breaches in the analysis of the organizational structure of SEV. The next analyses part II will focus on a description of the individual creativity?

6.2 Analysis Part II – Individual creativity at SEV

In Part Two, Teresa Amabiles Comprehensive Theory of Creativity will be utilized to describe the various factors affecting creativity in the SEV organization. Assuming Amabile's model three components of creativity does this. The analysis focuses on the individuals level, but also draws parallels to a more organizational level. The analysis will be based on Tejri Nielsen, Head of R & D and the surrounding culture in SEV.

Domain-relevant skills

Tejri has worked in this field for many years and it is his great passion. He has been the project manager on the Grani project and in the development of Power hub. He recently took an MBA in Germany, continuously contributing to developing LEMS. In addition, he has described the framework and purpose of the new innovation department. The technical part is interesting and the fact that you can help develop new solutions and strengthen the organization is what drives him. In the light of the new innovation department, he describes himself

"For an innovative technique, that's a great opportunity" Tejri has many highlighted projects of different character in his portfolio. Amabile describes that the more paths the individual has, the greater their ability to think out of the box relative to innovative solutions.

Another example is the development of LEMS, Developed by SEV in collaboration with Enercon. LEMS was not an available technology on the marked, and according to Tejri, the idea was conceived:

"Because of my experience, I know that anything is possible (...) if you can dream it - you can do it"

And he adds*: "I didn´t doubt for one second that this was something we could take all the way"* (Interview 3 Tejri, 2017 p. 2)

The cooperation with Dong have been a door opener, and clearly helped us to a larger network with access to new and exciting collaborations. (Interview 3 Tejri 2017 p. 3) In addition, the project has given SEV greater knowledge, and self-awareness, as well as broadening their horizon.

"They were really enjoyable, all the meetings I attended in Copenhagen, and elsewhere (...) There were many sophisticated names and terminologies attached to the subjects we discussed, like Smart Grid, an unfamiliar name – but to us, a familiar and natural resource.
(Interview 2 Tejri 2017, p. 3)

My work is so exciting - one week we are working on how to develop better storage for our energy the next week, I may be travelling the world looking at solar systems or tidal solutions. (Formal Conversation Tejri 2017)

Newell and Simon describe these sets of different paths as a *"network of possible walks"* (Newell and Simon, 1972: 82) in (Amabile 1988, p. 130)

This demonstrates Tejri´s vast expertise in the field and that knowledge, expertise and, not least, enthusiasm for technology is an important element in the development of innovative technological solutions at SEV.

Creativity-relevant skills

Teri has, from his own point of view, been much focused towards a greener approach, partly because he feels the time is right, but also because technology has improved, and now being funny and interesting.

"We need to become green, ant to take the necessary actions to make it happen, an opinion I have often aired in-house"
(Interview 3 Tejri, 2017 p. 1)

As Head of R & D, he is not afraid to explore new and alternative solutions to strive for the innovative profile they are seeking.
"It´s our plan to research the tide, although we have encountered some resistance within this area" (Interview 3 Tejri 2017, p. 3)

This means Tejri contributes with creative thinking and that he as an individual firmly believes in his visions. As already mentioned, *"If you can dream it, you can do it"* (Interview 3 Tejri 2017, p. 2). He paves the way for new and unconventional ideas, explore them to find new exciting paths to promote the curiosity and energy that, according to Amabile is so important for the performance of creative processes. Not all of these paths are followed through though, as they require the director's approval. .
"If I can convince my superiors, which I often try to by visualizing, and if the costs and benefits look prosperous, I´m usually being allowed to continue (...)" (Interview 3 Tejri 2017, p.3)

Despite his open approach, Tejri does not necessarily see himself as being particularly creative*. "I do not see myself as very creative, but I believe that I'm innovative"* (Interview 3 Tejri 2017, p.1)

But later in our interview he returns to the concept of creativity and adds:

"Being an engineer, it's often a task in finding new and unexplored methods to create solutions in order to reach the defined goals
You may have to be a bit creative to find ways that do not exist (...)"
(Interview 3 Tejri 2017, p. 2)

There is no doubt that SEV needs creative individuals if they are to realize their vision of becoming 100 per cent green by 2030.

"(...) Once you have set the bar as high as we have, we need to be creative, and we have to innovate" (Interview 3 Tejri 2017, p. 2)

Amabile describes, that only by the right creative and cognitive skills can the innovative pathways be made visible. From the section above it can be concluded that Tejri, through his visual techniques of his visions has come a long way in terms of his innovative thinking. The concept of creativity was something he had to think about and not something he immediately connected with his skills as an engineer. However, after some time, he was able to link the term to several events, as seen in the previous two quotes.

Intrinsic task motivation

The motivation for Tejri is clearly the excitement of trying to reach the goal of SEV becoming 100 per cent green by 2030.
"I think it's very motivating to have such a vision that by 2030 to be completely green (...) and being as motivated as we are, leads us to be further innovative" (Interview 3 Tejri 2017, p. 2)
"(...) We are very ambitious, and therefore we need to be equally innovative in our way of thinking" (Interview 3 Tejri 2017, p. 1)

The high level of ambition describes the inherent motivation you will encounter when meeting Tejri. He is quickly caught up by the questions asked and you clearly feel a strong enthusiasm towards his ideas and visions.
"I did an MBA in Germany and was very excited about the possibilities, so because of my interest, I felt this was a path we needed to follow"
(Interview 2 Tejri, 2017, p. 9)

Motivation is crucial for Tejri's innovative mind-set, and he describes, why multiple operational roles do not work for him.
"Having two hats is simply not working for me, as I tent to prioritise the one I find most interesting" (Interview 1 Tejri 2017, p. 9)

Amabile sets 9 categories in relation to how the organization can influence positively on the inner motivation. The nine categories can be seen in Appendix X. The highest score in her study was Freedom (Amabile 1988, p. 147)

Freedom allows the individual to immerse himself, to pursue a thought or an idea and freedom is something that affects the inner motivation.
"You need room and manoeuvrability to plan ahead and to see these long-term perspectives" (Interview 3 Tejri 2017, p. 3)

SEV is a non-profit organization, but still need some resources to pursue new innovative initiatives with relation to their target in 2030.
"The far cheaper renewable energy - compared to the price of oil, allows us financially to explore and experiment some (...)"
(Interview 3 Tejri 2017, p. 2)

Summary

The fact that your hands are untied during the initial process, and you have the freedom to think long-term and broadminded, is according to Tejri, the catalyst for innovation. (Interview 3 Tejri 2017, p. 3) With the new innovation department, this freedom is unfolded, and it increases motivation, according to Amabile. The department will serve as playground for new innovative initiatives and anyone can pitch in with new ideas. .

Where Amabile´s *Thee Components of Creativity* above was used to investigate the role of social context in relation with the development of

the individual creativity, as seen in the analyses of Tejri, the next analysis part III, will be based on Csikszentmihalyi´s *The systems model of creativity* to illustrate how creativity should be seen as a social process.

6.3 Analysis Part III – Creativity and the cultural aspects at SEV

Csikszentmihalyi finds it problematic when science focuses on individual persons in the research of creativity, without equally thinking the social and cultural aspects into the creative process including the individual aspects. If you truly want to understand creativity, it is necessary to investigate the complexity and dynamics between the three aspects of, *person, domain and field*. Combined they form the social process that Csikszentmihalyi considers crucial for the achievement of creativity as described in chapter 5, section 5.2.

Personal background

Personal background covers the individual. And as an individual, one is influenced by the external factors. This is also seen in the analysis of Tejri. His way of thinking with relation to creating new collaborators has been influenced through cooperation with Dong Energy.

"The collaboration has created many new and exciting visions for future production of electricity. The use of Heat pumps and tides are not war away, if we can control it through intelligent software systems, such as Power Hub" (Interview 5 Tejri 2017, p. 1)

In addition, SEV is working collaboratively in finding additional technologies to achieve their goal in 2030. An example of this is the cooperation with Danish energy. External factors like these affects Tejri as

a person. It nourishes to his innovative way of thinking and his visions for the future.
The more willing an organization is in their cooperation with other organizations, the greater the potential is to be *thinking out of the box* and enhance on creativity.

To this statement Csikszentmihalyi expresses
"The more exposed the culture is to information and knowledge from other cultures, the more likely it is that innovation will arise" (Sternberg 1999 p. 318)

Another external SEV factor is the political pressure to reach their ambitions of a greener approach.

"(...) I think it was in 98, we experienced the political pressure via external private initiators" (Interview 1 Tejri 2017, p. 1).

The culture of the organization prior to the new director was very conservative, as described, and it had a negative impact on the innovative processes, resulting in political approval in 2002, to allow some private initiators to install three wind turbines in the Vest manna.

"The pressure was massive, and I think it was (...) the Minister for Oil and Energy, that gave in and more or less demanded from us, that we as an organization should allow private investors to install three wind turbines in Vest manna" (Interview 1 Tejri 2017, p. 1)

Old values and leadership influenced on the direction of the organization and even after the political approval, followed by installation of the Vest Manna wind turbines, the organization was still very sceptical.

"(...) SEV nevertheless, chose (...) to move forward and our three wind turbines was installed in Nasha in 2006. Subsequently the measurements

were less impressive, and we were not overly optimistic regarding this technology at the time" (Interview 1 Tejri 2017, p. 2)

Both the cultural structure and the surrounding community have influenced on the individual's ability to work in relation to the innovative processes within the organization. The transition from traditional operations to the greener approach has resulted in incremental innovations not having moved the organization towards their present direction. But without the political and initiator pressure, the organization might not have welcomed the new technological opportunities. Csikszentmihayi refers to these external factors when he describes the social and cultural aspects being as important as the individual aspects.

Domain

The domain covers the culture of the organization. Through my field study, it became evident that an organization such as SEV has a symbolic language containing many codes and techniques, not making sense to the outsider. Csikszentmihalyi refers to this as the symbol system. Examples of these symbols could be concepts such as output, enabler, blackout, voltage sequence, etc. To create creativity within the field is a necessity that Tejri embraces these symbol systems within the conventions, is a way of communicating and sharing knowledge and techniques. Their isolated location can have the cocooning effect of excluding the outside world, and not utilizing global terminologies, thereby making it even harder to understand their symbol system. As already mentioned in Chapter 6, section 6.2, Tejri describes an example of this symbol system.

"Copenhagen was really fully (...) there were many sophisticated names and terminologies attached to the subjects we discussed, like Smart Grid, an unfamiliar name – but to us, a familiar and natural resource.
(Interview 2 Tejri 2017, p. 3)

The field

The field represents the social organization. As described in Section 2.3, SEV has a bureaucratic hierarchical structure. They previously had a conservative approach with a closed organization.
"They have been very closed to say it as it is. That's what I've said before and I can say that again" (Interview 6 Roí 2014, p. 2)

Much has been achieved during the new director, and the organization is now more open. *"(...) What can I say? It has become more fun, the organization is more open to all of it"* (Interview Roí 2014, p. 3)

The organization faces many challenges pursuing to achieve their vision in 2030. The restructuring focuses on open dialogue and cutting borders in cooperation with other companies.

"We encourage people to be innovative and come up with new solutions (...)" (Interview Tejri 2017, p. 5) they still utilize the old framework structure in SEV, though.

"(...) I do not agree to this new structure, where everything is being liberalized, and dividing SEV into three companies allowing private individuals to profit from the natural energy resources. No, we should continue with our present form and share the outcome with our customers" (Interview 1 Tejri 2017, p. 6)

SEV is pending between the traditional bureaucratic approach and a more open approach, depending on the circumstances. Sharing of knowledge is important and goes across the organization, which contributes to the creative processes of SEV. Csikszentmihalyi describes how the creative process can also influence the direction of the organization. Should the organization make small incremental changes or proceed in a radical direction. (Csikszentmihalyi 1997, p. 44) As evidenced by the analysis,

SEV has previously taken a more conservative and incremental approach that does not adhere to innovative processes. External pressure i.e. political, along with a new director, has opened the organization, and they are now relying on cooperation both internally and externally. The R&D department is purpose build for these innovative processes.

Summary

In the Csikszentmihalyi model, the social environment plays a role in relation to creativity, and based on the above analysis of SEV, it is assumed that the social context has a major impact on the creativity processes within the organization. During the radical transformation of their organization, SEV has been very open to external collaboration and they are not diminishing the fact that these crosscutting projects have helped bringing the organization to their current position.

6.4 Analysis Part VI – SEV a Community of Practice

For Csikszentmihalyi, social aspects play a major role in terms of creativity. Inspired by this, Lene Tanggaard also sees creativity as a social practice and she dives into the community of practice found in Csikszentmihalyi's concept Field, and in Wenger's social theory of learning, she further explores this field in order to better understand the meaning of community of practices for the creativity in organizations. The theory will be used in the analysis to illustrate what is seen through the social glasses, could be added to the organization in their aim to become 100 per cent green.

Apprenticeship

Tanggaard's idea of not being able to revolutionize a field, until the moment you know the field really well, is closely linked to Csikszentmihalyi's thoughts on the symbol system of culture. This learning, or apprenticeship as Tanggaard describes it, is seen at SEV, and illustrates how much they have learned in cooperation with DONG.

"The cooperation with DONG will provide us wisdom in capturing the bigger picture, especially from a SEV and Faroese point of view, and yes, I'm sure that GRANI has helped to expand our horizons"
(Interview 2 Tejri 2017, p. 3)

SEV has built the whole project based on the vision that cooperation with Dong would bring new knowledge to the organization. This narrative describes how the project was named

"(...) The cooperation agreement was signed during the summer of 2009, and it needed a name (...), I contacted another Faroese, more knowledgeable in the Nordic mythology and he suggested GRANI. The

horse GRANI, is a very good symbol of this cooperation and the story behind is (...) an old Faroe Islands saga telling... that Tuljó, a young man, is tasked to kill a dragon guarding a big treasure, he is given this horse called GRANI and together they fight and defeat dragon, to find out that the treasure was in fact wisdom (...)" (Tejri Interview 2 p. 3)

SEV acknowledges their limitations and see crosscutting collaborations as an opportunity to expand their knowledge, develop and implement new technologies to reach their vision. The collaborative approach is an innovative approach, but the innovations so far has emanated from monoculture cooperation that, according to Tanggaard, can limit the scope and breadth of the innovations. She describes it from the concept of crossing border. To understanding the term, the organisation must move across the workplaces and the education programs.

This is a necessity for creating more holistic innovations as crossing borders enables collaboration across the scientific directions. It is estimated, based on the theory, that SEV as an organization can go even further in relation to future collaborations and also think more interdisciplinary.

