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UNIVERSITY OF TECHNOLOGY

THESIS FOR THE DEGREE OF MASTER OF SCIENCE

A market study for small scale wind turbines in Swedish rural areas

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CHALMERS UNIVERSITY OF TECHNOLOGY
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Abstract

To successfully bring an invention to the market, knowledge about the customer and understanding of the market and its environment is necessary. This study aims to create a more profound understanding of the Swedish market in rural areas and its actors for Ventus Robur, a company developing small scale wind turbines. The objective is to give more experience so that a business model can be created for Ventus Robur.

Semi-structured interviews were used in this study to gain knowledge from customers and knowledgeable people in the energy sector. Eleven interviews were conducted to gather information about the potential and current view of the market, and what could be done to exploit the market. Eight interviews were held with potential customers to understand their pains, gains, communication channels, and the product specifications for a small scale wind turbine.

The study used theory about markets as networks of actors where people, organisations and technologies act, together and on each other. Theories about bringing new technologies to markets were utilised, and the importance of government support through policies and cooperation's with other actors in the markets was investigated. The combined business model canvas and PEST-tool is introduced and used.

The result of the study shows that there are a clear interest and a positive view of investing in small scale energy as long as the investment can financially be comparable or better than solar power. The study indicates that farmers, manufacturing plants and camping spots are potential markets if the criteria above are fulfilled. There are also indications that potential customers worry about future energy prices, thus creating a demand for investing in their energy generation rather than the sustainability aspects.

Wind turbines are heavily dependent on wind speed. This is a reason why the market is small and will most likely remain, so if macro factors like policies and energy prices do not change. It is, at this moment, proposed that Ventus Robur further explores other applications, rather than saving money on the electricity bill.

Keywords: Market analysis, Sustainability, Green energy, Small scale wind energy, PEST, Osterwalder, Business model canvas, Customer Development, Start-up.

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1. Introduction

From a certain angle, the start-up industry can be seen as very glamorous, with successful examples such as Spotify, Sigma Stocks, Icomera and Klarna. However, few companies expand to these sizes; Bhide (2003) has found that only 5 – 10% of the start-ups give any significant returns to their owners. Start-ups can meet an early demise in a multitude of ways and for several reasons. A lack of market analysis is one of those reasons, as tech start-ups commonly focus on the development of the best product under the presumption that it will sell itself, as managers often overestimate how attractive the innovation is (Aarikka-Stenroos & Lehtimäki, 2014).

Unfortunately, this is also true for the start-up Ventus Robur. Even though Ventus Robur has a pending patent with a top-20 placement in Venture Cup Idea Hunt (start-up award), a market analysis has not been conducted yet, and no customer has yet been found. Literature suggests that market discovery is undertaken at the same time as product development (Berglund, u.d.; Osterwalder & Pigneur, 2010). Currently, a prototype is being built, and a clear market strategy is needed. Bhide (2003) has found that 93% of the successful businesses had changed their strategy during contact with potential customers, and this is likely needed for Ventus Robur as well.

Ventus Robur was founded in 2012, then called Aqua Robur running a project developing small scale water turbines. The project pivoted, and a new business was created; the name was transferred to a new firm running separately from the firm now called Ventus Robur. Ventus Robur started its operations again in late spring 2018 with the development of a new type of wind turbine. Since then, the technology has been further developed, and an application for a patent in Sweden has been sent. The vertical wind turbine that Ventus Robur currently develops is innovative in a multitude of ways, by using two separate wings that counter-rotate; the idea is believed to have an increase in energy output as well as reducing noise and vibrations in comparison to existing turbines.

The technology is currently under early testing, and the goal is to reach a finished product in 2020. The company aims to develop a small wind turbine, as vertical wind turbines have been proven suitable for small scale electricity generation (Olausson, 2010). Ventus Robur is now in a stage where the development of the product needs to be accelerated to verify the technology, and at the same time find the right customer for the product (and vice versa).

Considering the need for sustainable power generation, this thesis aims to find out if there is a possible market for small scale wind turbines, but there is also the possibility that the market is non-existent and needs to be created. Either way, a strategic proposal will be provided for Ventus Robur.

1.1. Background

Previous research on the subject of small-scale wind energy generation has found varying results. Nilsson and Cisneros (2015) have found that small scale wind turbines could be used for street lights on roads utilising the accelerated windspeeds from passing cars, and have estimated a potential ROI on 5% - 10%.

Wu (2016) states that many previous projects with wind turbines in an urban environment have failed to achieve their goals of profitability due to an insufficient amount of expertise regarding the measuring the actual wind directions and forces on the proposed mounting spot for the wind turbine. Furthermore, Wu (2016) also suggests that further studies are required on the issue of power generation in urban environments, and especially on the way wind turbines and solar power can complement each other as sustainable power sources.

In “Small-scale wind turbines: introductory market study for Swedish conditions” Thorstensson (2009) summarises that to reach a large market for small scale wind power in Sweden, the government needs to ease the conditions for small energy producers. The most appropriate market is detached houses, farms and summer houses along the Swedish coastline. Thorstensson (2009) proposes that the key is the environmental benefits rather than the economic gains from reducing energy costs, but a reasonable payback-time is also needed.

1.2. Purpose

There is a growing market for small scale solar energy (Lindahl & Stoltz, 2017; Psomopoulos & Kaminari, 2015); however, this pattern cannot be seen in the small scale wind power business in Sweden. Even if wind energy is proposed to be an essential energy type for reaching a sustainable energy market (Kinnaresa & Sawetsakulanond, 2013; Energimyndigheten, 2018). In a list published by Ny Teknik (2009), out of 26 companies selling or developing small scale wind turbines, only five of them are still in the same field, and none of them seems to receive any significant profit on wind turbines themselves, but rather from selling other products (mostly solar panels). This is also indicated by a market analysis of the Swedish small scale wind turbine market that states that the range for small scale wind turbines has been reduced drastically between 2016 and 2017 (Noden för näringsliv- och affärsutveckling, 2017). To be able to scale up Ventus Robur, something special needs to be done to differentiate it from the seemingly dying or decreasing market.

To find a product-market fit, it is necessary to find the right customer first. The concept is often referred to as "Customer development" (Berglund, u.d.) and refers to testing the proper method for acquiring the customers, finding the resources for scaling the business, building the right product features, and identifying the right market (Cooper & Vlaskovits, 2010). This study will try to find out whether there is a market for Ventus Robur´s wind turbine or such market needs to be created, thus providing a strategic proposal for the company. It is possible that the result of this report is useful in economies and geographic areas similar to the ones of Sweden, and thereby gives a possibility to create an impact on the total amount of energy generated by small scale wind turbines overall. The report also provides reflections of the frameworks used and its usefulness in this case.

1.3. Objective

The objective is to analyse the potential market, using the PEST analysis to reach an understanding of such a potential market, namely whether there is one in the Swedish area, who the customers are, and what they want. A value proposition for Ventus Robur AB will be created based on the findings of this thesis and will be shown via the business model canvas tool by Osterwalder and Pigneur (2010). Finally, there will be proposed a market strategy to reach potential customers and a product-market fit.

The models used for verifying the value proposition and market analysis tools will be critically evaluated, their usefulness in the specific case will be assessed, and suitable modifications will be undertaken to fit the premises of Ventus Robur. The research questions are formulated to provide a foundation for the dimensions of the channel, customer segment, and value proposition in the business model canvas tool.

Research questions:

- *What are the opportunities for small scale wind power as sustainable alternatives in the Swedish area?*
- *Who are the potential customers in rural areas?*
- *Which value proposition is needed to gain potential sales in the preferred customer segment found above?*

1.4. Limitations

The focus is on the Swedish area due to complexity; analysing the European market would require a considerable amount of time and resources. The report does not go deeper into the technical aspects of wind turbines., and wind factors are disregarded when talking to customers. In reference to Wu (2016) elaborating on the problem with placing wind turbines in urban areas, the authors have deliberately chosen to focus on rural areas. Even if the technology may be proven suitable for urban placement, wind energy is low compared to rural areas. Mainly customer segmentation, value proposition, and channel will be researched for Ventus Robur as these three business model dimensions are the ones most significantly connected to the success of start-ups (Ladd, 2018).

2. Methodology

In this thesis, an abductive research approach has been adopted. Abductive reasoning can be explained as making the most plausible inference based on incomplete information such as interviews et cetera. (Folger & Stein, 2017). Interviews will be conducted, but they will not encompass all actors within the field of small wind turbines. The abductive approach provides the most plausible answers to the research questions.

Furthermore, according to Dubois & Gadde (2002), an abductive approach enables the researcher to constantly assess and develop their theoretical framework to suit acquired information. In this thesis, the authors started with previously known and used market analysis tools. However, during the thesis, the application and use of the tools have been altered slightly to suit this study.

2.1. Semi-structured interviews

Primary data will be collected through the use of interviews. There are several ways to conduct scientific interviews: either a very strict and rigid list of specific questions that can be followed, or the interviewee can speak freely about the subject under discussion giving qualitative data. Structured interviews are commonly associated with quantitative data since the main focus is on reliability and validity (Bryman & Bell, 2013). Qualitative data, on the other hand, is messy and subjective, relying on post-processing by the data gatherer to reduce cognitive biases (Croll & Yoskovit, 2013). The answers in qualitative interviews are often detailed, while the answers in a structured interview are concise and direct since the researcher needs to quickly compile and sort the data (Bryman & Bell, 2013).

This report is using semi-structured interviews. Since the research in this thesis will follow an abductive approach, there is not a hypothesis that is needed to be approved or disapproved as per the deductive approach, and the thesis is not starting without theory as stated by the inductive approach. Thus, a semi-structured interview approach sets a framework that can complement abduction and delineate what should be discussed, but not how and in which order. The interviewees will be conducted with both potential customers and industry professionals (Bryman & Bell, 2013).

Doing interviews with customers, without making them give the interviewer the answer the interviewer want, is a hard task. Getting the wrong answers from the customer might lead to even worse results than not talking to the customer at all, as they can deceive the company in building a business model that the customer does not actually want. The trick of getting the customers not to lie is asking the right questions (Croll & Yoskovit, 2013; Fitzpatrick, 2013). The three basics are: talking about the customer's life and not the company's solution, talking about the past and not the possible future, and talking less while listening more (Fitzpatrick, 2013).

The questions that the interviews are based on can be seen in Appendix 1. These questions are used as a handrail, but the purpose is to keep the interviewee talking; most of the questions will not have to be asked but answered by the interviewee itself.