This way, issues will be highlighted from multiple angles. They may still have "black boxes", based on their scientific direction. A field that is very evident from the theory of Tanggaard, and from a Techno-Anthropological point of view, is the issue of getting the population in the Faroe Islands to share the their goal. If they are to achieve the goals attached to their vision, it will require not only new innovative technologies, but user perspective will also be important, which indirectly is seen from SEV's model presented in Chapter 2, section 2.3, implying that users, for example, implement domestic heat pumps and invest in electric cars.

Summary

Tanggaard points that knowledge within a field plus crossing borders is necessary for creativity. In order to achieve the goals set by SEV, it is important to dare take this step. It is a necessity to acknowledge that one cannot be competent and creative in all community of practices, including all scientific approaches. When SEV focuses on collaborative cooperation's, it is important that they do not only focus on the monoculture approach. They have to move beyond their own practice curriculum and become more interdisciplinary in their approach to gain more knowledge, wider horizons and thereby more creativity.

Chapter 7

Conceptual framework

7.1 Towards a conceptual framework for creativity

In the last three analyses, it has been highlighted how individual creativity influences innovations and how the organizational and social frameworks affects the various innovations organizations can do. Is it the incremental or the radical innovations that are prioritized in the organizations? It has also been highlighted that one cannot look at creativity only on individual plan, but that creativity arises as result of several aspects and actions.

In Chapter 5, sections 5.1 and 5.2, Amabile´s *Three components of creativity* and Csikszentmihalyi´s *The systems model of creativity* were presented and in the analysis the theories and similarities of the theories were described, inspiring me to develop a conceptual framework for how the theories combined will support Tanggaard's theory of community of practice, presented in section 5.3

In this section, a conceptual framework will be presented. The conceptual framework is based on the three theories presented in chapter 5 and analysed in chapter 6. Amabile and Csikszentmihalyi theories have some coinciding points and their concepts floats inward. Amabiles expertise Domain is very close to Csikszentmihalyi Knowledge Domain. Like Amabile´s Creative thinking reside in Csikszentmihalyi's Person/ Experience and Amabile´s Motivation, and Csikszentmihalyi´s Field complements each other. Melting them together will create three new circles, and a new centre, a community of practice that Tanggaard

presented in analysis Part VI. In the next section, I want to elaborate on these similarities and what underlies the conceptual model.

I will do this by diving into the three circles: Field Motivation, Knowledge Experience, Creativity Person, individually, and display their origin, as well as how they each contribute to the model.

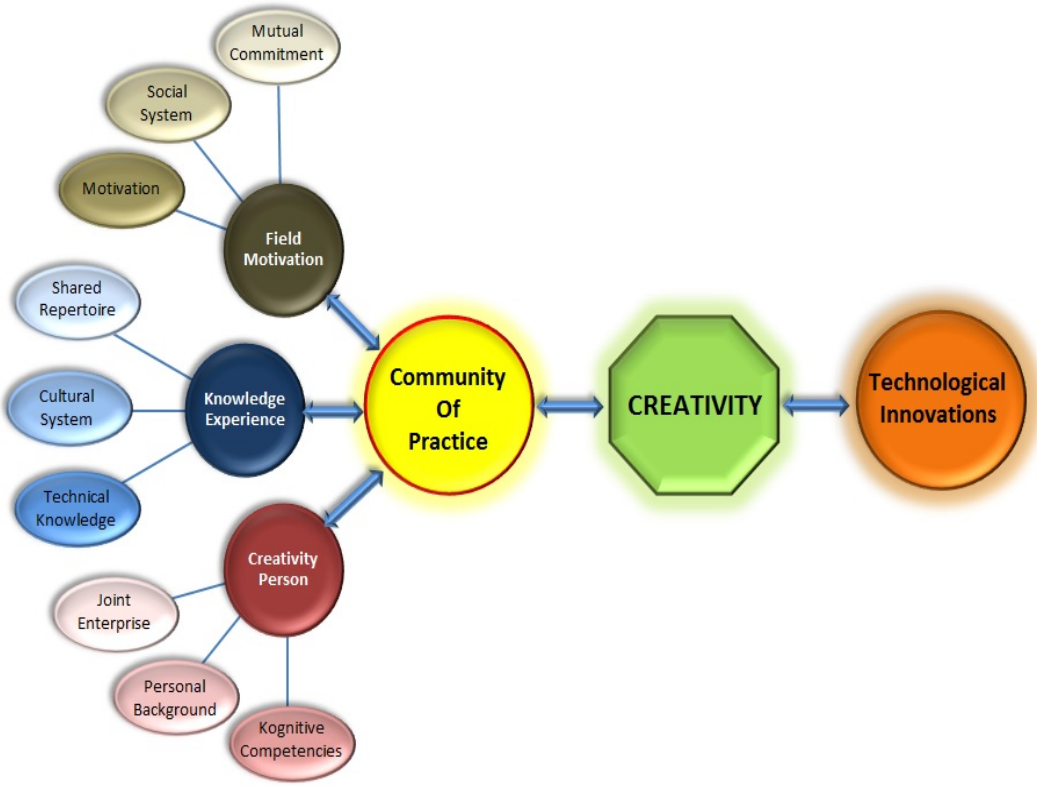


Fig. 23 A conceptual model (Larsen (2017), inspired by Amabile (1988), Csikszentmihalyi (1997) and Tanggaard (2008))

Field Motivation

To become part of the community of practice, mutual engagement is important. (Wenger 1998, p. 73-77) The essence of mutual engagement is to maintain close cooperation commitment to you and to the community. The mutual commitment should not be seen as homogeneous, but as

diverse, where conflicts and disagreements are equally part of the commitment. Csikszentmihalyi and his social system supplement this, as the social system consists of several different persons and groupings that all have the ability to influence on the knowledge system. (Csikszentmihalyi) Amabile also has the social aspect of her motivation element. She describes how motivation is the engine for the execution of creativity, but also that this motivation is characterized by the surrounding environment. There is a merge between Wenger, Csikszentmihalyi and Amabiles in the three smaller circles, in the model referred to as Field *Motivation*.

Knowledge Expertise

Common repertoire is based on negotiations from past experiences of the people that bring them into the practice community. The common repertoire consists of *"routines, words, tools, stories, symbols, genres, and actions"* (Wenger 1998, p. 83). This is supplemented by Csikszentmihalyi, describing his cultural system as being a symbolic system consisting of *knowledge, tools, values and practices* used by the individual within the given field of work. Amabile's expertise is leaning against both Wenger and Csikszentmihalyi, covering the individual's expertise within a given domain, such as *talent, knowledge, technology and professionalism*. She describes it as the individual having a set of different cognitive paths to choose from. Based on the above, the three smaller circles are merged into *Knowledge Expertise.*

Creativity Person

The joint venture can be described as creating the praxis community and helping to give the community a context. The joint venture is defined by the people in the practice community and is a result of all the negotiation processes, and creates a common dependency of relationship between

the participants (Wenger 1998, p. 78). This approach draws strings to Csikszentmihalyi´s Personal background describing how people bring their life experiences into in the community, and that the interests and unique skills they individually have, affect the acquiring and use of specific domains within their field to create a common context. In Amabiles's creativity skills, she differs slightly from Wenger and Csikszentmihalyi in this fusion, as she, opposed to the others, not relate to the community in the same way in her description of Creativity skills. She focuses more on the individual and the importance of having the right cognitive skills to perform creative actions. However, it is considered that there should be a common context for individual individuals to think in cognitive new paths and of the box, all strong arguments for melting the three small circles together *Creativity Person.*

A Community of Practice

The three circles form a community of practice where dedicated experts share problems and passions within a particular area, including the development of sustainable and renewable energies for the focus of the project. This Community of Practice shuts down by itself and creates a boundary to the other practice communities. It arouses reverberation in SEV's newly created R&D department, to be able to shut down from other work tasks and focus only on the development of future technologies. Wenger describes the importance of communities working alone and across communities, as shown in SEVs cooperation with Dong Energy and Enercon.

When the community of practice shares a particular problem and passion, it also affects the creativity being created within the given paradigm it will be limited by focus of experts working, and hampers the solutions created to deal with the problems. This means that creativity within the working groups is being frozen; this is reflected in the fact that the solution SEV is working on is based on accountability and sustainability. It further

influences on the technological innovations that will be characterized by the creativity created in the practice community, composed of the three circles, Field Motivation, Knowledge Experience and Creativity Person.

The model is not static, and the movement describes how Techno-Anthropology is driven by thinking in interaction, social responsibility, anthropology-driven design and actors, including users, stakeholders, experts, etc. (Børsen 2013 p. 50) The model is also Techno-Anthropological in the sense that, as a Techno-Anthropologist, you work interdisciplinary in relation to the problem studied, as described in Chapter 4 Section 4.1. As can be seen, the arrows are two-way arrows. That is to point out the circles affecting each other, for example, the communities of practice, which in turn is influenced by the three, affects the creative processes fused circles, influenced by the circles that existed earlier.
In spite of the Techno-Anthropological movement, the model has been linearly designed, consciously in order to accommodate the worldview that characterizes the people, including the organization I have worked with which I want to communicate with.

A community of practice with an interdisciplinary approach

What I would like to focus on with this model are the three parts of the circle; *Knowledge Expertise, Field Motivation and Creativity Person* together form a community of practice and it is in this field, my research has shown the creative processes has been and in the future will be created at SEV.
Based on the empirical and processing of the project, it appears that the organization has the sufficient skills to which the surrounding environment supports creativity and furthermore provides the employees with an open and free environment to experiment within. They have the knowledge and

expertise, and on the creative individual level Tejri, who is not afraid to step outside the box and explore new paths. The project also reveals how SEV acquires new knowledge to their organization when cooperating with other organizations, as described with Grani and LEMS in section 2.3

The model is created to highlight a community of practice utilizing the various theoretical models and the Techno-Anthropological approach, to help SEV benefit from in their new R&D department, and not only focussing on the monoculture approach. . For SEV to realize their vision, it requires not only technological solutions but also changes of a more social character. Based on the material above, there is link between human and technology. An interdisciplinary cooperation would contribute in building the needed bridge between the technology and the human link. Community of practice or crossing borders, as Tanggaard describes it, could be scientific directions with focus on user involvement and analysis. This would help to answer questions that do not arise in the communities created and in the context in which the organization is located today. Through interdisciplinary cooperation, SEV could be able to understand how people and energy interact. With this approach the context moves from merely relocating of technology to an approach, where technology is also thought into the human context. The interdisciplinary cooperation could focus on how to change the population's consumption patterns in the Faroe Islands, which could help spread the knowledge of how new technological investments could benefit the consumers. For example by going from diesel cars to electric driven cars or by switching from oil to heat pumps. These are just examples of questions an interdisciplinary collaboration could seek to explore knowledge based on the Techno-Anthropological approach, could have major impact on SEV's transition and their vision to becoming 100 per cent green by 2030.

Part VI

Reflection and conclusion

Chapter 8

Reflections

8.1 Reflections on utilized methods

Throughout the thesis I have utilized ethnographic methods from the Techno-Anthropological perspective. The most visible part of the work is seen in the fieldwork carried out in the Faroe Islands at SEV and Hiddenfjord, as described in section 2.3. The overall objective of the fieldwork was to create empirical material through first-hand experience in the field itself. The aim was to gain knowledge, not only from interviews, but also by experiencing and observing my informants during their everyday life. While the deep perspectives can be described as positive in terms of validity, it was not possible for me to participate equally with my informant, and to participate in observations as much as I would have liked, due to our different approaches. I was not able to contribute at the meetings and presentations. Hammersley and Atkinson (2007) describes that one is often found between the two poles of observation; full participant and full observer. If I should have acted as a full observer, it would have required me acting as an engineer to participate fully in their work. This could be a point of criticism, as I have not been a full participant. However, I believe that I have been more than just an observer, because according to Hammersley and Atkinson (2007), a full observer has no contact with the people being observed. I have participated in the daily life and in the daily activities where I was able.

The time frame of the two fieldworks also influenced on the collected empiricism. I visited the Faroe Islands for just over a month, but my first fieldwork conflicted with the seasonal slaughtering of sheep, which is a major factor of the culture in the Faroe Islands.

Subsequently, several scheduled meetings were cancelled. In addition, I have used empirical studies from a previous fieldwork in the same organization, but the empiricism have been further elaborated and broadened to provide a more in-depth understanding of the field. With regards to this, it is relevant for my professional competences to present my possible bias related to the organization SEV. My other fieldwork can be influenced by the perceptions and experiences I gained during the first fieldwork, though some aspects are excluded. . As Wulff (2000) points out, the native researcher is more inclined to look at the field through a practitioner's eyes, than with the outsider's theoretical perspective.

8.2 Reflections on utilized theories

The concept of creativity has been used eclectic in the project, as I incorporate more theoretical perspectives to support the importance of creativity for innovative processes. When more theoreticians are involved, there will be different perspectives of the theoretical approaches not being used, which can be criticized. Amabile's *A Model Of Individual Creativity* is able to stand alone, but can also be used in an organizational perspective, also isolated. Since my fieldwork's main focus has been on following one individual, it has influenced my choice to only use Amabile's individual creativity. Another criticism drawn from the use of Amabile is that A *Model of Creativity and Innovation in Organizations*, dates back to 1988. As a Techno-Anthropologist and researcher, a state of the art approach is imperative when utilizing theory, but In this case, I have chosen to return to ground zero, arguing, that through my research on the concept of creativity, I found a various different theorists, regardless of age, all referring to Amabile. The last thing that could be added to the criticism of

the use of Amabile is her lack of focus on the social aspect in the basic text. However, it should be noted that she later on linked this aspect to her model, which has also been described in chapter 5, session 5.2.

Csikszentmihalyi's *A Systems Perspective on Creativity* supplement, the previously described theory of Amabile and has been included to support creativity as socially designed. When a fusion of different theories is formed, there will be aspects standing out, as mentioned above. An example of this is shown in Chapter 7, explaining how Amabile's creativity skills differed from Csikszentmihalyi and Wenger. This was reflected in the fact that Amabile did not relate to the community in the same way as Csikszentmihalyi and Wenger in her description of Creativity skills.

A criticism can be made of the use of Lene Tanggaard's Crossing borders, the criticisms of this do not depend on the theory itself, but on the concept of crossing borders, not having the intended space in the design of the conceptual model. The argument for the concept of crossroads has been initiated with the Community of Practice, also successfully covered in the theoretical part, but retrospectively, the concept has only been given indirect attention in the field of community of practice. Crossing borders should have been further displayed in the model, possibly as a part of the circle Community of Practice, to clarify that cross-border or interdisciplinary cooperation is the core of creativity.