2.2. Interviewee selection

Interviewees have been selected through purpose sampling; purpose sampling occurs when the researchers deliberately choose an interview subject, and it is strongly connected to quantitative research studies. In some instances, this has led to "snowball selection"; an example of snowball sampling is the case of interviewees referring to other interesting people or organisations within the field, after the interview in which they have participated themselves has been concluded (Bryman & Bell, 2013). The purpose sampling has been conducted in accordance with the aforementioned limitations and research questions. The goal was to have both customer and non-clients, such as government officials, industry associations and other experts. The potential customers were interviewed to find opportunities in the market while the non-clients were chosen to give a comprehensive picture of the market and to create relationships and networks in the business.

2.3. Ethical consideration

At the start of every interview, the interview subjects were asked if it was okay that their answers and/or views might be published in this report. The information acquired from the interviews has been analysed in an unbiased manner. The authors have a vested interest in the information is as correct and truthful as possible, both for regarding the purpose of correct academic conduct, as well as for the company Ventus Robur itself.

2.4. Research process

The study builds upon earlier market studies of small scale wind energy in Sweden. by Thorstensson (2009) and Ruin (2017). These studies focus on the financial viability of small scale wind turbines and one of the small scale wind turbine ecosystems in Sweden, respectively.

In market analyses, there are two approaches to gain knowledge about the market. The first approach seeks knowledge from the insiders in their own businesses, using the ones closest to the customers to gain understanding, or through looking into the already owned data on customers. This is especially useful in business-to-business markets, as they are usually based on good relationships (Kuada, 2008). The other approach reaches out to the actors on the market directly. This commonly consists of quantitative studies and structured interviews. This is frequently used, as it is argued to widen the available business opportunities for the company (Kuada, 2008; Ikiring Onyas & Ryan, 2015). Engaging in the market with an exploring mind creates opportunities to exploit markets and develop innovations through market-shaping activities (Mele & Russo-Spena, 2015).

The goal of the market analysis is to identify some critical factors for the business. Toro-Jarrín et al. (2016) propose the following: finding and evaluating political strategy, macroeconomic forces, key trends, market forces, industry forces, customer relationships, business strategy, and performance dimension.

Interviews were held in order to gather knowledge about the current market for small scale wind energy, what opportunities there are to expand in a macro and micro level, who the potential buyers of a small scale wind turbine are, and what and why the customer would like to buy. The interviews consist of a mixture of people with insights in the Swedish energy sector, people engaged in renewable energy, resellers of wind turbines, experts on small scale energy, and potential customers like farmers and manufacturing plants. There was no clear differentiation between interviewees being potential customers or knowledgeable people in the energy sector, but the purpose with the wide group was to create a perspective of the market from a customer and a more “objective” perspective which, in this report, will be referred to as “industry professionals”.

Potential interviewees for industry professionals were found by looking at different industry organisations, through already created contacts within the energy business or new contacts established by the snowball effect. This process led to interviews with subjects having a macro perspective of the energy business, one existing competitor, one former wind turbine developer, some energy engineers within the facility and constructions business, and some resellers of small scale wind turbines. The focus of these interviews was on finding out about macro perspectives, such as governmental regulations, public opinion and the reasons the market has not grown at the same speed as solar energy.

Sustainable technologies commonly require changes in the macro environment to create a suitable environment for innovation (Planko, et al., 2015); therefore, the use of an analysis tool for the current macro environment is called out for. PEST is used to create a view of the current macro environment and to visualise what macro forces need to be changed to promote the expansion of the small scale wind energy market in Sweden.

The interviews are complemented with contextual information about the Swedish energy market, building permits and regulations, and organisations in the business ecosystem around wind energy, that was analysed and made a fundamental aspect of a PEST analysis.

The potential customers were chosen from existing contacts and industry organisations who had shown a clear interest in the development of Ventus Robur's wind turbine. The interviewees were possible pilot customers and had an already existing engagement in renewable energy. The focus in these interviews was to gain deeper knowledge in what the customers want, what is valuable when investing, how they want to buy products and their pains and gains regarding energy.

The results are presented in a business model canvas as a proposed business model for Ventus Robur with focus on the dimensions of channel, customer segment and value proposition, and PEST analysis are conducted.

The business model canvas is chosen as it is commonly used in the industry and is closely connected to the customer development theories proposed for start-ups. The tool is mainly used for its simplicity, practice orientation and "plug-and-play" methodology, which make it very useful for business starting from scratch and not been completely thought through already (Spanz, 2012; Ching & Fauvel, 2013).

3. Theoretical framework

A market is dynamic, fast phased and unpredictable, consisting of multidimensional agents and actions between them. To create innovation, a manager needs to understand that it is not only about the company affair, but an issue on shaping the market (Mele & Russo-Spena, 2015).

Creation of a business model is important for a company, as it is associated with expanding the company's advantages in its market (Johnson, et al., 2008). Financially successful companies put twice as much importance to the business model as less financially successful companies (IBM, 2007; Wirtz, et al., 2016). However, the academia has not decided upon one single definition of a business model; the most frequent uses of relevant notions refer to "business idea", business concept", "revenue model" or "economic model" (Magretta, 2002).

The art of creating a working business model is as much based on intuition as it is on analysis, and it requires in-depth customer knowledge (Teece, 2017). To engage in business model innovation, anticipating change is crucial, requiring the business to search for knowledge in a diversified area, as no one knows if the opportunities come from politics, technology or someplace else. Scanning all areas around the business can reveal new insights leading to new opportunities (Schoemaker, et al., 2018).

This chapter will further go into the concept of business models, explaining Osterwalder's and Pigneur's (2010) business model canvas tool, as well as the way to design the business model and PEST-tool for analysing the current markets for small scale wind turbines.

3.1. The actor's approach to the market

The actor's approach to the market means that market consists of actors, and their actions produce results – on which they may reflect and learn. Meaning that the market analysis itself will affect the market. This means that an observed pattern or opportunity is just one out of many possible and markets must, therefore, be studied relationally. The term "agencing" refers to the actions constructing the market between the agents, referring to the efforts enabling the market innovation (Ikiring Onyas & Ryan, 2015) and "*strategies for realising sought-after economic agencies*" (Callon, 2008). The Socio-technical approach means that not only the human entities are considered as agents, but also materials and ideas can be seen as agents in the market and useful tools for shaping or creating the market (Callon, 1998).

This also allows, or rather forces the analysis to be an ongoing process, involving studying the results on the market created by the analysis itself, as well as the implementation of the finding from the study (Kuada, 2008). The socio-technical approach, as a part of the actor approach, claims that innovation is created through relationships and arrangements between actors and technology using "market devices" and that every individual on the market is an individual calculative agent (Callon & Law, 2005; Akrich, et al., 2002; McFall, 2009).

Applying the actor approach, and especially the socio-technical approach imposes the importance of looking into the actors in the markets. Rather than finding the rationality of the customer decisions, it allows aggregation of alliances in the market that increases the likelihood of realising the innovation (Akrich, et al., 2002; Ikiring Onyas & Ryan, 2015). Network resource mobilisation is an essential part of innovation, as seldom the innovator has all resources themselves (Hoholm, 2011; Aarikka-Stenroos & Lehtimäki, 2014). Building an ecosystem or network for new technology has been linked with the more successful implementation of new technology (Planko, et al., 2015).

3.2. Implementing sustainable technology

It is common that the implementation of sustainable technology, even when characterised by a superior performance, often fails, as the socio-technical regime supports the existing technologies (Planko, et al., 2015; Caniëls & Romjin, 2008) and some technologies require a change in behaviour without adding any extra value to the customer (Hagardon, 2010). To overcome these obstacles, it is necessary that macro-forces like public policies are driving the development forward (Kemp & Loorbach, 2003; Planko, et al., 2015). Several management literature authors propose that business ecosystems of firms are required to reach a successful market implementation (Planko, et al., 2015).

System building is a concept of creating or reconfiguring value chains and supportive environments for new innovative technologies. System building can be made by one or few powerful actors (Hughes, 1987) but is more often carried out by a network of several actors (Planko, et al., 2015; Garud, et al., 2007). Several "system building" activities have been linked with the success of technology implementation, such as public testing of the technology, research projects, knowledge exchange as conferences, events to attract other actors, favourable policies and lobbying (Planko, et al., 2015).

Entrepreneurs introducing new technologies need to understand that they cannot be "lone wolves", but collaboration is the key to creating the ecosystem (Van de Ven, 2005). The health of the business ecosystem determines the success of the focal firms in it, and the interfirm relationships are essential (Moore, 1996). Well-functioning technology is a critical component in building a business ecosystem; faulty technology can erase the result of all other system building activities (Planko, et al., 2015).

3.3. Market Creation

One initial condition for successful technology implementation is that there is a market for it (Hall & Khan, 2003; Van de Ven, 1993; Van de Ven, 2005; Planko, et al., 2015). Admitting that ideas and technology are agents, underscores the importance of not neglecting technology in the shaping of the market (Kjellberg & Helgesson, 2006). Planko (2015) presents a framework for activities to perform for market creation and for system building when commercialising sustainable innovation.

- Generate new business models
- Creation of temporarily protected niche market
- Collaboration with the government for enabling legislation
- Collaborative marketing to raise user awareness
- Collaborative competition against other technology clusters

When a radical change of technology is brought to a market, the geographical and cultural distance is essential, as are mutual trust and even personal friendship; in addition, "hands-on" experiments with face-to-face interaction with the customers are critical in changing a technical paradigm (Lundvall, 2010).

3.4. Business model canvas by Osterwalder and Pigneur

Osterwalder's and Pigneur's (2010) business model canvas is a tool developed to create a shared view and understanding of the business model. The tool is commonly used in several large companies like IBM and Ericsson and creates a shared language to describe the essentials in the business model. The canvas consists of nine building blocks (see below in Figure 1 Osterwalder Business model canvas (Osterwalder & Pigneur, 2010; Ching & Fauvel, 2013)).

Relying only on product innovation is today seen as unsustainable, as products easily can be copied, and if they are not connected with an innovative business model, global rivals will grab markets fast. Integrating networks, brand recognition and intangible goods in the business model, makes it much harder to copy (Lindgren & Yariv, 2011). A business model is rarely successful from the start but must be revised several times or even overhauled to provide a good result (Teece, 2017).

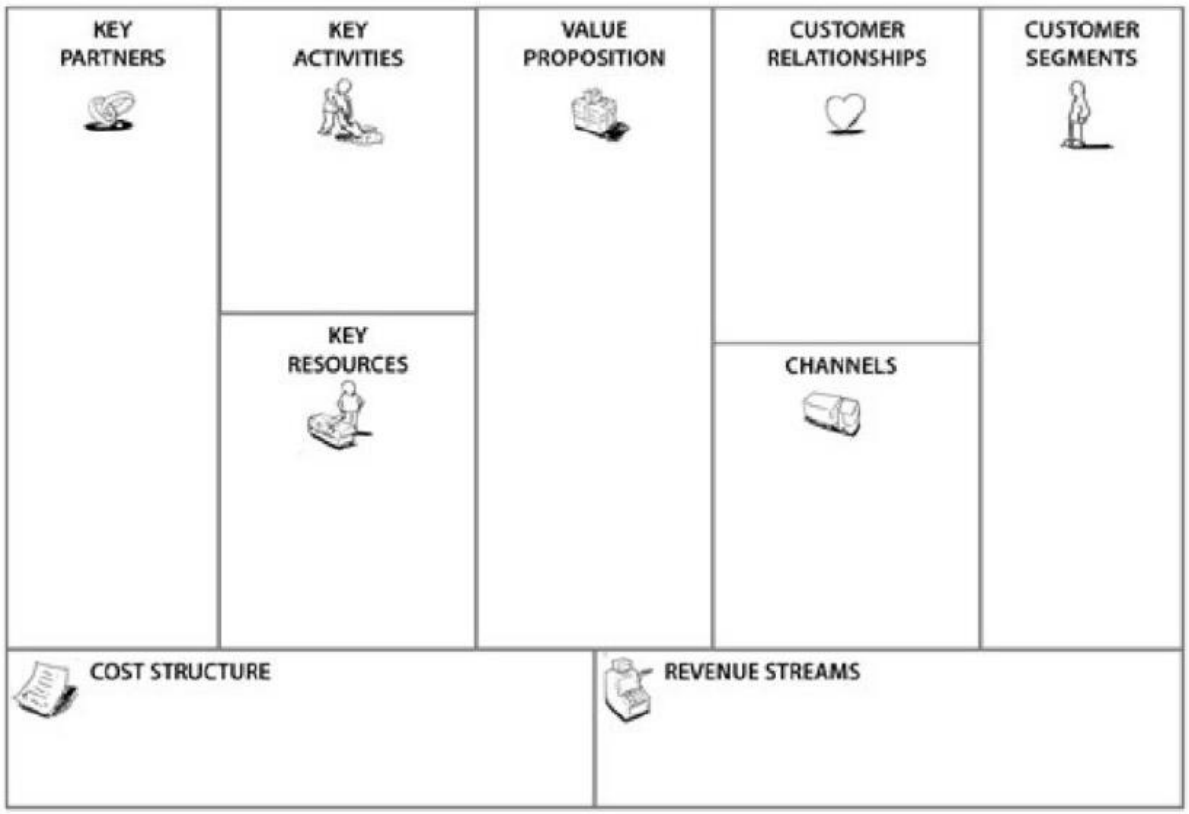

Figure 1 Osterwalder Business model canvas (Osterwalder & Pigneur, 2010).

Customer segment

All organisations solve a problem for one or more customers. The makes the customer a viable part of the business model. Without a customer, no company can survive for long. In the model, one or more proposed customer segments for the organisation should be defined. This building block consists of the most valuable customers for the organisation (Osterwalder & Pigneur, 2010).

Value proposition

What is the value proposition for solving the customer's problem? The value proposition block consists of the value provided to the customer segments. What problems are the organisation solving for the customer? What differentiates the organisation from others? It can, for example, be a lower price than competitors, bringing a new solution to a previously unsolvable problem or giving the customer a certain feeling or status (Osterwalder & Pigneur, 2010).

Channels

How is the value proposition delivered to the customer? What channels are used to communicate, sell and solve the problem for the customer? Channels can be distinguished between direct and indirect channels and owned vs partner channels. Creating the right mix of this is essential in how to deliver the value proposition. Channels to identify are brand channels, sales channels, delivery channels, and post-sales channels (Osterwalder & Pigneur, 2010).

Customer relationship

How does the organisation establish and maintain good customer relationship? The way communication and sales are performed are highly dependable on the customer segments and business type. Defining the way to reach out to the customers is crucial for maintaining and establishing new customers. How does the organisation reach out to customers? Is it done, for example, through a personal salesman or a website? This block needs to be integrated with the customer segment and value proposition (Osterwalder & Pigneur, 2010).

Revenue stream

What are the revenue streams for the organisation? This block contains the way revenues are created in the business – what is the customer paying for, and how are they paying? A classic revenue stream is through sold product, but it can also be sold services or information. The revenues stream could be either continuous or a one-time payment. It also indicates the pricing of the value proposition. How is it priced? Is the price dynamic? (Osterwalder & Pigneur, 2010).

Key resources

What are the key resources for delivering the value proposition? This building block describes the most valuable resources for implementing the business model. It contains resources of different kinds like human resources, intellectual property or financial resources. Essentially, it includes what is needed to deliver the value proposition to customers, how to attract and maintain customers and the other blocks (Osterwalder & Pigneur, 2010).

Key activities

What are the key activities that the organisation is engaged in to provide the value proposition? This block exists to illustrate the most important activities for delivering the value proposition and maintain and attract new customers. For an R&D company, it can be product development, while in a consultancy firm, problem-solving or knowledge management can be key activities (Osterwalder & Pigneur, 2010).

Key partnerships

Here the business key partnerships are described. Which partners are necessary to maintain for the company? It can be manufacturing partners, resellers or similar that is essential for the value proposition. Few companies hold all resources needed to implement everything on their business models but need good relationships with their partners (Osterwalder & Pigneur, 2010).

Cost structures

What are the cost structures to reach the organisation's value proposition? This block illustrates all the costs to reach the value proposition and reaching out to customers or partners. Which key resources or key activities produce the highest costs? Some business models are driven to minimise costs while some are value driven, trying to maximise the value produced by the company (Osterwalder & Pigneur, 2010)

Market fit process

Each of the segments described above needs to be validated, revised or perished through contact with customers. This process is redone until all segments are in accordance with the customers, and thereby reached a "market fit". After this, it is possible to start scaling the business, with a reduced risk of developing a product that no one wants to pay for (Eisenmann, et al., 2011). The change of business model is commonly referred to as "pivoting" in the customer discovery literature, and especially in the context of the Lean start-up (Eisenmann, et al., 2011).

3.5. Limitations of the business model canvas

The tool by Osterwalder and Pigneur (2010) is one of the most popular business model tools used and the website Strategyzer providing the tool, claims it has over 5 million users of the business model canvas (Strategyzer AG, 2019). However, there is a lack of academic study showing its usefulness (Ching & Fauvel, 2013; Ladd, 2018). Spanz (2012) propose some critics to the business model canvas: (a) the tool does not take any competitors into account, thus disregarding both the opportunities and risks associated with competitors on the market, and (b) the tool lacks goals, making it hard to implement as it is, and makes it hard to create any suitable KPI's for the business (Ching & Fauvel, 2013; Coes, 2014). Teece calls for a more practical approach to the business model, where technology is an essential factor, as well as the way the organisation will realise the business model (Teece, 2017). The business model canvas has a lack of strategy, a long term vision and focusing only on one focal company (Lindgren & Yariv, 2011). Chesbrough (2007) argues that this focus on only one company, is not efficient for future innovation in a global world, but rather the business model should be open and allow other actors to integrate with the same business model.

The business model canvas also focuses on financial success, which could make it unsuitable for NGOs and social enterprises etc. This reduces its usefulness as a motivating tool since it entails that only money drives entrepreneurs (Komisar & Lineback, 2001), whereas companies driven by a "higher purpose" are linked to larger financial success (Sisodia, 2009; Eisenstat & Fredberg, 2011). Maurya (2010) finds the business model canvas lacking the solution. Bringing in the solution to the model would motivate the user in creating the solution (Ching & Fauvel, 2013).

The business model canvas assumes that the pieces are tied together in the canvas, while this can be highly individual in different companies and markets and there are no theoretical reasons for splitting it into nine pieces instead of eight or ten (Foss & Saebi, 2017). In a literature study by Clauss (2016) on business model publications between 2002 and 2014, the author found 73 semantically different business model components.

The concept of a business model is a subject with a rapidly increasing research interest, while many critics claim that business model constructs only rephrase well-understood strategy insights (Arendt, 2013) (Porter, 2001). Even though extensive research on the matter has been made, little agreements have been reached on the subject (Foss & Saebi, 2017; Teece, 2017). There is no agreement on the values to analyse in business model research. making it hard to reach one conclusion, and plenty of studies are made without an actual definition of the business model (Foss & Saebi, 2017)

3.6. Market analysis

No methodology can claim it will guarantee success for the innovation (Akrich, et al., 2002). There is a general agreement that the knowledge about the customer is a crucial factor for the effective management of a firm, and the market analysis has the purpose of helping develop plans and execute them. Marketing literature suggests the following steps to be a part of the market analysis for successful firms: define the product, find the opportunities for the product, analyse and compare the strategic options, make suggestions, and establish an implementation plan (Kuada, 2008). Historically, market analysts have trusted in either word-of-mouth sources from trustworthy contacts (giving the answer the one asking wants), or pure quantitative studies through questionnaires. The methodology now proposed by scholars for start-ups is closer to the qualitative approach (Fitzpatrick, 2013), which can also be seen getting more accepted in large enterprises as well (Kuada, 2008).

3.7. Limitations of market analyses

As the market can change fast, the immense amount of uncertainty in innovation where customers are an abstract group often ends up in a desperate but indispensable hunt within an unpredictable and fast-phased market. This calls for action to specify who the customer is (Akrich, et al., 2002). There is a paradox in the market analyses and the innovation since to innovate is to change the customer, and changing the customer, can make the former knowledge obsolete (Akrich, et al., 2002).

It is of importance that market analysis is not handled as learning about the market, but rather learning with the market. As the market is malleable, the information about it quickly grows old, while a deep understanding created with the agents in the market continues to develop (Storbacka & Nenonen, 2015). Each agencing action in the market shapes it, and through interviews, changes in business models or other interactions, the market changes (Storbacka & Nenonen, 2011; Andersson, et al., 2008).

3.8. Customer Development theory

Successful innovation requires not only a great technical invention (Cooper & Vlaskovits, 2010), but also a deep understanding of the customers. It is about giving the customer what they need to solve their problem, not what they want. Henry Ford once said, *"If I had asked my customers what they wanted, they would have told me 'a faster horse."* (Osterwalder & Pigneur, 2010)

Adopting the customer perspective is a vital part of the design of the business model. It is the problem the business solves for the customer that decides the other parameters in the business model and fulfilling the customer need is what makes a business successful. To successfully solve a problem for a customer, there is a need of finding the right customer segment (Osterwalder & Pigneur, 2010; Cooper & Vlaskovits, 2010; Christensen, et al., 2007). There is often found that the customer is using the product for solving other problems than the company intends (Christensen, et al., 2007), and not having a deep understanding of the customer makes it hard to find the product fit (Aarikka-Stenroos & Lehtimäki, 2014).