Finally, a criticism of the missing societal perspective could be addressed. The meaning of individual creativity and the importance of the social aspect of creativity have been investigated but the surrounding social aspects are left out of the project. This is the product of a chosen theoretical framework. The theories utilized in this project have helped to form the framework, opened empirically and given a broader and deeper understanding of the problems raised. The theoretical framework limit, the focus and what theories are all valid and usable. The theories do not always include all aspects of a given problem.

8.3 Reflections on results

The results produced in this project have been based on empirical evidence collected through two field studies at the organization SEV. A possible criticism to consider, are that the observations made, have been conducted at meetings and presentations, making them articulated results. However, all meetings have been with the objects of gaining a deeper understanding of the company workflow, and of Tejri as a person. Observations have, in spite of this, served as a framework on which concepts and phenomena appeared and later served as a presentation to the interviews formed. Although some observations are of a non-active character, the majority and in-depth interviews have created an academic balance between observation, interview and gathering of empirical data and results. It can be criticized that my results are based on a few informants only. The involvement of several informants from SEV at different operation levels would have been able to give the project a stronger foundation and validity.

Another criticism that can be rectified is the fieldwork and interview with Roí at Hiddenfjord from 2014. It was impossible for me to get the data verified by Roí. I tried to contact him, but he is no longer an employee at Hiddenfjord. Therefore I have only displayed pictures with limited texts of statements and only statements that have been validated by other informants.

Chapter 9

Conclusion

To answer the problem statement for this thesis, three research questions were defined in Chapter 3. In this chapter I will present each research question and argue how these have been answered throughout the thesis. Finally I will conclude how these research questions helped answer the problem statement.

What role do individuals play in innovation processes?

Based on the analysis with Amabile, it can be concluded that individuals, like Tejri, have a major influence on the innovative paths taken within the organization. As Head of R&D, he is not afraid to explore new and alternative solutions to pursue the innovative profile they are aiming for. Tejri contributes with creative thinking, and as an individual he firmly believes in his visions. As he recounts, *"If you can dream it, you can do it"* He paves the way for new and unconventional ideas, exploring them and seeks new exciting ways to promote curiosity and the right energy for creativity. It can also be concluded that freedom is the solution to long term and abstract thinking. The new R&D department provided this freedom and that will according to Amabile increase the motivation. The department is an example of how individual people like Tejri bring new paths into play in his pursue of finding new innovative solutions.

What significance does the surrounding environment have for the promotion of creativity?

For Csikszentmihalyi, the social environment plays a role in relation to creativity and in the analysis in section 6.1 it emerged that the social context has major impact on the creativity processes within the organization. It is concluded that SEV previously has used a more conservative and incremental approach that does not appeal to innovative processes. With, amongst others, political pressure and a new director this conservatism is reversed. They now have an open and innovative organization that provides space for creative individuals and where knowledge and skills are shared between the levels. It can be concluded that the social and cultural aspect has had a major impact on the organization.

How can interdisciplinary cooperation open up for creativity?

Tanggaard points out that knowledge within a field plus border crossings is necessary for creativity. It is concluded that it is a necessity to acknowledge that one cannot be competent and creative in all community of practices, including all scientific approaches. When SEV focuses on collaborative cooperation's, it is important that they do not only focus on the monoculture approach. They have to move beyond their own practice curriculum and become more interdisciplinary in their approach to gain more knowledge, wider horizons and thereby more creativity

Covering the three-research question above, the problem statement can now be addressed. The problem statement was:

How can creativity promote technological innovation processes in the organization SEV and how can the collaborative approaches support these processes?

Innovation is a driving factor of today's businesses and communities. It is therefore important for organizations, like SEV, to strive for the technological development and innovative processes. For SEV, it has been possible to maintain the bureaucratic structure where top down decisions are made. However, with their new director and new R&D department, they have been able to form a framework that frees them from the bureaucratic iron glove. Openness is crucial if, you are in a process of transforming like SEV. Creativity requires openness and with creativity, innovative processes are created. As Kollerup and Jørgen Thorball describe: *"Innovation is creativity that succeeded"* (Kollerup et al. 2005, p. 27) LEMS is a good example of how openness and creativity go hand in hand when it comes to innovative processes. Collaborative cooperation forces participants to be more open to achieving a dynamic combination where creativity is allowed to flourish. The concept of creativity creates the basis values for SEV to become the green profile they aim for.

The conceptual model has been created to reveal how important community of practice with an interdisciplinary approach are for the organization. The challenges that SEV will face in their vision of becoming 100 per cent green by 2030 requires not only technological solutions, but also solutions of a more social nature. SEV is very far in reaching their goal. However, it can be concluded that the organization works from a monoculture approach and thus restricts its innovative achievements. They would benefit from moving beyond their own community of practice and become more interdisciplinary in their approach to gain greater knowledge, wider horizons and better innovative solutions.

Chapter 10

Future research

10.1 User Innovation

Based on the conclusion and the results of the analyses, it would be interesting to spread the concept of user-driven innovation and explore how user involvement could be implemented in SEV's vision of becoming 100 per cent green in 2030. Technologies enable innovations, as described in Chapter 2, but technology is only transforming when it has the human focus and therefore it is considered that user innovation is a necessary approach for SEV to bring in as one of the solutions to achieve their ambitious goal.

- Users as a valuable source
- Users have the core of knowledge needed to develop new innovative processes
- Users involvement implemented by systematic and scientifically based methods within anthropology and sociology can have a positive affect on product development

The value of user involvement is found in many companies, but perhaps because of the often highly bureaucratic structure, energy sectors are only beginning to realize this scientific approach. This point of view is parallel to Tanggaard's crossing borders and, seen from the Techno-Anthropological approach; it is an important part of the transformation the organization SEV is in, with their vision of being a hundred per cent green by 2030.

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Appendix

In order to get an overview of the empirical material collected in the field work in the Faroe Islands, an appendix has been prepared for each of the interviews, which will indicate who is interviewed and the time frame of the interviews. Interview designs have also been made for the interviews, an example of this will be presented along the first interview.

Appendix 1 / Interview 1. Tejri Nielsen Head of R&D hos SEV. 04/05 2017. Time: 00.48:28

I: For at starte helt forfra, så vil jeg gerne høre noget mere om Andersine, jeres første vindmølle? Var teknologien ikke moden nok eller var SEV for konservative til at forfølge ?

T: Hvis man går til bage til inden tilbage til 93, så er jeg ikke helt sikker på hvorfor, man valgte det den gang, jeg tro bare man valgte en teknologi alle snakkede om dengang i 93 og så synes at det var noget man skulle prøve, jeg tror ikke der var, jeg er lidt i tvivl om der var et politisk pres dengang at vi skulle i i det her for olie den var ret lav, så jeg er ikke 100 procent sikker på det, men når den så var kommet så kunne man rimeligt hurtigt se at med den teknologi, der var dengang i 93, der mente man i hvert fald at man skulle vi skulle passe på at have for mange af disse møller, da det jo er meget varierende, især på Færøerne, hvor vi har et meget variende vejrforhold, hvor der pludselig kommer en storm indover og så skifter det vinden retning meget hurtigt. Plus det at i 93 , jeg kan ikke huske hvad vores den samlede last var dengang men den var ret lav. En har helt sikkert været under 200 Giga timer pr år, så selv en lille mølle ville give et stort udslag samlet set. Jeg tror de målinger og det de resultater og erfaringer vi har fra 93 var måske ikke de bedste. Og det skal så siges at møllen kører stadig væk og på den måde er det en solskinshistorie alligevel. Men så når vi nærmer os op imod, jeg tror næsten jeg skal sige 98 der omkring, der begynder der ligesom at komme et politisk pres også udefra , fra private initiativtagere, vi skal i gang med at sætte flere møller op. Der er det så, at jeg synes at man har været på de ene hånd konservativ og bange, fordi man siger normalt at elforsyningsskaber de er

konservative af natur, de skal være, vi har en forsyningspligt, vi ligesom ikke mulighed for at gå ud og eksperimentere så meget, i hvert fald ikke så det går ud over kvaliteten hos kunderne. Så var det i - der var en lang til det her – til SEV faktisk i 2002 eller 3 nærmest blev tvunget til at give plads til private initiativtagere til at sætte tre Vestas møller op i vest manna.

I: Du siger at I blev tvunget?

T: Ja, jeg er ikke sikker på om det blev, i hvert fald ved jeg at der blev så meget pres fra politisk side, altså ham der øh. I: Du tænker på RØKT – Kender ham godt T: Røkt ja, de var så, de pressede så meget det politiske system, tror det var ham der hedder eller var olie og energiminister, han, jeg tror næsten han kom med sådan med mere eller mindre krav om at I skal, SEV skulle give lov til at sætte de her tre møller op i Vestmanna. Det var selvfølgelig ikke så, SEV var dengang ikke så glad for det, men det blev så og de blev opsat. Og så gik er noget tid og vi kunne de resultater der kom derfra de – eller det output de kommer med de er ..

I: Var det 3 procent de producerede?

T: Ja det var 1 procent pr mølle, mm... hvordan skal man sige, jeg kan godt huske at vi lavede nogle målinger som viste at når vind var ustabil, så kunne vi godt se på den overordnede sekvens i nettet, så det var – de havde tydeligvis en mærkbar indflydelse på det overordnede systemstabilitet. Alligevel, så valgte SEV alligevel, jeg var ikke så meget inde i det dengang, at gå videre med det her vind og sætte næste, eller SEVS tre vindmøller op i Nasha i 2006 og det er klart de målinger vi lavede efterfølgende de var ikke så optimisme, vi var ikke så optimisme over den teknologi der var.

T: Det er nok en kombination af konservative, måske konservativ ledelse og det faktum at vi skulle passe på med at sætte for mange op og jeg plejer at sige, nu her – det var rigtig godt at man var konservativ dengang fordi hvis vi havde sat mange vindmøller dengang, så var spørgsmålet om, hvor mange der havde været plads til i dag. Og den teknologi er udviklet helt enormt siden dengang.

I: Så det ville ikke have givet jer de muligheder I har i dag?

T: Det havde i hvert fald begrænset tror jeg absolut. Det havde begrænset vores muligheder til at komme i gang igen i dag. Lad os bare tage et eksempel, hvis vi havde sat bare 10-15 møller af den slags op i 2006, så tror jeg man ville have været så træt af vindmøller nu, det ville have så stor indflydelse på vores system, så man ville sige, vi skal ikke have flere vindmøller overhovedet det tør vi simpelthen ikke.

I: Det ville blive for udfordrende?

T: Ja, men så igen, så kom der igen og ja hvordan var det, det var i 208-9 deromkring, hvor man gik i gang med et nyt forsøg, nu skulle man til at lave, Nólsoy, den ø der ligger lige herude for

I: Kender den godt

T: En forsøgsordning derude, hvor man skal bruge vindmøller til opvarmning og sådan nogle ting og der kommer så enercon, den tyske fabrikant ind på banen og jeg var igen, jeg var slet ikke med i det projekt der, men og det blev så ikke til noget. En af grundene til at det ikke blev til noget var nok at vi havde ikke så mange vindmålinger der ude fra og der er især, specielt Enercon måske meget påpasselige hvis de ikke har rigtige gode vindmålinger fra de sites de skal sættes op.

I: Var det derfor det ikke blev til noget eller ?

T:Nej, jeg er ikke sikker. Jeg tror, jeg mener jeg husker noget om, at der var begrænset vindmålinger og derfor ville Enercon ikke gå videre med det.

T: Men vi fik øjnene op for den nye teknologi for de vindmøller man kiggede på dengang de var jo meget moderne og derfor kom et så eller når vi så hvordan var det....Der kom en ny el lovgivning i 2007 hvor der stod at nu skulle vind i udbud og der tog SEV initiativ til at sætte nye møller op i 2010. Nu er der en ny teknologi og vi skal i hvert fald afprøve denne. SÅ vi fik aftalt med myndighederne at vi skulle udbud med tre møller i 2010-11 har det været. Og det kom så i udbud og jeg tror næsten der var i hvert fald næsten 5, eller 4 der byd ind og SEV var billigst og vandt så det her udbud og der blev klaget til myndighederne og det var en lang proces, men det korte af det lange er så at vi fik opsat de her tre

møller Nasha. Og de erfaringer vi havde med både opsætning og de resultater vi fik fra de møller og det output der kom med, det var jo noget helt andet end det der kom fra de andre møller.

T: Nu kunne de gå ind og , det er lidt teknisk, men nu kunne de pludselig komme ind og levere nogle systemydelser som de andre møller slet ikke kunne klare.

I: systemløsninger eller ?

T: Nej systemydelser i form af spændingsstabilisering og sådanne nogle ting – spændings og frekvensstabilisering

T: når de møller så havde kørt i et års tid og vi kunne se at det var noget helt andet end de gamle møller, så tog vi en lidt, hvad skal jeg sige... en lidt risiko beslutning, nu skulle vi bare sætte en i vores forhold en rigtig stor vindpark op og velvidende at vi ville få nogle store udfordringer på de her systemydelser, spænding og sekvens og dit og dat og alt det her. Når pludselig vinden er en stor del af det samlede system, efter denne her vindmølle park har været installeret, så har vi , havde vi dengang i hver fald, 18 MEGA Watt vind i forhold til natlasten som er 20 mega watt. Nu kunne vi næsten forsyne hele Færøerne kun med vind.

I: Kan du uddybe det?

T: Ja Vindmøllerne producere 18 mega watt i forhold til natlasten som er 20 mega watt. Når folk går i seng om aftenen som kommer den helt ned 20 mega watt. Det betyder at så kunne vindmøllerne faktisk stå for hele produktionen og selvfølgelig når vinden går op og ned som den gør, så er det ikke muligt kun at bruge vind om natten. Så vi vidste med det samme at vi skulle lave nogle foranstaltninger eller et eller andet for at stabilisere den ustabile og ujævne vindproduktion. Og der er det så at vi er kommet ind i med batterisystemer og det var jo ikke kommet op sidst du var her.

I: Det er så til lagring så I kan bruge det om dagen selv.

T: Nej faktisk ikke - det er et stabilisering system, der stabilisere de her hurtige (...) output fra vinden.

I: Ok så det er ikke lagring ligesom TESLA? T: Nej...

I: De batterier vi skal op og se, de er ligesom med til at justere input og output eller hvordan?

T: Nej det de gør er faktisk at de, hvis vi har et vindoutput der er sådan her, dvs. at hvis det her er en stor del af den samlede produktion så vil det betyde at vi har et meget ustabilt/svingende el net og det kunne sagtens kunne mærkes i stikkontakten derhjemme. Det som batterisystemet gør – det stabilisere det her så vi får en jævn – det er en enabler til at få mange flere vindmøller op. Når vi kommer derop, så skal jeg vise nogle billeder derfra. FX hvis vindmøllen levere 11,7 watt, så kører det op og ned hele tiden, det er meget meget sjældent at vinden ligger stabilt, det gør ufatteligt sjældent, så den ligger altid og kører op og ned. Hvis vi satte en ny vindmølle park op til at lave energi til om dagen ville nettet blive al for ustabilt. Derfor er det vigtig at vi får lavet et eller andet der stabilisere vores vindmøller. Det batterisystem der er sat op, det er meget vigtigt. Og det er specifikt for den vindmølle park, så når der kommer en ny en så skal der et nyt system til. Dvs. nu har vi pludselig en vindmølle park der er mere forudsigelig end ellers. Det har været en succes. Det må jeg sige. Der skal jeg vise dig nogle billeder deroppe fra.

I: Det må være et kæmpe skridt?

T: Jaja også det som var meget sjovt for en tekniker i den proces det var ikke noget man kunne gå ud og købe. Det var ikke noget man kunne. DET fandtes ikke. Derfor var det meget interessant både for Enercon og Saft, som var leverandør af batterierne. Det var meget spændende.

I: hvor lang tid har det taget at udvikle?

T: Jeg tror næsten vi startede i 2012 og vi fik batterisystemet heroppe i april 2016, så det har været en lang tid undervejs.

I:Er det en teknologi I har patent på, når I har været til at udvikle den?

T: Nej det er ikke noget vi gør noget ud af. Vi invitere folk herop til for at være innovative og komme med nogle nye løsninger, men vi tager ikke patient på det. Så går de hjem og sælger det, sådan er det. I hvert fald i dag. Der er nogle der har spurgt os, vi havde faktisk besøg fra han var direktør fra Nokia dengang, det gik rigtig godt for dem dengang. SÅ

fortalte jeg ham om det her og han sagde I er dumme. I skal få pengene ud af det.

I: JA

T: Vores filosofi er når vi snakker udledning af co2 og sådanne nogle ting så siger vi, el produktionen på Færøerne kan sammenlignes emulsionsmæssigt med et enkelt Mærsks tankskib.

I: Okay

T: så det er meget lidt globalt set. Men der er det vi siger, at hvis vi kan være med til at udvikle nogle løsninger på Færøerne der kan implementeres andre steder for virkelig at gøre en forskel så er vi hvert fald lavet en stor del. Det tager vi ikke penge for. Vi får alt muligt, vi får et knowhow på Færøerne og får en masse ud af det alligevel, men spørgsmålet er måske skal vi ikke være lidt mere..

I: For dine børn og børnebørn – så vil det måske være godt at I får noget for jeres viden?

T: måske – ja.

I: Jeg kan godt følge din filosofi – bare I kan bidrage til verden bliver et bedre sted, men måske også – løfte samfundet.

T: jo jo det er måske noget vi skal tænke lidt over om det er noget vi tilføre vores virksomhed måske lidt mere penge, men indtil videre har det ligesom været vores filosofi. Vi får udviklet en teknologi på Færøerne som vi så bibeholder eller beholder – jeg vil ikke sige gratis men vi får i hvert fald rigtig meget ud af det. Bare et eksempel er enercon. Vi har en direkte linje ind til deres R & D afdeling, så hvis vi har brug for et eller andet, så har det og det er ikke så tit man har det i så stor en virksomhed. Så vi har – vi nyder i hvert fald godt af det selvom det ikke er i form af penge.

I: Alt kan vel heller ikke gøres op i penge? – Det er vel også en måde hvorpå I kan være mere åbne for nye initiativer for så ryger fokus væk fra det der hedder at udvikle?

T: JA, det er det nemlig og en anden ting er også at hvis vi nu pludselig

sætter på vores hjemmeside, I er velkommen til Færøerne og afprøve jeres teknologier, vi et rigtig godt og spændende elsystem, men vi tager nogle rettigheder i på det der bliver udviklet, så kommer der ikke en. Der kommer ikke nogle herop for at afprøve, så det er så man skal være meget påpasselig med hvordan man strikker sådan en økonomisk businesscase sammen.

T: SEV er jo ejet af de færøske kommuner og vi er ikke vant til at tænke nu skal vi bare have en masse, det er en non profit. Vi skal levere en kvalitetsprodukt ud til vores kunder og alt det der kommer ind, i form af penge og indtægter, de bliver brugt igen i systemet. Så på den måde leveret ud igen til vores kunder og det er derfor jeg siger, det behøver vi ikke at komme ind på, jeg er meget imod denne her ånd, som er i dag, nu skal alt liberaliseres nu skal SEV splittes op i tre selskaber og vi skal have private ind som skal tjene penge på vindenergi og sådan noget. Nej vi skal beholde det i den form vi har i dag, således at vi kan levere det ud igen til vores kunder.

I: Det tror jeg personligt at man gør godt i at tænke

T: JA men det er ikke nemt. Det er meget svært og fra politisk side. I: Det er jo også en meget konservativ tænkegang

T: Det er det.

I: Jeg tror stadig på at det den model der vinder plads.

T: Jeg plejer at sige prøve at se rundt i verden og se om liberaliseringen er blevet billigere for kunden – det ser du ikke mange steder. Det er faktisk en af hovedpunkterne i el lovgivningen at vi skal have en så lav pris så muligt. Det har man ikke hvis man skal have økonomi for øjet.

I: Det er dermed også jeres mål – billig energi

T: Ja, billig grøn energi

T: heroppe er grøn energi billigere end olie, så det.

I: Jeg vil gerne spørge ind til vanetænkning, vi har været lidt inde på det mht. til implementeringen af Andersine – Nu er der noget nyt og det

blomstre derude –tør vi ..

T: JA, jeg tror, altså vi fik en ny direktør i 2009 var det – 08-09 tror jeg det var som var helt anderledes og meget mere åben og nytænkende på mange måder. Jeg vil ikke sige noget ondt om den gamle direktør, for jeg kunne meget godt lide ham, men han var sådan måske lidt konservativ også i hans måde at lede på, hvor den nye direktør er mere sådan han er hvad hedder når man ligesom for innovationen til at blomstre ude i organisationen? At man stoler måske lidt mere på folk, så kommer der innovative løsninger på bordet før eller siden. I hvert fald synes jeg det har meget at gøre med, hvilke personer sidder hvorhenne i sådan en organisation det er jeg 100 procent sikker på.

I: han gav mere plads

T: Ja nemlig I Kan du uddybe det lidt mere – du siger selv, at han har fået innovationen ti at blomstre?

T: ja det jeg mener med det er ....mm. han hvordan skal jeg uddybe det. Det er ..

I: Er det strukturen der er anderleders?

T: JA strukturen er anderledes og ø.... Jeg skal lige finde ordene. Den gamle direktør han skulle have en finger med i alt hvad der blev lavet og det er meget motiverende når man hele tiden føler at måske ikke direktøren , men ens overordnede hele tiden ånder en i nakken, du skal kunne have lidt frirum for at kunne tænke de har lange og fremtidige tanker og bare det at give jo, et eksempel er SEV er gået fra at være en drift organisation til at være en innovativ projektorganisation. Det er fx, da vi startede det her Grani projekt.

I: Jeg skal lige være med – en drift organisation? T: hvor det kun handlede om at vi skulle have timerne og dagene til at løbe rundt og have lys i vores stikkontakter og alle de udfordringer der ligger i fremtiden, dem tager vi når de kommer og ved at har vi i underskud af energi så sætter vi en ny motorer op og det er det og bruger bare mere olie.

T: Den nye er mere en innovativ projektorganisation, der bruger tid på at

kigge ind i fremtiden og finde fremtidige løsninger der giver mening her på Færøerne. Det som er et rigtig godt eksempel er da vi gik i gang med det her projekt med dong energy, det var tilbage i 2009 der blev jeg taget væk fra alt det, alle de driftsopgaver jeg havde dengang til kun at tage mig af dette her med projekt Grani. Vi tænkte langt frem i tiden hvordan skal løse de her problemer, når der kommer mere vindenergi, når der kommer mere vand og tidevand of sol osv. hvordan løser man det? Der fik man en stillig her i huset, der næsten kun brugte tid til at tænke lidt frem i tiden og det er så også blevet en afdeling, en udviklingsafdeling hvor vi faktisk kun bruger tid på hvordan vi løser de udfordringer vi støder ind i fremtiden og som vi angiveligt vil støde ind i før man gør i Danmark og andre steder, fordi vi er et isoleret øsamfund. Og får en innovativ teknikker er det jo en fantastisk mulighed.

I: Det jeg hører dig sige det er, at du får plads?

T: Ja ikke kun mig men hele afdelingen

I: Nu tænkte jeg på det projekt du beskrev tidligere – Grani

T: ja ja det var kun mig

T: Dvs. når du sidder i driften og som driftschef, så er det problemstillinger som du skal løse her og nu. Du får aldrig tid til at læne dig lidt bagud og sige hvor nu om 5 år eller 10 år og det er også en ting, som jeg synes var rigtig sjov. Bare en teoretisk tankegange, for i starten der var jeg, der lå det jeg arbejdede med i Grani projektet, jeg var under en afdelingsleder der havde med driften af gøre og det var jeg aldrig tilfreds med for det ..for når jeg skulle spørge ham eller høre ham hvad tænker du om tidevandet i 2020, så svare ham – nej nej det har jeg ikke tid til at tænke på lige nu for vi har en koblingsstation som skal sættes i drift om en uge, det virker simpelthen ikke. Derfor har jeg også været fortaler for at vi skal have en udviklingsafdeling og den skal ligge under direktøren eller på lige fod med driften men slet ikke have noget med driften af gøre. Det er det så blevet til. Der synes jeg det er blevet rigtig godt. Vi taler stadig med alle, vi er nød til at have en dialog med alle. Der er jo mange dygtige folk i organisationen der kan komme med input til et eller andet,

I: I kører også en flad struktur

T: ja – og vi har en struktur der ikke er så fald, vi har en direktør skabsfunktion og tre afdelinger. Og det er bare. Den struktur er gældende når vi har nogle essues et eller andet sted, men helt generelt så skal der lov til at vi taler på alle plan. Så på dagsligvis er det en meget fald struktur I: Alle vil have mulighed for at banke på hos direktøren og sige jeg har fået en ide?

T: Ja nemlig

I:Så hvem der får ideerne er underordnet

T: Ja, en af tankerne ved udviklingsafdelingen er at kunne lufte de ideer der kommer og kigge på dem. Og der er mange ideer der kommer der ikke bliver ført ud i livet, men man kigger på dem teknisk og økonomisk, hvis det er prøver man at få det synliggjort, så ledelsen kan se ideen med det, på den anden side så er der nogle projekter der er interessante, men økonomiske set er det et No go.

I: Hvor mange er I den nye innovations og udviklingsafdeling?

T: der er kun en god person

I: Okay

Teit er en lang historie, det som er rigtig sjovt det er, at jeg har snakket om det her i lang tid og så havde vi en konsulent, der var rundt og snakke med alle i organisationen og jeg ved ikke helt hvad det overordnede mål var, hun hørte hvordan det gik og det er noget ledelsen absolut har sat i gang og jeg var meget opsat dengang – jeg tog jo en MBA i Tyskland og var helt oppe og køre med det her udvikling og det må vi i gang med også fordi jeg var meget interesseret i det selv, så hun har nok , tror jeg taget de input jeg havde og så langt dem for ledelsen for så engang det har været i efteråret sidste år, der blev der lavet om i organisationen og der blev der så den her stabsfunktion lavet under direktøren hvor jeg så skulle arbejde halvt tid i en afdeling med reference til direktøren og halv tid med reference til afdelingslederen. Det var jeg ikke så glad for, for det er igen når du har to forskellige hatte på, det dur simpelthen ikke i hvert fald for mit vedkommende, så laver jeg mest det som jeg gider mest. Det er naturligt, og så fik jeg faktisk selv den opgave at skulle beskrive de her

afdeling, hvordan skal jeg , hvad skal jeg ligesom være hovedformålet med afdelingen, så jeg fik faktisk en hel del et halvt år til at tænke hvordan den skulle struktureres og faktisk, så skulle det forbi vores direktør. Det er virkelig en forandring i hele systemet så fra januar måned blev det så sagt, nu er det offentligt, så den er ny. Vi skal have op til 5 personer, der skal både være økonomifolk og andre med ingeniørmæssig baggrund. Jeg vil ikke bare gå ud og ansætte, jeg vil se hvad der virkelig er brug for. Det er en opstartsfase.

I: Spændende

T:Det er det

I: Du bliver hele tiden stillet overfor nye udfordringer – det må være fantastisk.

T:ja (...) 42:09

T: Hele organisationen er blevet mere åben for innovation –

I: Har I en drejeskive for denne udvikling?

T: ikke sådan direkte – tænker du på organisationsændringen?

I: Ja, også mere generelt.

T: en grund til altså en ting er det her er non profit...vi kan tillade os at ekstra ressourcer af til at tænke. – der er ingen tvivl om at på den lange bane kan vi se at grønne energiformer er på Færøerne er billigere end olie dvs. , vi bliver nød til at gøre så meget så muligt for at få de her grønne teknologier implementeret så hurtigt så muligt for at komme af med olien, så et ellerandet sted så er der også et økonomisk perspektiv i det.

T: vi har jo meldt ud at vi 2030 skal vi være 100 procent grønne, så der skal virkelig ske ting og sager.

I: hvor meget er i oppe på nu ? – kan huske sidste jeg var heroppe var I oppe på 62 procent vedvarende energi, mener jeg?

T: nej, det højeste vi har været oppe på var i 2015, da var vi oppe på 60 procent.

Appendix 2 / Interview 2. Tejri Nielsen Head of R&D hos SEV. 05/05 2017. Time: 01:12:40

I: I dag vil jeg gerne høre noget mere om LEMs

I: Det som det er det er vind ?

T: Ja princippet som du så i går det er at vinden den levere sådan et ustabilt output eller input til vores system, så er det sådan at når vinden går op så går vores batterisystem ned og omvendt og ligger du de to kurver sammen så har du den grønne meget mere flade kurve som kommer ud, men det som , så er det at jeg tegnede at vi har batterisystem så har vi forbrugerne her og så har vi vores vind. Det som det som vi har udviklet er LEMS Local Energy Management system og det den gør, den kigger ind i hvad laver vinden, hvordan ser vindproduktionen ud og det er på millisekund niveau og hvad er det så vi skal få vores batterisystem – vi får noget information ind den vej, fra produktionen fra vind og sender vi nogle sætninger ud til batteri systemet og så levere effekten ude i modsat retning og det er meget simpelt men inde i den her – er der nogle algoritmer der er meget meget komplekse og det har enercon lavet – vi har kun lavet nogle kravspecifikationer, sådan og sådan skal den virke og så har de været stået for selve programmeringen af det. Det er meget simpelt på PowerPoint at lave det og forklare med hele systemet er meget meget kompleks.