Finding the right business model takes time, requiring the participants to explore many possibilities and not just go with the first one that seems viable (Osterwalder & Pigneur, 2010). The main implication for customer development theory is to question your assumptions; proving them with empirical data reduces chances of biased decisions and going into a dead end (Cooper & Vlaskovits, 2010; Eisenmann, et al., 2011; Kuada, 2008).

All business models need to fill the three criteria's: The customer is willing to pay for the product, the price for acquiring a customer is lower than what they pay, and that the market is large enough to support the business (Cooper & Vlaskovits, 2010).

3.9. Limitations of the customer development theory

Finding the market fit is a term widely used by both theorist and practitioners with different definitions. There is no straight line that the entrepreneur needs to pass to be able to say, "We have reached a market fit". This makes the term highly subjective, and it is possible that entrepreneurs get stuck in the customer development process (Vohra, 2019; Ladd, 2016). There is no evidence that the more the business is validated the better it performs, and thereby there is a risk that companies are being validated for a long time, that the first evaluations are no longer valid or the entrepreneur losses their passion for the idea (Ladd, 2016). There is also a risk for vanity metrics, pointing the business in the wrong direction or false positives or false negatives forces the business to pivot from a lucrative business model (Cars, 2016; Ladd, 2016; Furr & Nickerson, 2016). To deal with these issues, Ladd (2016) argues that clear metrics should be proposed before the development prosses starts and clear stop/go metrics should be defined. Moreover, the focus should be on validating customer segments and value proposition, as validating more of the business canvas is not a significant predictor of success for start-ups (Ladd, 2018).

Figuring out who the real customer is can be complicated. In a business to business relationship, it easily gets complicated to know whom to speak with. Is it the department in need of the product/service? Alternatively, the Finance department holding in the wallet? This can give false positives solving problems, but no one is willing to pay for the solution (Akrich, et al., 2002).

The possibility of testing the product gets harder in areas with entry barriers. In areas with large entry barriers, it might be impossible to create and test products on a small scale. Policies or other barriers might reduce the options of trying the market "in small scale" due to the costs of getting into the market. Getting licenses or certificates for an early stage prototype might end up in a waste of money while, giving away unnecessary data (Walton, 2014). The model is also harder to apply in businesses where a long product development time is required, or when the cost of mistakes is high (Eisenmann, et al., 2011). Many people in the product development field claim that the customer-centric design obstructs radical innovations (Verganti, 2009)

3.10. Customer Demography

Markets consist of different agents, but the customer is one of the most crucial actors for a business to reach success. Customers can be grouped in different categories to help a business get a view of who they are and make it possible to reach out to specific groups. Cooper & Vlaskovits (2010) have identified the following two groups the , early adopters and innovators; those are the ones pursuing and adopting new technologies fastest. The innovators are the ones adopting new technologies for the sake of the technologies, while the early adopters are the ones first to use the technology for the conceived purpose (Cooper & Vlaskovits, 2010). The early adopters are important for start-ups as they seek out the new technologies, do not rely on earlier references for the product to buy it, and enter as partners rather than passive customers, to help with developing the technology or business further (Cooper & Vlaskovits, 2010). Many marketing managers believe that the customer segmentation process appears naturally (Kannisto, 2016), while in customer development, the firm actively searches for it. The customers themselves are hard to be seen as one concrete entity. Even if it is "convincing" to see it as a homogenous group, the reality is that the customers are an abstract group with erratic behaviours (Akrich, et al., 2002).

Market segmentation and positioning

Cooper & Vlaskovits (2010) define a market segment as a group of people, sharing a common interest, having access to each other and trusts each other as a reference. It is believed that a customer segment can be reached with the same methods and references, spread with word-of-mouth within the segment. Finding a proper customer segment makes it easier to become a market leader within the segment and leading in a segment will create bridges into other segments (Cooper & Vlaskovits, 2010). The closer the business can match its offering to the need of the customer, the more likely the customer is to buy it (Andersson, 1996) and correctly implemented, thus helping to improve the firm's overall performance (Kannisto, 2016; Wind & Bell, 2008).

Customer segments could be split in many ways. The segments could be divided by customer focus, e.g. age, gender, income level or industry, product segment. The problem with this method of segmentation is that the segments are treated as static. The behaviour of the customer generally changes faster than their demographics, and it is proposed to define the segments out of what problems the customer wants to be solved (Christensen, et al., 2007).

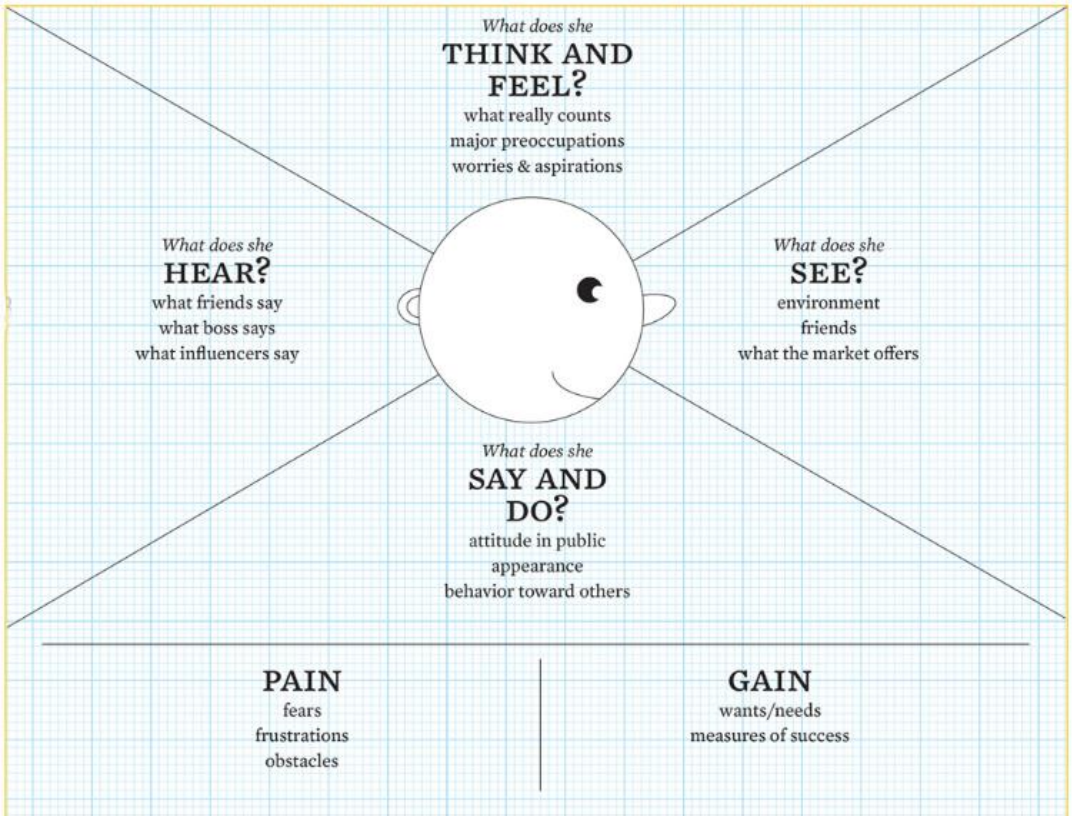

Figure 2 Customer Canvas (Osterwalder & Pigneur, 2010, p. 45%)

The markets are getting more and more segmented, and new segments arise far more rapidly now than before, as most of the businesses are trying to cut their segment out of the existing markets (Andersson, 1996) – but some things can define a good customer segment. The business must have the resources to serve the customers within the segment. There must be a barrier to enter the segments to keep competitors out; there must be a simple way to communicate with the segment, the segment must be large enough to make it profitable for the company, and it must be stable enough to reach a large enough market share (Andersson, 1996).

When the customer is a business, the common goal is saving money for the customer, while if the customer is an individual, the goal is to find the exact job for that specific individual; this is a more delicate task, and it is common that neither the customer nor the business can clearly define the job to be done (Christensen, et al., 2007).

Osterwalder & Pigneur (2010) present a canvas (see) to map out the hypotheses about the customer. The canvas can be made as a tool to visualise what it is known about a certain customer segment or customer demography.

Differentiation

Making business through product differentiation is getting harder and harder, and market exclusivity is hard to keep for a long time. There are two ways for a company to differentiate from the competitors: it can change the physical appearance of the product or reshape the value proposition for the product. The most important part of the differentiation is the brand, which, together with well-protected intellectual property, are the only things a competitor cannot copy (Andersson, 1996). The cost that the customer is willing to pay can be called the reservation price or the willingness-to-pay price. If that price is found, the business can charge up to that amount for the product (Sanders & Huefner, 2011).

The main problem with not being able to specify the market segment is that eventually too much data will be generated; this will make it harder to draw the right conclusions and falsify the ambiguous assumptions for the business model. This also makes it harder to know which segment to start with and thereby, whose problem the business is solving (Fitzpatrick, 2013). Markets are never homogeneous, which makes it likely that different parts of the market could use either different value proposition to the same problem or vice versa (Andersson, 1996).

The common understanding of competitors as the players working in the same field of products while using the "getting the job done", proposes that the interesting competitors are the ones who solve the same problems for the customer. An example of this would be that the newspaper Metro, which opted to compete with Facebook or some other application on killing time, rather than the major newspapers (Christensen, et al., 2007).

3.11. Limitations of customer demographics

Customer demographics as age, gender, race, income, and so forth are a poor substitute for the segments that matter; why would the customer buy the product? Once the products reach out to thousands or millions of units, these demographics may reveal some interesting patterns, but at the beginning of a new business, the quantities are too small for making accurate predictions (Alvarec, 2014).

Creating segments can undermine the goal for firms to be customer-centric as it can produce harmful power asymmetries between the firm and customer. Segmentation is based on the assumptions of the average customer, treating a group with different individuals as a homogeneous group which can make the firm focus on a suboptimal segment (Kannisto, 2016). Splitting a heterogeneous group into customer segments might lead to the firm treating their customers as a group of passive agents, thus leading to ineffective methodologies on the way of communicating with the customers, and not keeping up with the development of the customer, but rather trusting in old assumptions (Kannisto, 2016).

3.12. PEST

The "PEST" analysis consists of several different factors that aim to describe the external environment that the company operates in. In certain cases, legislative initiatives and macroeconomic occurrences might affect a company more than the direct industrial climate; these external "forces" can provide both problems and opportunities for a company (Warner, 2010).