I: SÅ for lige at strege op – I har stået for kravspec og de har levereret. T: ja I: Enercon er stadig en stor del af det? T: Ummm hvad mener du med stadig

I: Stadig på den måde at de er en del af udviklingen – altså I bruger hinanden?

T: JA absolut – det som de også sagde, de har to containere, 20 fods, de batterier der er indeni dem, de er produceret over i Jackson ville i Californien, ja jeg tror det er Californien, så er de blevet transporteret til Beaudeau i Frankrig, hvor de er blevet integreret og sat sammen i de her containere, så skulle de faktisk sendes til Færøerne dengang, men så sagde vi nej, i og med det er et system der ikke er opfundet, så synes vi at vi skulle sende de her containere op til enercon i Tyskland, så kan de få

lov til at lege med det her, så det stod der faktisk hos enercon i Nordtyskland i et helt år, hvor de ...

I: For at sikre for fejl?

T: Ja for at sikre at det hele kørte som det skulle inden det blev transporteret herop for det er meget billigere for dem at have det stående end at de skulle sende ingeniører herop for at tilse engang imellem eller tit i starten. Så det blev installeret ved en vindpark der helt tæt på enercon hovedkontor i Nordtyskland og der stod det så i 10 måneder, tror jeg og vi var dernede nogle gange for at lave nogle test og så at der var fremskridt i projektet, og så når de var færdige, så sendte de en invitation, nu var deres test færdig og så laver de nogle test og beviser over for os at det som vi har sagt i vores kravspecifikation, det er opfyldt. Okay det så ud til at virke så det hele blev pakket sammen og sendt herop of det var virkelig således, at der var en lille smule der skulle laves i de forskellige parametre så det passer til det færøske system, men det var plug and play, det virkede bare første gang.

I: Første gang. Det var imponerende

T: og så efterfølgende så har enercon været inde og for at optimere nogle ting. DE holder øje med det for at sikre sig at. For som de siger, det er det første, en prototype for dem og hvis de skal kunne lave et produkt ud af det som de kan sælge så bliver de nød til at dokumentere og få det hele.

I: Så det er dem der kommer til at tjene penge på den, altså LEMS?

T:Det er faktisk et godt eksempel på IP altså intellektuel Property, de beholder rettigheder til en del af det og vi får leveret alt der her system, både ..ja batterisystemet det var en hyldevare dengang, det købte vi bare, men den her del, der ikke var udviklet, der betalte vi ikke noget, det har de gjort, de har afholdt alt som hedder udvikling, det som vi har , vi har købt hardwaren og det er det. Derfor er det jeg siger, vi får alligevel, selvom vi ikke tjener penge på samarbejdet, så får vi noget tilbage alligevel. I: Så for dem bliver I også en slags, som DONG de havde sådan en Power hub, der bliver et slags forsøgslaboratorium for dem.

T: Absolut.

I: Så var der lidt med det her – noget af det jeg synes der var interessant for det første, det var den historie, der var, GRANI –

T: Kan du huske den?

I: Ja, det var noget med en trojansk hest – jeg kan huske historien?

I: Jeg tænker hvad ligger der bag, når man vælger et navn fra de nordiske sagaer? T: Det er meget persons afhængigt også – det som var lidt sjovt med den historie. Hvis vi starter helt fra tidernes morgen, i vores samarbejde med DONG. Vi har en person heroppe på Færøerne, der hedder Johan Mortensen han er sådan en alt mulig mand og meget kreativ på mange måder, han havde læst noget om det her med dong og elbiler og jeg tror næsten det var starten at det her samarbejde med dong det startede. I 2008. Så Rákon vores direktør han var lige blevet direktør her i huset. Så engang hvor de sad i sauna oppe i svømmehallen, så havde Johan sagt til Rákon, jeg kunne godt tænkte at vi kunne tage et møde når du kan omkring et samarbejde med DONG, eller om elbiler fordi det var elbiler helt fra starten og det syntes Rákon det var en god ide så et par dage så kom Johan herud og Rákon blev lidt tændt på det her med elbiler og det ville være rart med nogle lidt flere informationer om det. Så SEV inviterede faktisk DONG herop i forbindelse med en konference, der skulle være om elbiler og det blev så ligesom så sat op og der kom 4 eller 5 fra DONG for at deltage i konferencen, men så skulle de havde et møde men så havde vi også lavet sådan en tur rundt til de forskellige steder SEV har ind på Sund og til de forskellige vandkraftværker og sådan og det endte med at de var så betaget af det færøske elsystem og de sagde de var nød til at komme og lave et eller andet for det var så spændende og det var engang i foråret 2009 og det omkring sommeren 2009 blev der så underskrevet den her aftale, den her samarbejdsaftale og så skulle den jo have et navn, så var det Johan igen der, han havde tænkt noget kreativt, å han kontaktede en anden færing, der sådan er lidt inde i den nordiske mytologi og de var så kommet frem til at Grani hesten, den var et rigtig godt symbol på det her samarbejde og historien er , nu skal jeg lige historien vi har en gammel saga på Færøerne, der siger, den er vist nordisk som går ud på at det er således at tuljo en ung mand han får til opgave , man ved at der er en drage der vogter over en skat og man ved ikke hvad skatten er og han får så til opgave at finde ud af had denne skat

er og han får så hjælp af denne hest der hedder Grani og de går så lige i krig med denne her drage og Tuljo han får så dræbt dragen og så når han kommer til skatten, så viser det sig at det er visdom of sagaen siger at Tuljo han blev så vis at han kunne forstå fuglesprog og det hele og der er det så vi siger, at det her samarbejde med DONG det er noget der skal føres os til at blive mere vis, så vi forstår mere by the end of the day og det synes jeg absolut, i hvert fald for vores vedkommende for den Færøeske del af det samarbejde, der har vi virkelig og jeg er sikker på at dette Grani har været med til at udvide vores horisont. Det som er rigtig sjovt alle de møder som vi var til i København og andre steder, det mest jeg som var af sted, så kom jeg hjem helt entusiastisk og det som var lidt sjovt det var en stor del de ting de snakkede som havde et navn, smart Grid og masse af termologier som vi ikke kendte og det har vi også herhjemme, det er bare sådan helt naturligt for os. At kommer derned og få bekræftet det vi laver heroppe i nord hvor vi ikke har en forbindelse, det er faktisk i den forbindelse alle går.

I: Alt smelter pludselig sammen?

T: Nemlig, ja jeg synes vi har lært en frygtelig masse og kommet i kontakt med andre partere rundt omkring også det...os færinger generelt.. vi er ikke særlig gode til at prale, vi er ikke så gode til at nu her, vi har lavet dette. Vi er ligesom lidt mere ned på jorden. Det vi har lært det er når vi laver et eller andet der er fantastisk så skal vi være bedre til at gå ud og fortælle det. For der er måske nogen der har brug for de samme. Så man ikke skal opfinde den dybe tallerken hver gang. Vi er blevet lidt mere bevidste, eller vi skal være bevidste om de gode historier, så de andre. Så på den måde..

I: Det er I blevet gode til?

T: Jaeee, men det, der synes jeg også hver gang der kommer en delegation til Færøerne der kommer og skal se et eller andet som vi har lavet, så har vi altid et eller andet lille guldkorn liggende tilbage som de kan fortælle om hvad de laver og har I tænkt på det og har I tænkt på det. Så får de noget input herfra så det synes jeg er rigtig rigtig vigtig.

I: Samarbejdet, det har også åbnet døren for jer?

T: Ja absolut

T: jeg synes også det er en dejlig fornemmelse at du bliver bekræftet i, at vi har virkelig, hvad skal jeg sige, vi arbejde på samme måde som andre energiselskaber gør, vi måske lige så langt fremme i skoene og nogle gange endda lidt foran da. Og det som Dong sagde hele tiden, vi står midt i de problemer som danskere gør om 5 -10 år. Derfor var de dengang meget interesseret i at udvikle nogle teknologier der kunne implementeres andre steder eller i deres system.

I: Man giver noget et navn og der er en historie bag det så lægger man også et ikke pres, men en lyst til at få noget ud af det? T: Kan du følge i det? (...) Ja jeg huske da vi fortalte denne historie, som vi gjorde meget i starten, det var meget interessant, det var en god historie.

I: Ja, Det er også min fornemmelse at I altid har historien med jer, den er ikke glemt. Hvor mange er blevet globalisede, så de glemmer hvem de er. Hvis man glemmer hvem man er kan man også miste essensen?

T: Ja bestemt.

I: I svæver, men I stå også virkelig fast

T: Ja enig. I: Vil du fortælle lidt mere om power hub, der skulle være en løsning for jer mht. de her blackouts?

T: Altså lidt teknisk så er det således at vi har nogle store maskiner, dieseldrevne maskiner og de er i forhold til det forbrug der er ,så er de rigtig store –Tejri laver tegning. Hvis vi tegner forbrugskurven her på Færøerne så vågner folk om morgen, så det er klokken 6, det er kl. 7, det er så klokken 18 og så går vi i seng og så står vi op igen. Sådan og hvis vi siger at det her er 40 megawatt og på denne linje er nede på ca. 20 megawatt, dvs. at vi skal dække det her energibehov med et eller andet og det vind og dieselkræft og sådanne nogle ting. Når vi nu har nogle dieselmaskiner, som kører, de er 12 megawatt og så har vi d 1 det er 12 megawatt, d 2 det er som kan være en maskine i Klaksvig den er på 2 megawatt og vi skal dække dette her behov på 20 megawatt. V – vandturbine. Vandsystem der kan være på 6 megawatt og så har vi 20 megawatt så kører, vi siger det er et eksempel om natten, det som sker

nogle gang, det er at der sker et stop af en maskine, dette er helt normalt, hvis der kommer en eller fejl, så har vi en beskyttelsesanordning på, det vi kalder et safety system på alle vores enheder der gør at de hellere skal stoppe i stedet for at blive totalt ødelagte, hvis der er , f. Eks lejerne de bliver for varme, så stopperne man maskinerne og det sker nogle gange om året, måske 4-10 gange, men hvis du forestiller dig at vi pludselig, så stopper denne her maskine så har vi kun 8 megawatt tilbage og det er en blackout for så får vi en ubalance i forbrug og generation og derfor er det meget typisk når en af de her maskiner, vi kalder det falder ud, det betyder at den stopper pga. en fejl, så har vi ikke nok reserve til at bibeholde balancen. Det er et af de største problemer vi har når vi er et øsamfund for hvis det var i Danmark så ville de her 12 megawatt være lavet om til at være 100 megawatt, hvis de forsvinder så for de bare lidt fra Norge eller Tyskland. Det kan vi ikke her. Det som, det var for at forklare de her Black out, så der skal ikke så meget til så har vi et Black out, det man så gør for at undgå Black out der er at man siger, at vi hellere starter en ny turbine op der kører måske 4 megawatt, den kan godt kører 6, den kører så 10 megawatt, ved den kan køre 12 og 3 megawatt, men kører 1, en sidste der kører 2 megawatt, men kører 1 så har vi stadig en balance, problemet med denne kørselsmetode er at hvis du kigger på effektivitet på en kurve over sådan en maskine. Så er der effekt og det er procenter af effektivitet, så siger man at 80 procent last der har vi størst effektivitet, det er specifik fuel oil konsumption, det betyder bare at når en maskine kører på 80 procent, så får vi mest ud af den, den bruger mindst olie. Dvs. at hvis vi nu siger at vi skal have alle vores maskiner de skal gerne, for at kunne være med til at stand by til hvis der kommer et Black out, så skal den ikke ligge nede på 65 procent, det vil sige nu bruger vi lige pludselig meget mere olie. Derfor er det vi siger at hvis vi nu kunne stadig væk bibeholde alle maskiner til at køre optimalt, men vi i stedet for kobler less for forbrug ud, det er der power hub blev interessant. Så kan vi lade alle vores maskiner kører optimalt og den spinding reserve, der ligger i systemet den ligger vi ud til vores kunder i stedet. Så i stedet for at vores maskiner de skal til at producere mere så aflaster vi faktisk hele systemet ved at koble noget last ud. Er det for teknisk?

I: Jeg skal lige have det med den spinding reserve med – Når I så ligger det ud til kunderne, hvordan juster det grided?

T: Ja, det er. Nu skal jeg forklare hvordan det er . Det er det der er rigtig interessant ved power hub, det er nemlig det her. Vi har en fabrik fx Hiddenfjord. De har et forbrug som sådan her ud eller et eller andet, så når de indfryser fisk så bruger de meget og så går det ned igen og de bruger ikke så meget og så kommer der et skib ind, en trawler eller et eller andet og så skal fryse igen. En rigtig stor del, hertil det er lys plus andet, alt den her energi der ligger herimellem, det er faktisk indfrysning, det er nogle kompressorer der kører og de tager, hvis vi siger 6 megawatt de bruger Maks og dette er 4 megawatt og resten de her 2 megawatt, det er så andet forskellige strøm ting og sager. Det som her er smart det er at power hub system det går ind og kigger på kun på forbruget af indfrysning, dvs. at vi kan afkoble noget forbrug der uden at påvirke resten af produktionen måske i 10 minutter, det påvirker ingen, heller ikke indfrysningen, der er stadig lys og transportbåndet kører og alle folk er glade og ingen kan mærke noget som helt. Men rent faktisk har vi aflastet noget energi i 10 minutter og hvis vi har to tre forskellige fabrikker der kan tilkobles.