Political

Encompasses the influence by which political policy affects the business, for instance, subsidising of the chosen industry. Regulations are posed to the specific industry; for example, the FDA in the USA is such a regulatory organ. The CE certification is a typical example; everything that is sold in the EU needs this certificate. General stability of the country is also considered here, but for the sake of this thesis, it will be ignored. Legislative issues/opportunities are also to be considered as political factors (Warner, 2010).

Economic

Considers the general state of the economy, such as the level of income and employment rates, which affects the consumers' buying power. Macroeconomic indicators are available, and the reliability is generally high. However, events like the economic crisis in 2008-2009 are always a risk factor that cannot be denied. Even if the data can be reliable, it is still primarily a qualified guess of what the future will look like (Warner, 2010).

Social

The social factors in the PEST consist of the demographic structure and the values and beliefs within the structure. These are in constant change. However, it often takes some time for new values and ideas to take root. This type of change usually occurs over generations, since the change is slow; as such, the future increase or loss in demand can be foreseen and planned for. For instance, since the emergence of sustainability as a large question in society today, every major company works with sustainability in one way or another (Warner, 2010).

Technological

Technological aspects determine how a "problem" has been solved for the customers. For instance, right now, there is a shift in the automotive industry where the change in technology from traditional combustion engines moves toward hybrid / fully electric vehicles. The shift in technology required essentially the existence of levels the industry where newcomers suddenly have a chance of establishing themselves (Warner, 2010).

3.13. Limitations of PEST

The PEST analysis tool can provide significant value to a company, but at the same time, it is easy to get constrained by it. The PEST analysis paints a picture of what the company's opportunities and threats are at the moment. Society today is changing rapidly, and it is easy to get stuck in a state of constant analysis where no real result can be concluded. Furthermore, it is paramount that the factors that are analysed have a direct implication/influence on the company for which the PEST analysis is conducted (Sammut-Bonnici & Galea, 2015). Warner (2010) emphasises the importance of regarding the possibility of unforeseen disruption. No one had predicted the emergence and importance of the Internet, for example. It has changed how people think, works and interacts in society.

3.14. Business model canvas and PEST

The supposed weakness of the business model canvas is that it does not account for macro factors, and thus, it was decided that a PEST analysis also should be conducted. With PEST, the weakness is that it creates a snapshot of the current external factors.

With the information gathered from the interviews, the business model canvas will be completed. After that, the PEST analysis will be conducted. If the PEST analyses support the business model canvas, the results will be quite clear on what Ventus Robur has to offer to its potential customers. However, if the PEST does not support the result of the business model canvas, then a PEST that will support it will be proposed. Thus, several iterations of a possible macro environment will be used to evaluate the feasibility of the business model canvas.

3.15. Business model canvas modification

To complement the lack of competitors, technology, and social issues, including environmental and political aspects, the authors propose the PEST as an extension to the business model canvas. Several modifications and extensions have been introduced earlier as Joyce & Paquin (2016) suggested three different canvases, for business, environmental and social value creation (Eskelinen, et al., 2017), adding customer needs, company solution and competing solution to the business model canvas. Toro-Jarrín, et al. (2016) added another framework called technology roadmap to create the business model canvas. Several of the "new" frameworks for business models neglect the environment around the business (Demil, et al., 2018).

Business model making is dependent on policies (in which the business model can change to fit), or on specific workaround regulations, as shown by Dewitte, Billows and Lecocoq (2017) who wrote about French food retailers making regulations profitable opportunities. Demil, et al. (2018) argue that rather than seeing the environment or the ecosystem as something the company submits to, the environment is something the company creates or chooses.

It is found that to increase the chances of success when implementing new sustainable technologies, collective forces should be gathered to try to achieve changes in the macro-environment; this might be necessary, along with an overall acceptance for the technology (Van de Ven, 1993; Planko, et al., 2015). This makes everyone with interest in the value chain or ecosystem to assume both the roles of competitors and partners significant for the likelihood of success in the ecosystem.

Key Partners to Actors

In a business ecosystem, consisting of heterogeneous actors participating in a value creation-process, a balance between partners and competitors exists. Business model innovation commonly requires bridging between actors creating new opportunities (Demil, et al., 2018). A common reason for business models to fail is the difficulties to align with the ecosystem proposed in the business model (Demil, et al., 2018). Van de Ven (1993) and Planko et al. (2015) point out the importance of competitors in an innovation network:

"*Entrepreneurs have to develop their own innovation and design their individual business strategy, but at the same time they need to collaborate strategically with actors along the supply chain, including direct competitors, to build a supportive infrastructure which will stimulate the fast diffusion of their technology*." - (Planko, et al., 2015, p. 2330)

Missing the competitors in the model might lead to a missing picture in the ecosystem, and the boundary between partner and competitor is not a clear line. Therefore, the authors propose that "Key partners" is broadened to "Key actors" in the business model canvas, in order to underline the importance of the business ecosystem.

4. Context

A study of the market for small-scale wind turbines was conducted. Thorstensson (2009) claims that the market needs further development regarding policies, as well as a third-party organisation verifying and testing wind turbines to provide neutral performance data; currently, manufacturers provide their data, which in certain cases might be questionable. It is suggested that the potential customers are mostly municipalities, organisations and companies who prioritise sustainability over economic gain (Thorstensson, 2009).

Thorstensson (2009) argues that visual infringement is an obstacle to implement wind turbines as it ruins the landscape. Some success factors for a small-scale wind turbine project would be to reach a reasonable payback time and trustworthy products. The analysis concludes that to create a substantial market in Sweden, the support from politicians is needed with eases for small scale energy generation and some third-party test organisation is required.

In a market analysis from Svensk vindkraft förening, it was found that there are three different small-scale wind turbine developers in Sweden, Innoventum AB, Girowind AB and Windforce AB. It also states that there are two resellers, Hedbergs industry AB and Nordh Energy (Ruin, 2017).

4.1. Electricity production in Sweden

Across Europe, the structure of the electricity markets is changing from centralised production to decentralised production. Specifically, the trend in Sweden is towards wider and more efficient large scale wind turbines. In Sweden, the question is not if the power companies can produce enough electricity, but rather if it is available when needed (IVA, 2016). The development between industrial consumption and private consumption is, however, prognosticated to go in different directions. While industrial demand will increase, the private demand is expected to remain at a relatively low yearly increase. Since the 1970s, the electricity that households consume has doubled, and the annual growth has been around 3 % between 1970 – 1995. Right now, the annual increase in demand is estimated to be approximately 2,5 %.

The factors that affect the consumption can be attributed to an increase in households, standards, the economy of the households, demographic development and development of energy efficiency (IVA, 2015). The historical and future prognosed demand for household electricity can be viewed below in Figure 3.

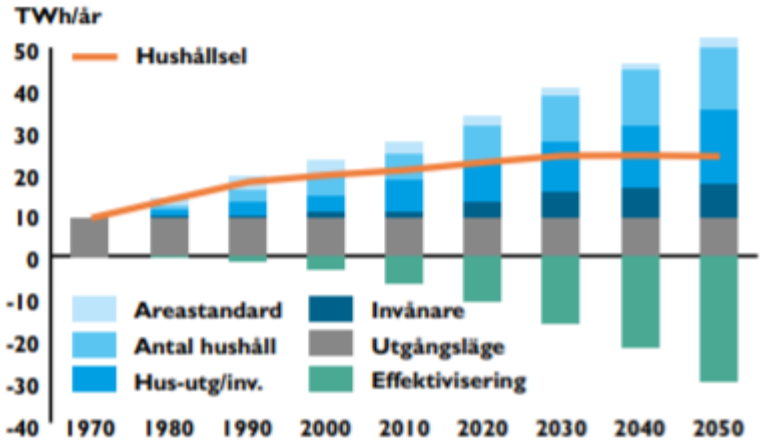

Figure 3 Estimation of future energy price in Sweden (IVA, 2015)

In Sweden, the bulk of the energy is generated from hydropower and nuclear power. Both these types of energy have limitations for the future. Nuclear power is not renewable, and there are thoughts about reducing it. The water energy in Sweden is highly debated as it destroys big parts of the environment around them, making it unlikely that it will be further developed. See Figure 4 for the energy mix.

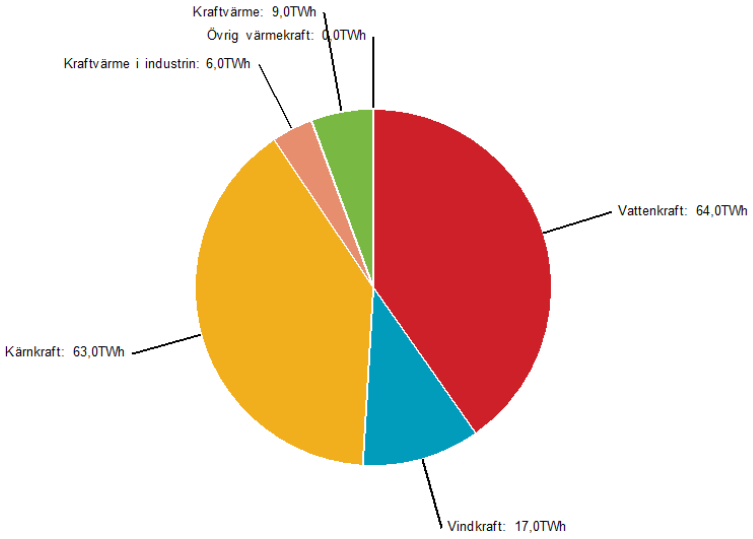

Figure 4 Power generation in Sweden 2017 (Holmström, 2018)

4.2. Small scale energy

To be able to use the energy generated without the power grid, special equipment is needed, and the most common solution is through a battery (Carlson, 2019). To be able to sell the energy, the quality of the electricity has to be good and to keep the same characteristics as the electricity on the power grid (Svensk Solenergi, 2018).

Solar power in Sweden is most commonly solar-to-electricity solutions; whether it is profitable or not is a topic of discussion, but taking into account the current policies, several financial calculations from the people interviewed, and different websites, the estimated payback time is around 8 – 12 years, with the current investment support from the Swedish state being on a level of 20% (most calculations are done with an investment support of 30%, which is changed to 20% in the government budget change 20190404) (EON Sverige AB (a), 2019; EON Sverige AB (b), 2019; Solcellskollen AB, 2019). The payback time and return of investment are dependent on a lot of different factors and the bigger the power plant it is, the shorter the payback time. The actual value of the solar energy in Sweden is not agreed upon by everybody, and in a report about using solar energy on KTH in Stockholm, the investment was found doubtful (Mewesa, et al., 2017).