I: Ja I har Kollafjørdur og Hiddenfjord, dette er Kollafjørdur og så har vi Bakkafrost, når vi så kan samle nogle forskellige enheder der kan det her så har vi pludselig en masse last eller forbrug som vi kan koble væk og det er rigtig, det var jeg synes selv et kanon spændende projekt og det virkede rigtig godt. Vi står i dag i den situation at, hvis vi lige gør den historie færdig med power hub og Dong. Dong har lavet rigtig meget om i deres strategi hvor førhen da vi startede Grani, der havde de et innovationscenter, hvor de, det er faktisk det samme jeg gør heroppe, det er også et innovationscenter hvor man får lov til at tænke de her lang, tanker der er lang sigtede og det blev så nedlagt hos Dong, da den nye direktør kom fordi han skulle spare nogen penge og det viste sig bare at mange af de mennesker som vi havde kontaktet de, enten blev opsagt eller de forlod Dong af anden årsag og til sidst der var der kun en enkelt der følte noget for det. For hver gang Dong skulle ligge et budget, så skulle de virkelig slå kæmpe en kamp for at bibeholde nogle pengene til dette her projekt. De kom tilbage med en million eller 500 tusinde til Grani, men så og som tiden gik blev der skåret mere og mere end så de kun fokusede på deres kerne værdier og det er vind og var olie og det er kun vind og vind, de fokusere på. Så de bruger slet ikke økonomi på eller

økonomiske ressourcer på andet og så blev det bare en naturlig død for projektet. Ham Henrik den nye direktør, dengang Anders Heldrup var direktør for han kendte til det her projekt og han var også interesseret i det. Ham Henrik jeg tror ikke han har hørt om det her projekt. Men det skal så siges at det her power hub system det drukkede faktisk inden denne aftale døde. Der var det at vi ikke måtte skrive om det mere der var det at vi blev skuffede for vi havde brugt mange ressourcer på det her og installeret power hub ude ved kunderne og sådanne nogle ting og så når det havde kørt i et års tid eller to eller 1 1⁄2 år måske, så kom DONG TIL OS, NU SKAL VI HAVE ET MØDE OM POWERHUB, nu var det sådan at de brugte nogle ressourcer på det og de ville have betaling for det og sagde vi, det har altid været en del af aftalen, vi betaler det som vi, de udgifter som vi har og I betaler det som I har. Jamen det koster penge for os at drive det her. Okay vi har ikke afsat penge til at betale for det og så blev det sådan at vi havde et par møder eller tre og de stod fast på at de skulle have nogle penge for det og det var ikke bare kun nogle, det var 30.000 pr enhed pr måned, så sagde vi så stor glæde har vi heller ikke, det koster mere end et Black out så hellere bare at der sker et Black out. Noget andet er så at mens dette har stået på, så er batterisystemerne udhvilet så meget, at hvis vi siger 4 megawatt og v har 1 megawatt andre steder så vi har 5 megawatt, som vi faktisk skal afkoble, det kan vi faktisk købe et batterisystem for i dag. Så vi slet ikke behøver at afkoble vores kunder, men vi klarer vores problemer selv kan man sige ved at installere et batteri, der er faktisk det vi kigger på i dag, så jeg tror sandsynligt vil vi installere et og det bliver også endnu større end 5, jeg tror det bliver 12-15 megawatt batterisystem og så har vi slet ikke det problem. På den måde slipper vi også for at bruge vores kunder. Jeg synes faktisk de var meget med på ideen og de var med til at stabilisere det færøske og de havde den grønne indgangsvinkel til det også, den del er lidt synd at de ligesom mister den del.

I: Ja det kan jeg huske fra et interview hos Hiddenfjord, han var vist maskinansvarlig

T: Jo Rói, han var tekniskleder derude.

I: Han var i hvert fald positiv for den grønne vinkel

T: Helt bestemt en anden ting, ikke Kollafjørdur, men vi har jo været i kontakt med Marina Harvest og Bakkafrost og Hiddenfjord mht. andre projekter end Power Hub anden ting, jeg tror også jeg nævnte dengang, powerhub version 2, det er i stedet for at afkoble forbrug så starter de deres generatorer og jeg synes at det var en rigtig god ide dengang. Problemet i da at nu er fiskemassen på land blevet så stor at vi skal være meget påpasselige med at gå ind og lave noget om, for hvis der går noget galt, og vi får skylden for det så er det mange millioner der står på spil. Derfor synes jeg at det er bedre at vi klarer vores problemer selv.

(...) T: Så det er ikke fordi når jeg skriver denne mail her med Dong og vores samarbejde, så er det ikke fordi vi er, altså jeg har kontakt stadigvæk til en af, faktisk kun den ene der er tilbage i Dong der kender til det her projekt. Vi er i kontakt engang imellem. Så der er ikke noget. Det er også det jeg siger Grani var et rigtig godt projekt og det kørte i de her 4-5 år – vi lærte en frygtelig masse og jeg synes vi virkelig kom ud af starthullet. Det var ligesom det der skulle til for at SEV skulle blive mere international. Nu er vi så der hvor ja hvor begge partere siger det er fint at vi holder med projektet, men vi har en masse andre muligheder

I: vil det sige at dette samarbejde har åbnet op for nye muligheder?

T:Ja

Appendix 3 / Interview 3. Tejri Nielsen Head of R&D hos SEV. 08/05 2017. Time: 00:35:53

I: I dag vil det om handle meget om kreativitet og forskellige begreber.

I: Jeg vil kunne godt tænke mig at høre om du tænker at kreativitet og innovation hænger sammen i din optik?

T: Engang til?

I: Ok. Om kreativitet og det at være kreativ hænger det sammen med innovation? Altså kan man være innovativ uden at være kreativ? Kan man innovere uden at have et kreativt aspekt med? Ved godt det er sådan lidt ..
T: Det var godt nok et svært spørgsmål. Jeg har ikke , jeg ser ikke mig selv som så vældig kreativ, men jeg synes jeg er innovativ, det synes jeg

da.

I: Hvor udspringer det fra, der er ikke et konkret svar, men hvad udspringer det innovative fra?

T: Jeg tror, en ting som jeg har tænkt over, det er i hvert fald, fordi i mange år der var ligesom at vi bare arbejdede på at vi skulle forsyne Færøerne med energi ikke nødvendigvis grøn energi og ...men så efter at vi fik denne her vision 2030 præsenteret 2014, så er der ligesom sket et eller andet. Vi skal være grønne og der skal virkelig noget til og jeg har sagt det tit her i in house, jeg synes at det er meget meget motiverende at have sådan en vision om at vi i 2030 skal være helt grønne. Og der synes jeg at når man er så motiveret som vi er så er du også nød til at være innovativ på en eller anden måde. Jeg synes, jeg vil heller ikke oppe imod, vi har rigtig høje ambitioner og når du har de her ambitioner, så er du nød til at have en form for en innovativ tankegang. Jeg har lidt svært ved at sige, jo det helt sikkert er kreativitet og innovation er en side af sammen sag. Jeg ved det ikke helt. Men øh.

I: Du tror ikke det er en af samme side.

T: ikke nødvendigvis fordi – især hvis jeg tænker på mig selv, jeg ikke specielt kreativ i det daglige, tror jeg ikke, men jeg er ikke sikker.

I: Ok så har jeg et spørgsmål – Hvad forbinder du med kreativitet?

T: stilhed

I: Bare sig hvis du tænker at det er børn der sidder og tegner på et stykke papir

T: Ja det er her jeg er, det her med at sige til børnene skal vi ikke lige prøve og lege det her og prøve det her- sådan nogle ting. Det er i hvert fald i det område jeg er absolut.

I: Du har måske lidt svært ved at forholde dig til begrebet?

T: Ja, det er derfor jeg ikke helt forbinder kreativitet med innovation

I: Nu er du ingeniør og når du hører ordet kreativitet, er det så noget du

forbinder med, du har en hvis autoritet, som ingeniør og når jeg nævner kreativitet, så tænker du stærkt ned på gulvet og børneaktiviteter. Er ingeniører og kreativitet en dårlig kobling?

T: Sådan tænker jeg ikke. Nej det gør jeg ikke. Jeg tænker heller ikke at ingeniører det er sådan en autoritet.

I: Nej men set i forhold til vi er nede på børne niveau, når vi taler kreativitet. I Så når du tænker ingeniør, så tænker du ikke kreativitet?

T: Nej det tror jeg ikke jeg gør nej.

T: stilhed

T: Jeg nærmere sige som ingeniør er man meget målrettet. Du får en opgave og du skal løse den på en eller anden måde. På den måde kan det være at du er lidt kreativ for at komme mål med et eller andet. Jo måske.

I: Jo – vi har talt om det tidligere og I har en vindmølle farm og den har den funktion at den skal komme med energi. Det ved vi. Det er den tekniske del, men stadig væk sætter i lys og alverden ting. Er det så noget der kommer udefra eller er det en kreativ ide herfra?

T: Både og. Mht. de lys der, der fik mange forskellige indspark eller input udefra. Vi skal til at gøre et eller andet for der kommer alt for mange der spørger om et eller andet. I: Det vil sige det var udefrakommende

T: Ja, men for lige at komme tilbage til her med kreativitet, når vi har en opgave som ingeniør, så er det tit en opgave som især i min stol, så er det ofte noget som ikke er opfundet og en lige til løsningerne, så for at nå i mål så er du måske nød til at være lidt kreative for at finde nogle veje som ikke eksistere, så der er måske et eller andet uden jeg har tænkt over det. I: For mig hænger kreativitet og innovation sammen. Jeg føler ikke du kan være innovativ uden på en måde at være kreativ. For at innovere er det nødvendigt at tænke ud af boksen og hvordan skal du tænke ud af boksen, hvis du ikke tænker en smule kreativt?

T: Ja I: Nu hopper jeg lidt i konteksten, vi taler om kreativitet, men hvad fik dig eller jer til at udtænke løsningen omkring LEMS

T: Som jeg nævnte vi har tænkt i batterisystemer i mange år efterhånden som kunne være en del af løsningen og vi har også vidst at batterisystemer er en hyldevare du kan gå ud og købe et eller andet sted og som jeg nævnte de her inverterer, der danner strømmen om til ac, det er også noget du har kunnet gå ud og købe og har kunnet gøre det i mange år. Men den LEMS, local energi management system som styrer outputtet fra batterisystemet i forhold til hvad nu vindmøller nu engang giver på millisekundniveau, det er noget hvor vi gik hen til saft og enercon som er de respektive leverandører og sagde at vi vil at et system der virker på denne her måde. Opgaven er at vi skal stabilisere vores ujævne vindenergi og det skal denne her kasse. LEMS sørge for. Og så gik vi i gang med at lave kravspecifikationer til den og skrev side op og side ned om hvordan det skulle virke notes, så det var absolut ikke noget der kom ud fra det blå, vi skulle bare sætte ord på hvad vi tænkte. Og så vidste det sig selvfølgelig, det var ikke noget vi kunne gå ud og købe i handlen så det skulle opfindes på en nu måde.

I:Fra det ikke er en hyldevare hvordan kommer I så til at I kan udtænke en hjerne, der kan udtænke det her?

T:Jamen det er fordi man har været lang til i dette her område, man ved at alt er muligt. Især når man snakker om programmering af pc'er og alt er muligt. Du skal bare have den rigtig tanke. If you can dream it, you can do it! Så der – vi vidste at det selvfølgelig kunne lade sig gøre. Det var vi i hvert fald meget overbevidste om. Jeg har ikke været et sekund i tvivl om at det var noget som vi kunne kører i mål. Så det.

I: Det her var også et frirum.

T: Det var et R&D projekt og sådan et projekt har altid en portion usikkerhed. Det kunne sagtens være at vi brugte de her 20 millioner og så stod vi med et system der ikke virkede. Absolut var det en mulighed. Men i og med vi var så overbevisende i vores salgstaler overfor vores bestyrelse og sådan nogle ting, så troede de virkelig på at det kunne lade sig gøre. I: Er det viden der er kilden til at I går i gang med at udvikle det her? T: Ja, det var en stor portion af kilden/ den viden vi har, men igen når man sat et mål så højt som vi har, så er vi nød til at være lidt kreative, nød til at være innovative på en eller anden måde og vi er næsten tvungen til det. Det

gør, ja at vi får lov til det. En ting, uden man behøver at komme så meget ind i økonomi, når vi ved at vedvarende energikilder er så meget billigere end olie, så har vi også lov til at eksperimentere lidt, selvom det koster 30 øre pr kilotime, det 32 pr kilotime, det er jo langt billigere end olie alligevel. Og der er et vist frirum til det.

I: Du siger i får input fra andre – Hvad tænker du om begrebet dialog. Jeg synes dialog er alfa omega, ikke kun intern men også ekstern. At have en rigtig god og sund dialog med vores samarbejdspartnere fra andre lande som sådanne nogle ting. Der er der en god dialog og det synes jeg absolut er meget meget vigtig. Igen jeg synes at selvom vi var rigtig langt henne inden vi stiftede bekendtskab med Dong energi og vi blev lidt mere globaliseret så synes jeg efter den kontrakt den blev underskrevet og vi kom ind igennem dem og ud til andre. Det har simpelthen sparket os ud i et eller andet som blev så stort som det blev. Så dialog er rigtig rigtig vigtig.

I:Tanke og handlingsmønstre er ofte vanebaseret – synes du vanetænkning kan være en hæmsko for at tænke kreativt og innovativt?

T: Ja det tror jeg. Hvis du tænker at det er måde vi altid har gjort det på, det her med at hvad er det man siger; hvis du alt det du altid har gjort for du det du altid har fået. Ja, det kan absolut være en hæmning. Du er bundet til din tanker på et eller andet niveau. Sådan plejer vi at gøre.

I: Man skal ikke være bundet til ens tanker?

T: Nej, det er hvad hedder det, det er katalysatoren til innovation, det er ikke at være bundet til noget, noget som helst faktisk. Du skal virkelig havde lov til at tænke store tanker.

I: Det kreative frirum du har fået i jeres nye innovation afdeling hvad giver det dig, som leder eller head of – hvad giver det af muligheder ?

T: Stilhed

I: Jeg tænker du nævnte at I skulle til at forske i tidevand, er dig der sidder og får de tander

T: Ja sammen med andre. Nu er det på tide at vi sætter fokus på tidevand.

Nu er det lige det der er lige nu. Vi har snakket om tidevand i mange år. Det har været på et overordnet niveau og vi kan se at tidevand kan spille en rigtig stor rolle i vores fremtidige energisystem, så nu er tiden inde til at bruge energi på det også. Vi er ved at etablere en projektgruppe der virkelig skal gå ned i detaljerne, er der virkelig et potentiale på Færøerne og hvilke teknologier skal bruges, hvad koster det. Det er en ting som jeg synes er rigtig spændende også når det bliver lidt mere konkret, så jeg kan få lov til at springe videre til det næste. Det synes jeg vigtigt. Når et projekt er blevet håndgribeligt og klar til at lægge ud til en projektgruppe, så tager de over og så forsætter jeg.

I: Du er udviklingen og når det skal søsættes, så sejler det sin egen vej ?

T: Yes. Ellers drukner man i alle projekterne. Det synes jeg er vigtig at man har en projektorganisation, der kan tage over, når det er modnet til det.

I: Du har fuldstændighed friheden til at gå efter ideen og skabe noget hvis den opstår?

T: Hvis jeg kan overbevise min ledere, det gør jeg ofte ved at visualisere og fortælle lidt om priser og perspektivet i denne løsning, så hvis begrundelsen er god nok så har jeg lov til det absolut, men de er meget, det er ikke bare sådan at jeg kommer hjem med et projekt, som er dødsfødt fra start og det går du bare i gang med

I: Nej selvfølgelig

T: Der skal virkelig være noget feedback og sådan.

I: Vil det sige at der er en form for medejerskab for de ting? T: absolut, som er meget vigtig. Selvom man ligesom kommer med en god ide så er det vigtig at få de andre med på ideen og de føler ejerskab i den så den ligesom forankre sig i virksomheden, så alle ligesom føler. Det er vi en del af og vi var med til at udvikle et eller andet. I; Medejerskabet er altså en vigtig ting i virksomheden?

T: Ja absolut. Det er derfor det er vigtig at man i denne her afdeling lytter til hvad andre har at sige. Der er jo mange. Mange spændende projekter

de kommer jo helt nede fra, uden at det skal lyde negativt, gulvet af og op efter.

I: I dag vil det om handle meget om kreativitet og forskellige begreber. I: Jeg vil kunne godt tænke mig at høre om du tænker at kreativitet og innovation hænger sammen i din optik?

T: Engang til? I: Ok. Om kreativitet og det at være kreativ hænger det sammen med innovation? Altså kan man være innovativ uden at være kreativ? Kan man innovere uden at have et kreativt aspekt med? Ved godt det er sådan lidt ..

T: Det var godt nok et svært spørgsmål. Jeg har ikke , jeg ser ikke mig selv som så vældig kreativ, men jeg synes jeg er innovativ, det synes jeg da. I: Hvor udspringer det fra, der er ikke et konkret svar, men hvad udspringer det innovative fra?

T: Jeg tror, en ting som jeg har tænkt over, det er i hvert fald, fordi i mange år der var ligesom at vi bare arbejdede på at vi skulle forsyne Færøerne med energi ikke nødvendigvis grøn energi og ...men så efter at vi fik denne her vision 2030 præsenteret 2014, så er der ligesom sket et eller andet. Vi skal være grønne og der skal virkelig noget til og jeg har sagt det tit her i in house, jeg synes at det er meget meget motiverende at have sådan en vision om at vi i 2030 skal være helt grønne. Og der synes jeg at når man er så motiveret som vi er så er du også nød til at være innovativ på en eller anden måde. Jeg synes, jeg vil heller ikke oppe imod, vi har rigtig høje ambitioner og når du har de her ambitioner, så er du nød til at have en form for en innovativ tankegang. Jeg har lidt svært ved at sige, jo det helt sikkert er kreativitet og innovation er en side af sammen sag. Jeg ved det ikke helt. Men øh.

I: Du tro ikke det er samme side.

T: ikke nødvendigvis fordi – især hvis jeg tænker på mig selv, jeg ikke specielt kreativ i det daglige, tror jeg ikke, men jeg er ikke sikker.

I: Ok så har jeg et spørgsmål – Hvad forbinder du med kreativitet? T: stilhed

I: Bare sig hvis du tænker at det er børn der sidder og tegner på et stykke papir

T: Ja det er her jeg er, det her med at sige til børnene skal vi ikke lige prøve og lege det her og prøve det her- sådan nogle ting. Det er i hvert fald i det område jeg er absolut.

I: Du har måske lidt svært ved at forholde dig til begrebet? T: Ja, det er derfor jeg ikke helt forbinder kreativitet med innovation

I: Nu er du ingeniør og når du hører ordet kreativitet, er det så noget du forbinder med, du har en hvis autoritet, som ingeniør og når jeg nævner kreativitet, så tænker du stærkt ned på gulvet og børneaktiviteter. Er ingeniører og kreativitet en dårlig kobling?

T: Sådan tænker jeg ikke. Nej det gør jeg ikke. Jeg tænker heller ikke at ingeniører det er sådan en autoritet.

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T: stilhed

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I: For mig hænger kreativitet og innovation sammen. Jeg føler ikke du kan være innovativ uden på en måde at være kreativ. For at innovere er det nødvendigt at tænke ud af boksen og hvordan skal du tænke ud af boksen, hvis du ikke tænker en smule kreativt?

T: Ja

I: Nu hopper jeg lidt i konteksten, vi taler om kreativitet, men hvad fik dig eller jer til at udtænke løsningen omkring LEMS

T: Som jeg nævnte vi har tænkt i batterisystemer i mange år efterhånden som kunne være en del af løsningen og vi har også vidst at batterisystemer er en hyldevare du kan gå ud og købe et eller andet sted og som jeg nævnte de her inverterer, der danne strømmen om til ac, det er også noget du har kunnet gå ud og købe og har kunnet gøre det i mange år. Men den LEMS, local energi management system som styrer outputtet fra batterisystemet i forhold til hvad nu vindmøller nu engang giver på milisekundniveau, det er noget hvor vi gik hen til saft og enercon som er de respektive leverandører og sagde at vi vil at et system der virker på denne her måde. Opgaven er at vi skal stabilisere vores ujævne vindenergi og det skal denne her kasse. LEMS sørge for. Og så gik vi i gang med at lave kravspecifikationer til den og skrev side op og side ned om hvordan det skulle virke notes, så det var absolut ikke noget der kom ud fra det blå, vi skulle bare sætte ord på hvad vi tænkte. Og så vidste det sig selvfølgelig, det var ikke noget vi kunne gå ud og købe i handlen så det skulle opfindes på en nu måde.

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it! Så der – vi vidste at det selvfølgelig kunne lade sig gøre. Det var vi i hvert fald meget overbevidste om. Jeg har ikke været et sekund i tvivl om at det var noget som vi kunne kører i mål. Så det.

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T: Det var et R&D projekt og sådan et projekt har altid en portion usikkerhed. Det kunne sagtens være at vi brugte de her 20 millioner og så stod vi med et system der ikke virkede. Absolut var det en mulighed. Men i og med vi var så overbevisende i vores salgstaler overfor vores bestyrelse og sådan nogle ting, så troede de virkelig på at det kunne lade sig gøre.

I: Er det viden der er kilden til at I går i gang med at udvikle det her?

T: Ja, det var en stor portion af kilden/ den viden vi har, men igen når man sat et mål så højt som vi har, så er vi nød til at være lidt kreative, nød til at være innovative på en eller anden måde og vi er næsten tvungen til det. Det gør, ja at vi får lov til det. En ting, uden man behøver at komme så meget ind i økonomi, når vi ved at vedvarende energikilder er så meget billigere end olie, så har vi også lov til at eksperimentere lidt, selvom det koster 30 øre pr kilotime, det 32 pr kilotime, det er jo langt billigere end olie alligevel. Og der er et vist frirum til det. I: Du siger i får input fra andre – Hvad tænker du om begrebet dialog. Jeg synes dialog er alfa omega, ikke kun intern men også ekstern. At have en rigtig god og sund dialog med vores samarbejdspartnere fra andre lande som sådanne nogle ting. Der er der en god dialog og det synes jeg absolut er meget meget vigtig. Igen jeg synes at selvom vi var rigtig langt henne inden vi stiftede bekendtskab med Dong energi og vi blev lidt mere globaliseret så synes jeg efter den kontrakt den blev underskrevet og vi kom ind igennem dem og ud til andre. Det har simpelthen sparket os ud i et eller andet som blev så stort som det blev. Så dialog er rigtig rigtig vigtig.

I:Tanke og handlingsmønstre er ofte vanebaseret – synes du vanetænkning kan være en hæmsko for at tænke kreativt og innovativt?

T: Ja det tror jeg. Hvis du tænker at det er måde vi altid har gjort det på, det her med at hvad er det man siger; hvis du alt det du altid har gjort for du det du altid har fået. Ja, det kan absolut være en hæmning. Du er bundet til din tanker på et eller andet niveau. Sådan plejer vi at gøre.

I: Man skal ikke være bundet til ens tanker?

T: Nej, det er hvad hedder det, det er katalysatoren til innovation, det er ikke at være bundet til noget, noget som helst faktisk. Du skal virkelig havde lov til at tænke store tanker.

I: Det kreative frirum du har fået i jeres nye innovation afdeling hvad giver det dig, som leder eller head of – hvad giver det af muligheder ? T: Stilhed

I: Jeg tænker du nævnte at I skulle til at forske i tidevand, er dig der sidder og får de tander

T: Ja sammen med andre. Nu er det på tide at vi sætter fokus på tidevand. Nu er det lige det der er lige nu. Vi har snakket om tidevand i mange år. Det har været på et overordnet niveau og vi kan se at tidevand kan spille en rigtig stor rolle i vores fremtidige energisystem, så nu er tiden inde til at bruge energi på det også. Vi er ved at etablere en projektgruppe der virkelig skal gå ned i detaljerne, er der virkelig et potentiale på Færøerne og hvilke teknologier skal bruges, hvad koster det. Det er en ting som jeg synes er rigtig spændende også når det bliver lidt mere konkret, så jeg kan få lov til at springe videre til det næste. Det synes jeg vigtigt. Når et projekt er blevet håndgribeligt og klar til at lægge ud til en projektgruppe, så tager de over og så forsætter jeg.

I: Du er udviklingen og når det skal søsættes, så sejler det sin egen vej ? T: Yes. Ellers drukner man i alle projekterne. Det synes jeg er vigtig at man har en projektorganisation, der kan tage over, når det er modnet til det.

I: Du har fuldstændighed friheden til at gå efter ideen og skabe noget hvis den opstår?

T: Hvis jeg kan overbevise min ledere, det gør jeg ofte ved at visualisere og fortælle lidt om priser og perspektivet i denne løsning, så hvis begrundelsen er god nok så har jeg lov til det absolut, men de er meget, det er ikke bare sådan at jeg kommer hjem med et projekt, som er dødsfødt fra start og det går du bare i gang med

I: Nej selvfølgelig

T: Der skal virkelig være noget feedback og sådan.

I: Vil det sige at der er en form for medejerskab for de ting?

T: absolut, som er meget vigtig. Selvom man ligesom kommer med en god ide så er det vigtig at få de andre med på ideen og de føler ejerskab i den så den ligesom forankre sig i virksomheden, så alle ligesom føler. Det er vi en del af og vi var med til at udvikle et eller andet.

I; Medejerskabet er altså en vigtig ting i virksomheden?

T: Ja absolut. Det er derfor det er vigtig at man i denne her afdeling lytter til hvad andre har at sige. Der er jo mange. Mange spændende projekter de kommer jo helt nede fra, uden at det skal lyde negativt, gulvet af og op efter.

Appendix 4 / Interview med Bogi Jensen – Tidligere professor ved DTU og rektor ved Glasír i Tórshavn. 14/10 2014. Time: 00:41:06

I: Er vi klar? Vil du starte med at præsentere dig?

B: Mit navn er Bogi Bech Jensen. Jeg er professor indenfor energi på universitet på Færøerne.

I: Jeg har jo været ved SEV og fået lov til at følge dem og en del af implementeringen af de nye vindmøller. Noget af interviewet vil omhandle deres målsætning Og her tænker jeg på deres fremtidsperspektiver og omkring de innovative løsninger de har. SEV har jo den målsætning at 75% af deres energi i 2020 skal komme fra grøn energi, hvor noget af det kommer fra vind og noget af det kommer fra vand. Til trods for at de nu har en grønenergi på ca. 60 procent, så er det et rimeligt ambitiøs målsætning.

I: Hvordan vurdere du mulighederne for at indfri de mål med de teknologier der er på marked i dag?

B: Det mener jeg burde være muligt, men hvis de ikke udbygger deres vand, så bliver det lidt udfordrende for dem, så tror jeg ikke med den

teknologi som de bruger lige nu, hvor de bare installere nogle vindmøller, som de kan styre, men stadig så tror jeg at de der ekstra 15 % det kan blive lidt svært. Men hvis man kigger på Sandavágu så er der overhovedet ingen vind der overhovedet, så der er der stor potentiale. Hvor stor procent del af hele landets forbrug, der er i Sandavágu , det er jeg ikke klar over. Der kan de i hvert fald installere lige så mange vindmøller som de har gjort her på Main land om det giver de der ekstra 10 procent på landbasis eller 7 det ved jeg faktisk ikke. Men udover det så arbejder de nu med et batteri, som jeg tror kommer til at hjælpe virkelig meget. Du for problemer om sommeren, fordi om sommeren er der ikke specielt meget vind og ikke specielt meget vand, det bliver deres største udfordring, at klare noget om sommeren. Men det er 75% på års basis til 2020, som er om 6 eller 5 år.

I: Når du siger batteri, så er det for at gemme den energi i vinterhalvåret?

B: nej, de er meget kortvarig batteri. Der er stadig vind og regn om sommeren. Om de kommer til at installere solceller, det er ikke sikkert. Solceller er stadig en lidt dyr løsning, men de er begyndt at tale om tidevand. Men det er en endnu dyrere løsning. Om de kommer til at installere det før 2020 i stor Scala, det tvivler jeg på.

I: Er teknologien så moden i tidevands teknologier, at den er mulig at implementere?

B: Der er færdige produkter i dag. (...)

I: nu springer jeg lidt... den færøske befolkning virker teknologisk visionære, de ved noget om vand, vindmøller og varmepumper - sammenlignet med DK er det meget innovativt og nytænkende, hvor kommer jeres interesse fra?

B: mange husstande har store udgifter til olie, det inspirerer til nytænkning, gode ideer spredes hurtigt i små samfund, og vi interesserer os generelt for vedvarende energi, og besparelser

I: Grønland er på ingen måde innovative og nytænkende

B: innovationen fylder meget på Færøerne - vi er hurtigt gået fra landbrug til teknologisk fiskeri, og udviklingen går hurtigt. Jeg er professor indenfor energi, så jeg forstår som ikke menigmand ikke forstår, så man er glade for mine forklaringer, og fordomme rykkes let til forståelse

I: det er en god egenskab, hvor vi er modsatte i DK, hvor folk er stivsindede og traditionsbundne, og hvad nu med omkostningerne..? vi er ikke så visionære

B: på Færøerne har vi den Aller billigste energi, den er grøn, og der er masser af vind hvorfra den billigste energi kommer

I: ja, og så er det let at være grønne

I: Micro insulated systems har vi også været inde på, og jeg kan forstå at SEV vil udvide med endnu flere vindmøller, er det så en løsning med pump storage - hvor langt er men med den teknologi?