4.3. Regulations and policies for small turbines

Small wind turbines with a diameter of less than 3 meters and a height of under 20 meters do not require any building permit. The height of the structure defines how close it can be put to any neighbouring land; for instance, a 20-meter high wind turbine should be placed at least 20 meters away from one's neighbour's property. However, to install a turbine on the roof of a building or higher than that, a permit is needed. Regarding the installation, it is required that a certified installer is used; the components in the wind turbine are also required to be CE-certified. There are different rules in different regions in Sweden; for example, the Swedish army has "areas of interest" where certain rules apply, and some cities are favourable to this kind of innovations while others have completely stopped them (Energimyndigheten, 2015).

Even though a small wind turbine does not require any building permit, the "municipality's holistic plan" might include recommendations or suggestions on where and how small wind turbines might be placed. The restrictions for the placement of small wind turbines are rather on the specific placement of them and have to do with parameters such as potential interference with roads, railways, power lines and animals etc. (Energimyndigheten, 2015). It is common that the municipalities are positive to small scale energy wind energy, but do not actively work for the installation of small scale energy (Leo & Isaksson, 2015).

For small wind turbines, the impact of potential shadows and noise are of primary concern since they are placed in the vicinity of buildings and people. Technological advancements have however mitigated the volume of the noise, but placement is still prominent. As mentioned earlier, there is no special application process, but it is strongly suggested that the placement is discussed with eventual neighbours (Energimyndigheten, 2015).

4.4. Business Ecosystem

The business ecosystem for Ventus Robur is hard to define. It contains actors like different industry organisations, governmental organisations, politicians, solar power companies, et cetera. This section maps some parts of the ecosystem regarding different industry organisations in the proximity. The ecosystem is very undeveloped in Sweden compared to, for example, the UK. In the UK, there has been created a standard called "Small Wind Turbine Performance and Safety Standard" to increase the trust amongst actors in the market (Energy Saving Trust, 2012).

Svensk vindkraftförening

Svensk Vindkraftföreing is a lobbying organisation working on influencing the conditions for the continued development of wind power through referrals and education. They annually arrange conferences and informative seminars on current themes (Svensk Vindkraftförening, u.d.).

Nätverket för vindbruk

Nätverket för vindbruk or “network for wind farming” is a network for spreading knowledge and support for wind power initiatives in Sweden. The network is coordinated by the Swedish energy agency and supports wind power exploration in Sweden (Nätverket för vindbruk, u.d.). They also run the page Vindkraftcentrum.se, which is an organisation that coordinates and evaluates wind power projects (Vindkraftcentrum, 2011).

Skånes vindkraftakademi

Skånes vindkraftsakademi is an industry organisation with a purpose to share knowledge and experience within wind energy in Skåne, Sweden. They have a page for small scale wind turbines with some knowledge on what to think about when buying a small scale wind turbine (Skånes Vindkraftsakademi, u.d.).

Svensk vindenergi

Svensk vindenergi is an industry and lobbying organisation working with the public opinion of wind energy. They work with coordination and referrals within the wind energy sector (Svensk vindenergi, u.d.).

5. Empirical findings

This section contains the results from the interviews discretized into the ones conducted with industry professionals, and the ones conducted with customers. The results from the interviews cannot be strictly separated in two categories or be strictly compared due to the semi-structured interview format. Since a semi-structured approach was used during the interviews, the interviewees have pointed out several interesting perspectives and /facts that have been useful in the thesis for both the business model canvas and PEST-analysis.

5.1. Interviews with industry professionals

This section includes the interviews with people engaged in the energy sector, former and current developers/resellers of wind turbines, and people within the construction/real estate market. The results can be found in Appendix 3 and are split in their view of the potential market, their view of the current market, and what value Ventus Robur could bring to the market.

Potential of the market

The benefits from the scale are large in both wind and solar energy, and the potential will be more financially and environmentally sustainable with larger renewable energy production as it requires less of the surrounding technology to modify the energy to fit with the electricity grid. However, the rising load on the power grid could be minimised if the energy is generated closer to the users. It is likely that the price of energy will increase in Sweden, and especially the fluctuations in price for both solar and wind energy, which are growing rapidly.

Off-grid is a market niche that is not fully exploited yet, the market is not that large in Sweden, but could be more extensively utilised in other countries, especially emerging markets or in the far north/south where solar energy is only applicable on one half of the year.

Current market view

To make small scale solar energy competitive with the grid in Sweden, it is necessary to use the different support from the state for solar energy, which does not apply for wind energy. The payback time without the support is around 15 years instead of 8-12 years.

To reach a 100 % electricity independence without any risk of going days without energy, some storage is needed, and the cost of the batteries required to achieve this is a very high cost. There are tests of using hydrogen storage, but it is still on early stage, and today diesel generators are commonly used by farmers. To provide energy to an off-grid unit like a summer cottage or boat, solar energy is commonly a better solution as it is mostly used during summer. However, if it should be used all around the year, a wind turbine is a good compliment.

The market for small scale wind energy was a lot more active around 2000 – 2010. Cheap wind turbines from Asia were imported during these times, lack of quality led to malfunctions in several cases. Furthermore, the placement of a wind turbine is of paramount importance, and since the placement was primarily made by the consumer, it was less than optimal. This made the public opinion negative to small scale wind energy.

Value proposition

To revive the market, a robust wind turbine must be developed; one that has an acceptable investment cost and produces a substantial amount of energy, making the investment worth it. It is possible that it has to deliver something else than electricity as the investment is large to get the electricity to the power grid; this could be achieved either through heat storage or battery, for example. If the wind turbine can be combined with solar energy, it can give substantial value to the customer who wants to be more energy-independent, as it generates energy at different times than solar energy and a combination should be proposed. Regarding the value proposition, it is more profitable for the wind turbine owner, and also more environmentally friendly, to invest in a large wind turbine, rather than the small wind turbine.

5.2. Interview of customers

This section contains a condensed result from the interviews with potential customers. A table with the answers can be found in Appendix 4. The results from the interviews are discretized into the categories customer pain, customer gain, channel and product.

Customer pain

Even though the potential customers vary in both geographical position as well as business areas, their ideas and responses are similar. Several interviewees have invested in solar panels, and they have described similar issues with these as the ones identified for the small wind turbines. Mainly the power is generated when it is not needed, and there is no efficient way to store the energy. Batteries are still expensive and are not even near to provide the power required by a small factory/farm. In several cases where the respondents have invested in solar panels, they raise the issue that during power outages, the solar panels need to be shut down and will not generate any electricity, so storage of energy is a hot topic among the respondents.

Common among the potential customers is that they are concerned about future electricity prices. Politics influence the electricity market in several ways, and future talks about shutting down nuclear power plants could lead to a price increase for electricity. Electrification of vehicles and other industries, such as the steel industry shifting from fossil fuels to electricity, might make demand surpass supply.

Customer gain

The primary reasons for the respondents to invest in a wind turbine is to be able to reduce their energy cost. There is also a strong will to be self-sustaining and not reliant on power companies. Several of the respondents utilise diesel generators during power outages. Since solar energy mainly generates power when it is not needed, the diversification of having a wind turbine could be able to provide sustainable power when it is required. Among the indirect benefits, the respondents mention the marketing value of using environmentally friendly power generation. Important to note is that the environmentally friendly aspect is not a primary concern but rather a “nice bonus” when cutting electricity prices.

Channel

The majority of the respondents would appreciate a local reseller for the products since wind turbines are perceived to need more maintenance as well as other technical support. Farmers usually have a preferred supplier of various goods that they require regularly. Bonnet, a supplier of such wares, also expressed interest in selling the wind turbine and thought that it would sell as long as the performance was good.

The strong emphasis of having a local and trusted retailer selling the wind turbine is probably a reaction towards the cheap and bad wind turbines that were sold a decade ago, but by having a trusted reseller as support might counteract this scepticism.

Product

The size of the product is not a concern in the majority of cases. Farmers have enough land, and the wind turbine can be placed a certain distance away from the main buildings. The factory owners, however, stressed the fact that reduction of sound and vibrations is essential if the turbines are to be mounted on a factory roof. Concerning the performance of the product, they need to deliver at least as good or even better financial performance than solar panels. The initial investment is of little consequence as long as the payback time is in the range of 8-10 years.

6. Analysis

The gathered data is processed and analysed with the PEST, and a business model canvas is created. This chapter shows the result of the customer canvas and the proposed value proposition. The business model canvas can be found in Appendix 2.

6.1. The market

There is a decreasing market for small scale wind energy; one reason for this is believed to be the many accidents with small scale wind energy. Around 2000 – 2010 there was a good market for small scale wind turbines, but several accidents with wings being thrown away from the turbines severely shrank the market (Augustsson, 2011; Falkenby, 2013).

6.2. Customer Segment

The studied customer segments are farmers, manufacturing plant owners, and camping places. Their need is believed to be similar to each other, and very dependent on its profitability as well as giving a marketing advantage. The interest from the interviews in this technology has been very positive, and both farmers and the manufacturing plant asked for the possibility of running a pilot project.

Farmers

Figure 5 Shows the starting hypotheses for the customer segment farmers in Sweden. The hypotheses were founded on beliefs about the Swedish farmers as a group, as they possess large grounds and open fields providing locations with high wind activity, and also as they consume much energy.