B: teknologien i pump storage fungerer fint, men hvis man ønsker at styre det som varmepumper etc., er vi ikke så langt endnu, men det kommer - det kræver at en motor kan styres og levere som en generator. der tales også om stand-alone systemer, hvor man har vindmøller som KUN pumper, og en Hydro generator leverer inde på nettet, altså vindmøller med en meget stor buffer til storage, og herefter via konverter ud til nettet. konverteren har en kondensator som lagrer energien millisekund bases, og kan IKKE oplagres i større enheder som timer eller min. stans-alone storage systemet virker på samme måde, men kan oplagre i timer eller dage, idet som nu svarer til kompensatoren, endog uger eller måneder kunne lagres hvis vandreservoiret var stort nok - det er der dog mulighed for at lave dem, men det vil optage lagring som kunne bruges til andet, og det vil kræve et indgreb i naturen..

B: om det kan løses om sommeren, vil kræve yderligere forskning. hvis der derimod er penge nok, kan der bare etableres flere vindmøller, og så er lagrings problemet ikke så centralt - alternativ til stand-alone er vindmøller som leverer direkte til prober på nettet som er aktive brugere, som styres i forhold til vindmøllerne, det mener jeg burde være lidt billigere, fordi du får højere autorisation af alle vindmøller, og derved levere mere energi end på nettet, og ikke al energi behøves at gå igennem pumpen, som har en virkningsgrad.

I: man taler om at yderligere 500 øer på verdensplan kunne drage fordel af den overgang i har fra olie til vedvarende energi, tror du at DK kunne drage fordel jeres udvikling?

B: ja DK kan bruge den variable styring af varmepumper, elbiler - dog har DK ikke mulighed for pump storage, men ligesom alle andre lande kan i benytte styringssystemerne. et problem er den varierende vindstyrke, fordi der er behov for en vis min. belastning, output skal altid være ens, ellers flytter frekvensen sig, for at den skal matche kunne man bruge varmepumper og elbiler om natten, på den måde kan DK/Europa/verden få mere vind ind på nettet, ja vind er jo den billigste af de grønne, ja muligvis der billigste overhovedet jf. rapport i inginøren.dk inviromental impact medregnet. Men vind kræver, at man kan styre belastningen, for at beholde stabiliteten og frekvensen.

I: I DK er der ramaskrig over den manglende udnyttelse af energien, som vi sælger billigt til Norge, for at købe den dyrt tilbage.

B: Den problematik kunne varmepumperne løse - der er ingen grund til at forsøge at udnytte energien, hvis den ikke lagres/bruges fornuftigt, og etablering er meget dyrt (dårligt brugte skattepenge). Grundet danmarksbefolknings modstand til onshore møller, må fremtiden ligge i offshore parker, der er ikke andre plausible grunde, og offshore etablering/udnyttelse er næsten dobbelt så dyr i samlede omkostninger pr. kWh, altså er de landbaserede løsninger langt billigere. Bonus, som nu hedder Siemens er en af lederne indenfor offshore har været dygtige til at reducere prisen, så cost of energy er 100% i fokus hos alle vindmølleproducenter æstetisk bliver løsningen for DK nok offshore placeringer. SEV fremtidige målsætning lyder på "100%", måske om 20-30år, sagt af Tejri i nordisk råd... et meget ambitiøst mål, som måske må suppleres med veje og fuel.

Appendix 5 / Interview Rói Joensen – Tidligere maskinmester hos Hiddenfjord 12/10 2014. Time 00:30:10

I: Ja, vil du starte med at præsentere dig og fortælle hvad det er du laver

her ved Hiddenfjord.

R: Mit navn det er Roí Joensen og jeg er ansat her ved Hiddenfjord

som maskinmester og min hoved opgave er, at have al de tekniske dele på plads så sikkerheden også er på plads. Ved siden af det vedligeholde systemet og være en del af hele udbygningen, få det så godt så muligt, igen fokusere på sikkerheden den vej.

I: Kan du fortælle hvad Hiddenfjord er for en virksomhed?

R: Her på stationen er det ligesom startskuddet til det hele, her importere ved laks, vi starter med laks helt ned et gram og så kører så med dem her på stationen, hvor de er 1 kilo, når de bliver sat på søen. Vores arbejde er at holde liv i de her små fisk.

I: Kan du så forklare sammenhængen med Hiddenfjord laksefabrik og Power Hub?

R: I med at vi producere 4 millioner små laks om året, så produktionen er hele tiden I gang. I takt med at vi har forøget størrelsen af laksen fra ca. 900 gram til op imod et kilo, så øger vi risikoen på land, hvis noget går galt. Det med at vi har implementeret Power Hub, det er sket sammen med min chef og først og fremmest Thomas, som kom og introducerede os for Power Hub og spurgte om vi ville være med i et projekt. Der gik efterfølgende et par dage og så kom han tilbage og sagde at vi godt kunne være med. Det er også ligesom for at bakke op på sikkerheden her.

I: Hvilken betydning har det, hvis I går uden strøm her? #00:03:25-3#

R: Det der sker rent praktisk, hvis vi går uden strøm. Hvis der kommer en Black out hvis vi har en 1/2 time uden strøm på stationen, så kan vi miste det hele arrangementet. Så er det slut, så må vi starte op forfra igen. Det tager et helt år om det. For at undgå dette har vi installeret 6 generatorer på stationen så vi kan lave vores egen strøm på stationen. Den kan vi selvfølgelig starte op, men i og med vi via Power Hub kan prøve at undgå det et såkaldt Black out, så skal generatorerne være med til at starte op, før en evt. Black out. Vi kan hænge på nettet og evt. overtage. Hvis der kommer en Black out og hvis vi mister det hele så er det mange millioner

det drejer sig om. Det er ikke bare det at vi mister fiskene, det drejer sig også om 20 millioner eller mere. I slut værdi ville det selvfølgelig være meget mere. Power Hub er altså en ekstra forsikring.

I: Nu er der 3 virksomheder der er en del af det her Power Hub indtil videre og når der så kommer et Black out så betyder det at så bliver der skruet ned for strømmen i herude.

R: Hvis du har et fuldt udbygget Power Hub, så er meningen at når vi er færdige med at få Black out og power hub starter generatorerne, så har de mulighed for at trække på vores generatorer for den overskydende vi har og stabilisere nettet. Altså for at give El leverandøren tid og mulighed for at stabilisere sig. og det et er meningen I fremtiden at få flere anlæg på, så de har den back up også.

I: Det vil sige når Tejri skal ud og finde kvalificerede emner til Power Hub projektet, så skal de have generatorer. Nu ved jeg hospitalet gerne ville have med - er det så fordi de ikke har generatorer?

R: De har generatorer, men de hvorfor de ikke kan være med kan jeg ikke svare på. men I og med vi har 2 MWh her, så er det jo en stor effekt, det kunne måske være en af grundene.

I: Når I er med til sådanne projekter, som Power Hub får I så en kompensation, for at deltage og yde jeres bistand, ligesom man kender det var andre eksempler. ?

R: De har en kontrakt klar, hvis det bliver til noget med Power Hub men vi har ikke lavet den endnu, men det arbejde, der er blevet lavet her opsætningen på power hub stationen, der er ikke noget vi har betalt for.

I: Det er en lille form for kompensation? R: Ja det kan man sige – vi har givet vores viden og kompetencer. I: Er det en mentalitet der ligger til det færingen generelt, at man løfter i flok?

R: Ja, man kan sige I denne her situation: den her situation, er det jo en Win Win, men vi tænker selvfølgelig også først og fremmest på os selv i denne situation.

I: Hvis I er en attraktiv virksomhed for SEV og DONG, så kunne I måske

godt have sat sig lidt på bagbene og sagt så forlanger vi sådan og sådan

R: Vi er et øsamfund og det kan være svært at finde nogle interesseret partnere til at afprøve så noget system I et øsamfund. Vi køre jo meget på vand go rigtig meget på olie derfor er det også vigtig at give noget. Vi gør meget her på stationen, vi bruger også varmepumper og vekslere, vi prøver hele tiden.

I: så når I tænker innovative og fremtidsperspektiver, så tænker I grønt med et samme? R: Ja, det går den vej, så grøn så muligt.

I: Det er meget tankevækkende, lige meget hvor jeg har været så virker det til at færingen tænker meget grønt.

R: Vi har jo også vand, vi har vind og vi har strøm, vi har rigtig mange muligheder, som ikke er prøvet. Der er mange muligheder.

I: Det er måske også en udfordring for det skrøbelige el net.

R: Teknologierne er blevet bedre nu og el leverandørerne er mere åbne for nye ideer go nye muligheder.

I: Jeg kan forstå at SEV har været en lille smule konservativ med hensyn til nytænkning.

R: DE har været meget lukkede for at sige det som det er. Det har jeg også sagt før og jeg kan også sige det..

I: Det har alle sagt, det har de også selv sagt. Så det stemmer meget godt over ens. Det har selv sagt at de betegner dem selv som ret konservative lige indtil for nylig.

R: Ja, så det er meget, hvad kan man sige...Det er blevet mere sjovt, det er meget mere åbent det hele.

I: Hvordan er det blevet mere åbent?

R: Jamen I og med, bare det med Power Hub, kan man sige. Du for mere information, du for mere kontakt.

I: Kan det være fordi DONG er med indover, at I for mere kontakt og mere

information?

R: (Tvivlende) Muligvis, altså, der skal jo penge til for at komme videre. SEV er jo folkets ejendel kan man sige, så de har ikke så mange ressourcer til at komme videre, så man må ud go hente penge go.

R: I og med at Færøerne ligger som de ligger så er det et godt område til at prøve det af, som også kan hjælpe os selv.

I: Der er også tale om en Win Win. DE for lov til at afprøve nogle ting og får viden.

R: Nu siger du varmepumper og sådan noget. Det har fået implementeret herude?

Ja, I det nye, vi har udbygget I fem år, ca. go I det ene system har vi implementeret en varmepumpe til opvarmning af vandet således at vi ikke køre på olie, hvor vi igen veksler på temperaturer, så vi kører med omkring 14 grader.

Appendix 6 / Interview 5 Tejri Nielsen - Projektleder ved SEV 9/10 2014. Time 00:27:35

I: Vil du starte med at præsentere dig selv.

T: Mit navn er Thomas Jensen. Jeg arbejder ved SEV som ingeniør og projektleder. Jeg en blandt omkring ca. 14 ingeniører her. Jeg afsluttede min ingeniøruddannelse i 1999 fra Århus Universitet. I øjeblikket arbejder jeg blandt andet som projektleder for et samarbejde mellem SEV og DONG Energi, kaldet GRANI. Ved du hvem GRANI er og sagaen bag?

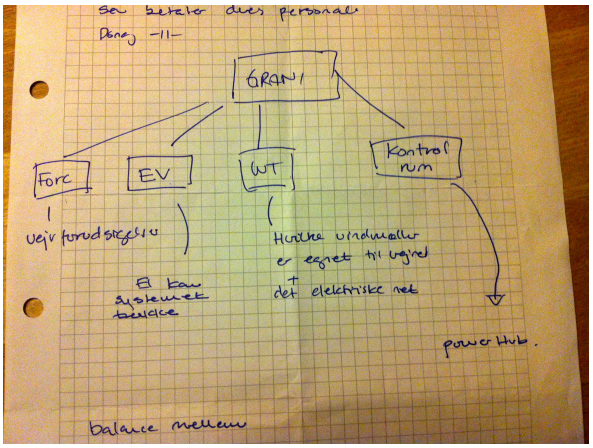
I: Nej

T: Det er en gammel norsk saga og navnet på Sigurd ottebenede hest, som han havde fået af Odin... (smiler) Nå men GRANI har det primære fokus at integrere vindenergi og andre vedvarende energier i vores el net. Vi er på Færøerne i samarbejde med DONG selvfølgelig, det største levende laboratorium for testning af intelligente teknologiske løsninger.

I: Kan du uddybe jeres samarbejde lidt mere i detaljer?

T: I GRANI betaler vi hver især for det personale der indgår i samarbejdet. Det er en slags paraply samarbejde, det er vist lettest hvis jeg tegner det på tavlen. Samarbejdet har åbnet op for mange spændende nye visioner for fremtidens produktion af el. Varmepumper og tidevand kan også i nær fremtid komme i spil, hvis det kan styres via intelligente software systemer, som f. eks Power Hub. Det er en meget innovativ proces, som vi er glade for at være en del af.

Tegning:



FORC: Vejrforudsigelser EV: Hvor el kan systemet trække WT: Hvilke vindmøller er egnet til vejret og det elektriske net KONTROLRUM: Power Hub.

T: Vi skal indvie vores nye vindmølle Húsahagi på torsdag, der er du selvfølgelig med. Det bliver et stort arrangement med over 300 mennesker på Hotel Føroyar. Vi kører derop forbi senere i dag, du skal lige ind og se en vindmølle indeni og det kunne da også være interessant for dig at se anlægget inden på indvielsen. Det er 13 nye vindmøller, der et stort projekt og vi kommer til at blive endnu mere grønne.

I: Er du også projektleder på det projekt?

T: Ja, men det har været en meget lang proces. Den første vindmølle, Andersine blev sat op i 1993. Det var ikke noget SEV på det tidspunkt ønskede at gå videre med, teknologien var ikke helt moden og vi har også altid været lidt konservative her hos SEV, vi kan godt lide at gå med livrem og seler.

I: Hvordan er I så kommet så langt?

T: I 2003 valgte en ekstern virksomhed at sætte 3 vindmøller op, Røkt hedder de. DE sætte tre vindmøller op fra Vestas og på et år producerede 3% af den samlede energi.

T: Og i 2005 kunne vi sætte tre vindmøller op i Neshagi. SEV er ejet af kommunerne og er dermed en nonprofit organisation, hvorpå Røkt er privat. Det er en længere historie, den må vi tage på et andet tidspunkt.

I: Så det var Røkt, der var de første rigtige mht. til vindenergi?

T: Tja, det kan man vel måske sige, Vi har måske bare ventet lidt længere. Vi ligger godt placeret her i Atlanten med hensyn til vand og vindenergi og med de nye teknologier, der er på markedet, er det blevet mere interessant. Det kræver, at vi er innovative og åbne overfor nye tiltag. Vi er også blevet meget mere opmærksomme på, at vi som organisationen nød til at følge med i udviklingen, der er også et stort økonomisk grundlag for at gå den grønne vej, olien stiger og stiger og det er ikke en udvikling, der stoppe. Så det med at finde både grønnere og billigere løsninger, er attraktivt på alle områder. Der er vi nok lidt heldige med vores placering, i forhold til at mange andre.

T: Tiden er desværre ved at rende lidt fra os. Vi skal en tur ud på sundsværket.