Before the interview:

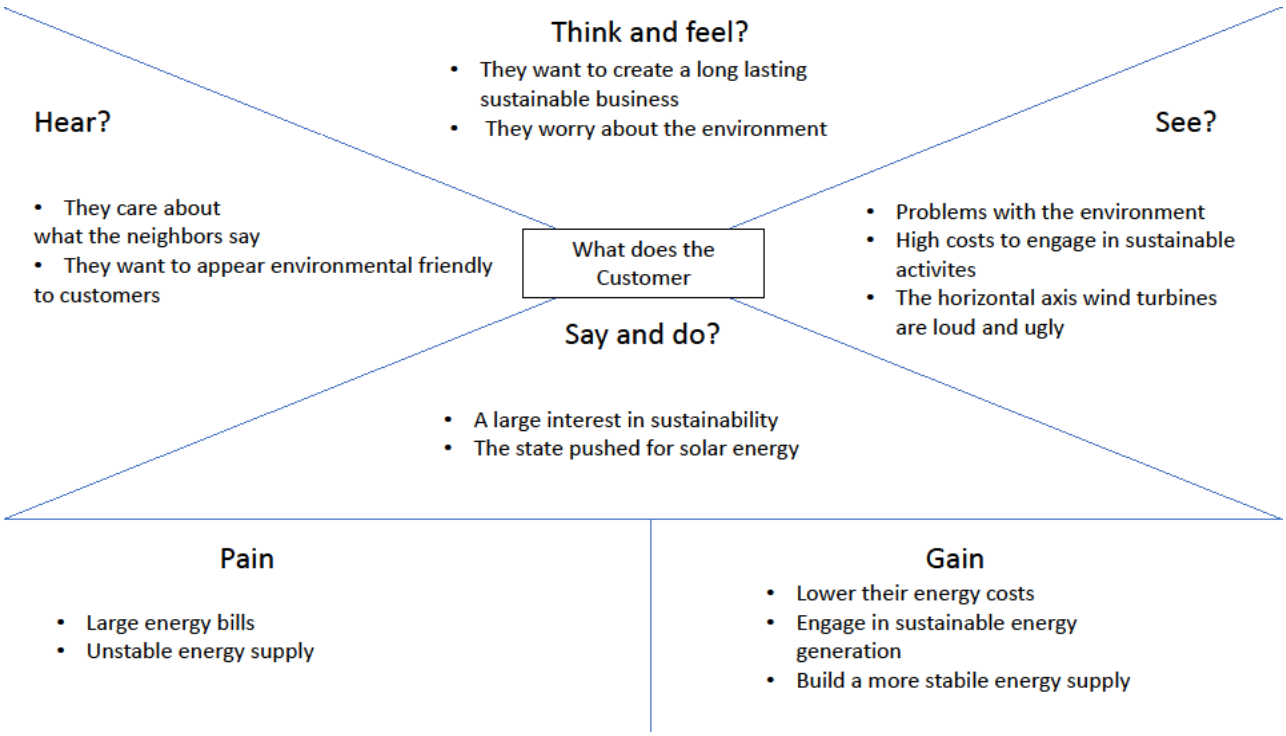

Figure 5 Customer Canvas Farmers

After the interviews, some changes to the hypothesises are made. The interviews that the interest in the environment is lower than believed. The will to appear sustainable to customers and neighbours is lower than believed, and the worry about future energy prices is high. This can be seen in Figure 6.

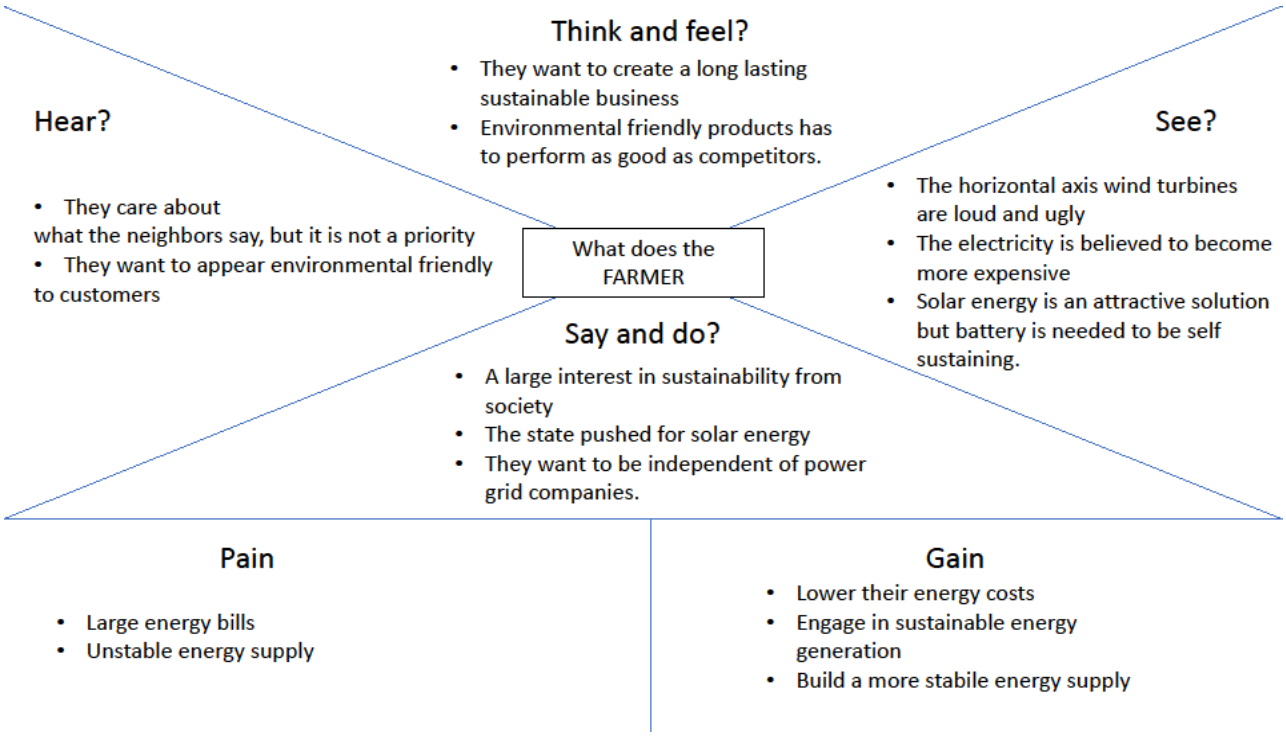

Figure 6 Customer Canvas Farmers

Country house owners are very similar to the farmers in pains and gains, but as they are not running a business, their willingness to invest large amounts of money and time is believed not to be as big. The farmer is also often a quite practical person and thereby reduces the need for third-party service, and one interviewee pushed for the importance of technical interest in the customer.

The hypotheses and the segment need further investigation, but after the interviews, a point of direction is given. There is an interest, as long as the product is profitable and has a payback time that can compete with solar energy.

Manufacturing plants

Only one manufacturing plant owner was interviewed, so the hypothesis has not been proven or disproven. More interviews have to be held in order to call the hypothesises verified.

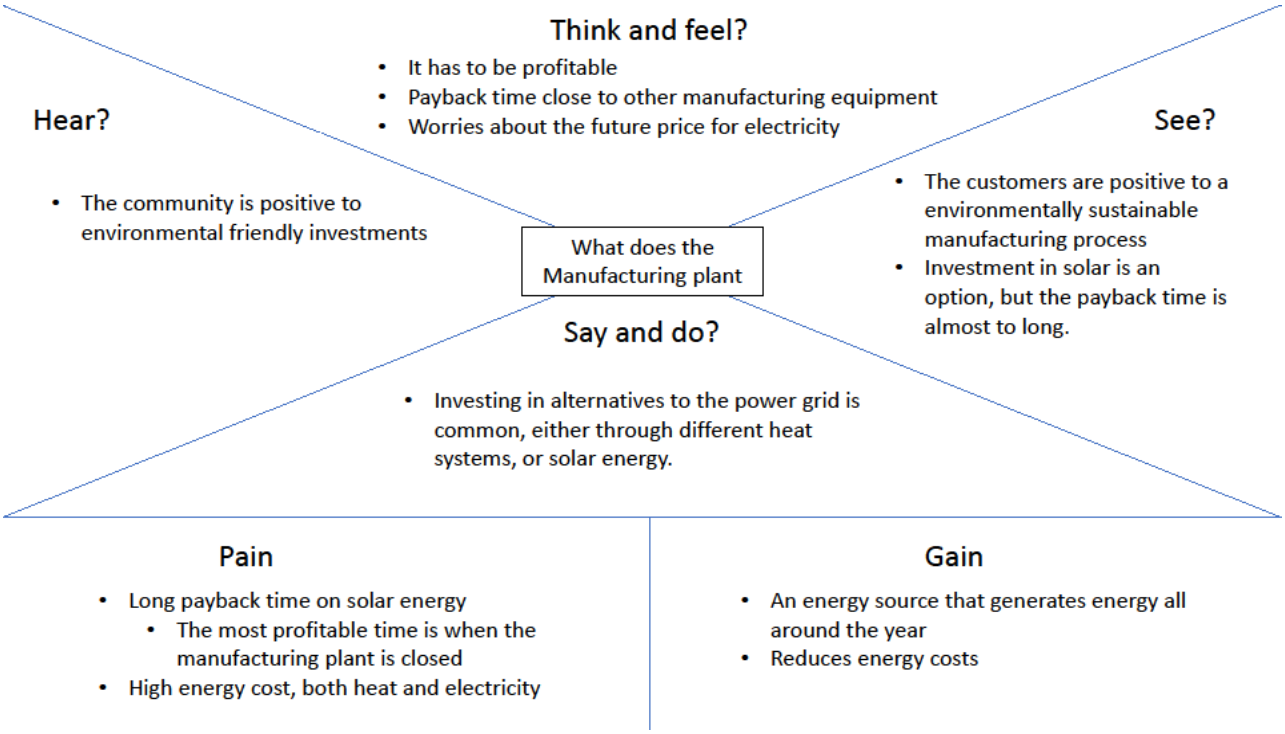

Figure 7 Customer Canvas Manufacturing plant

Camping owners

A representative from an industry organisation was interviewed, so the hypothesis has not been proven or disproven.

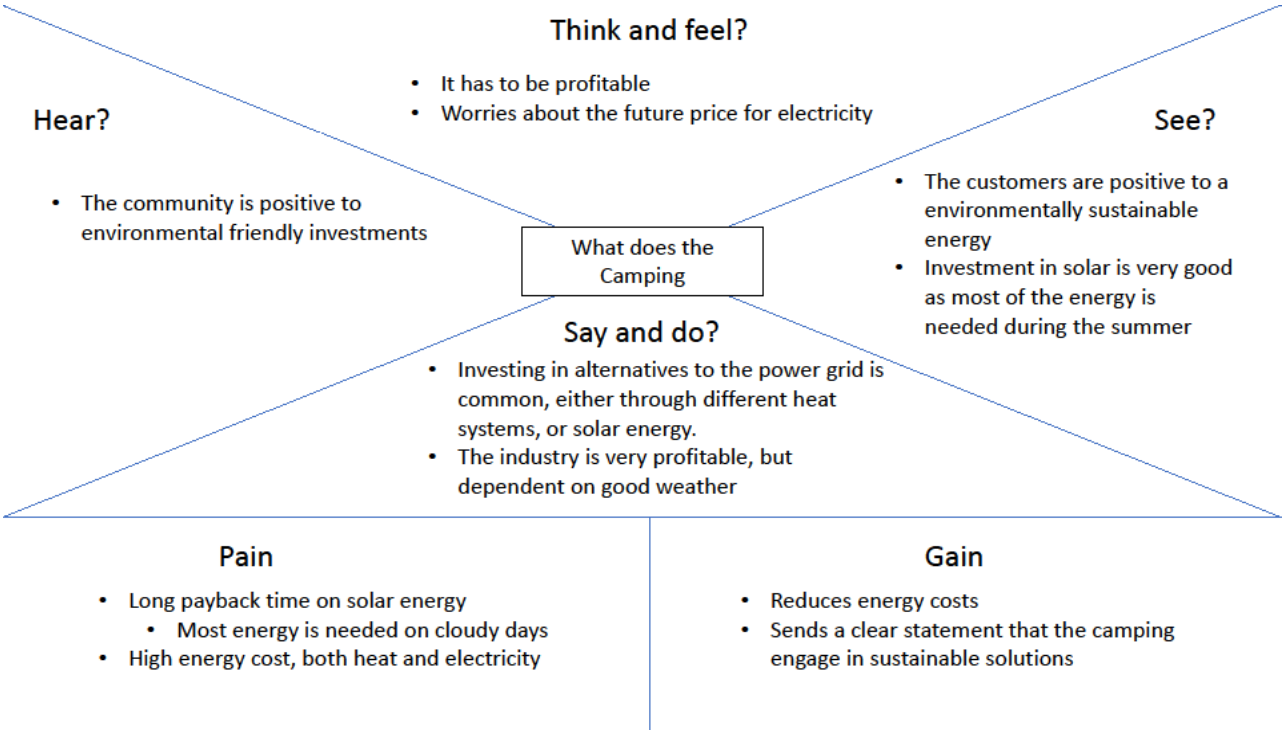

Figure 8 Customer canvas camping owners

6.3. Value proposition

The value proposition is to create a financially good complement to solar energy. The return of investment and payback time has to be similar or better than the solar energy to be able to reach the large market of farmers. Therefore, the value proposition is formulated as the following:

> *"Our value proposition is to help customers save money on their electricity bills without increasing the carbon footprint. We want to create a financially good complement to solar energy, creating a more diversified market for self-sustaining households and energy investments. Wind turbines generate electricity in both daytime and during the night for all seasons, and therefore produce electricity when it is needed the most, making it an excellent complement to solar energy."*

6.4. PEST

Prices for electricity and the future prognosis for that market can be found in the theory chapter as well as the respective regulations. The analysis has to become a living document as the policies, which are very important to go further with this, change rapidly; several changes have been made during the current work.

Political

Respondents have noted the lack of support for small wind turbines in comparison to solar power. Solar panels have in the recent years been subsidised by the government, but now the government has started to roll back the subsidising for solar panels.

The respondents of the interviews also stressed the convenience of not needing a building permit for wind turbines that are smaller than 3 meters, but policies vary in different regions in Sweden. However, their power needs are much greater than what a 3 meter in diameter turbine can produce.

The farmers and factory owners were also fearful of the future electricity price, as politicians are constantly debating nuclear power, and whether the plants should be closed. The respondents have drawn the conclusion that if the reactors were closed, the electricity price would increase severely.

Economic

The potential customers/respondents are mainly businesses, which means that they are possessing capital on hand and can secure low-interest loans by using their facilities and land as security. The most important factor is that the payback time is required to be around 8-10 years, as stated by the respondents. Since the investment is relatively small in comparison to the forestry industry that farmers also often are engaged in, the payback time of a wind turbine is short.

Social

All respondents have expressed their opinion that environmentally friendly energy is important for different reasons. Certain respondents view it as a marketing gimmick while others stress the fact that the environment in itself is important. However, the wind turbine needs to achieve the required payback time of 8-10 years, or it will not be considered at all.

There is a clear positive view already for micro-energy generation, and engaging in small scale wind energy or solar energy provides (most of the time) the producer with a positive response from friends and neighbours.

Technological

The technology is one of the most important agents in the market, as it works as a binary gateway. Either it solves the problem for the customer, or not. Now it is unlikely that the turbine can deliver a reliable payback time of 8-10 years, but the technology behind the turbine has not been tested enough yet. Furthermore, the respondents have also expressed a will to be independence from the power grid. In the case of solar power, the energy is mainly generated when it is not needed, thus emphasising storage for the produced energy; as of now, batteries are too inefficient and expensive for an average household, farmers and factory owners.

Several respondents also spoke positively at using both sunlight and wind to have more diversified power generation.

7. Discussion

The analysis method “talking to potential customers” as a market-creating activity, is utilized. Several of the interviewed potential customers showed an interest in buying and testing the turbine, as well as potential resellers had been found for the future. Asking the customer for help can lead to the so-called “Ben Franklin effect:”, asking for favours helps build and promote the relationship (Niiya, 2015; Jecker & Landy, 1969).

Talking to the competitors and former wind turbine developers created potential partners as they showed a clear interest in cooperating. It is clear that the other resellers of wind turbines have an interest in improving the amount of clean energy generated in Sweden and that working together is a requirement to be able to increase the amount of small scale energy.

Lack of technology in the business model canvas makes a hole in the usage of the business model, but adding more boxes to the model hardly makes it more useful. Adding a second PEST as a compliment to the business model canvas covers the respective lack of the politics, environment and technology dimensions, and makes it easy to link the boxes in them to what is needed to reach a working business model and finding a product market fit. Realising that product market fit is not only creating a product that fits the market but shaping the market is also key to succeed in the renewable energy market and to manoeuvre around the policies and politics.

7.1. Customer Segment

The conclusions about the customer segments are based on very few interviews; as can be seen in Appendix 5, the metrics in the scorecard were not fulfilled. This is due to the small chances of developing the technology to be good enough for a fulfilling ROI and payback time to the buyer, and a decision to look into other segments was made. Even if the metrics were fulfilled, doing conclusions from 10, or even 100 out of, for example, 60 000 farmers, is dangerous, as Alvarec (2014) points out.

The explored customer segments were chosen as they were all fulfilling Andersson's (1996) definition of a "good" customer segment. They all fulfil the criteria's: The business must have the resources to serve the customers within the segment. There must be a certain barrier to enter the segments, to keep competitors out; there must be a simple way to communicate with the segment, the segment must be large enough to make it profitable for the company, and the segment must be stable enough to reach a large enough market share.

Farmers is a customer segment with several aspects that makes it suitable as a preferred customer. There are around 60 000 farmers in Sweden, making it a large market; they have in general a good financial position to invest, they use much energy, and commonly live far away from neighbours, things that mitigate the problems with building permits. What can be seen from the interviews with the farmers is that the economy is very important for the farmer. Having a long payback time is not a very big problem, but the investment has to be comparable to other investment options to the farmers (like solar panels).

Many farms get passed on from generation to generation, thereby making the farmers having a long-time perspective on the business and as many others, they worry about the future energy prices; these conditions make investments in the production of their energy very attractive. It is also seen that the view of the large energy corporations, owning both the grid and selling the power, is not good and an interest in becoming independent of them is an aspect that has to be taken in regard. The power grid can be sensitive in the countryside in Sweden, and many farmers have a diesel generator producing electricity if the power grid is damaged.

As farms are businesses, an interest in being environmentally friendly can be a good business move as a commercial aspect, as well as a curiosity among neighbours and the farming community. The authors believed that worry about the environment could be a driving force to invest in wind or solar energy, but it is rather seen as a positive side effect than a fundamental reason to invest in sustainable energy, as seen from the interviews.

Manufacturing plants are a customer segment that needs further exploration. The interest in engaging in sustainable energy exists, with both economic and environmental arguments. The same fear of rising energy costs is believed to exist in this field, and manufacturing plants commonly use much energy.

Engaging in sustainable energy generation has to be comparable to other investments that could be made for the plant; however, not only the savings in electricity price but also potentially positive impact on how customers, personnel and the society view the company has to be taken account of into the financial calculations. The problem with this market is the location; commonly, manufacturing plants are placed in urban areas where the wind energy is lower, making the financial goals harder to reach. The manufacturing plants are a customer group that is very segmented per se, making it hard to find any specific needs that can apply for the whole segment except saving money.

Camping owners is an attractive customer segment with a countryside location, large investment possibilities and commonly close to water, increasing the probability of adequate wind power generation. Camping places, however, generally have most of their guests in the summer, making solar energy very suitable for them. Investing in solar energy is already very common on camping places, but a combination of wind and sun could create a more stable energy generation. So, using a wind turbine can cover a large marketing post for the camping. However, if a wind turbine should be used in the proximity to camping places, the safety, design and noise levels are very important.

Neither of the customer's segments here is a homogeneous group, making it hard, even with more interviews, to know whether any assumptions can be made about them. Even if the feeling of uncertainty exists for coming energy prices, and several experts agree with that, this does not mean that the individuals are willing to take the risk of investing in the energy source, even if the investment might have a very high chance of being financially secure. Neither of the customer segments is a homogeneous group with close connections to each other, nor can it be trusted to act "rational". This makes the use of "market segment" as a term hard to use, as Cooper and Vlaskovits (2010) define a market segment as a group of people, sharing a common interest, having access to each other, and trust each other as a reference. With this definition of a market segment, there would be hard finding a market segment within the different customer groups, as they all consist of actors competing against each other. This makes their common interest hard to define (except from "generate electricity at a lower price than they buy from the grid"), in all the explored customer groups. This can, according to Christensen et al. (2007), be the job to be done, making the customer segments usable anyway.

Whether to choose one customer group or not is a delicate issue for Ventus Robur. Choosing to focus on one segment is recommended, as "conquering" one segment at a time is supported; however, by doing this, a suboptimal segment that is much smaller than what can be exploited may be created (Kannisto, 2016).

It is important to reach out to some early adopters to gain a track record of the product. The early adopters would be technically interested persons with the ability to do some small modifications on the turbine by themselves. Some early adopters have been found during the interviews, and also a person with experience in using a small wind turbine to provide electricity already. The first sales, or pilot installations, should help these people to prove the usefulness of the technology.

From the interviews, it can be seen that the profitability and the payback time of around 8 – 12 years (in good wind positions) is important if the market segment refers to the customers (farmers, manufacturing plants and camping). If the newly invented wind turbine can be either a lot cheaper or better than the current competitors on the current market, it should be possible to ride on the wave of sustainability interest with a large potential market in Sweden. If the payback time does not reach 8 – 12 years, this market segment is believed to be hard to reach out to as money is considered very important. The product market fit is very hard to reach with these criteria due to technical limitations.

7.2. Value Proposition

A common denominator for the customer segments proposed is the importance of the financial aspects. Environmental and marketing arguments is a plus for the technology, but to be able to compete with the solar panels, the economics has to be at least as beneficial. The energy cost can be higher for wind turbines but the fact that wind energy is generated all over the year and during nights when most of the energy is used, and therefore more expensive to buy, can give a wind turbine a competitive edge.

The problem the customers have can be phrased as:

High energy costs, uncertainty for future energy price and instability in the power grid with limited offers to secure future energy without increasing their climate footprint.

The current solutions to this problem are either: change energy company, reduce energy usage, invest in heating solutions or invest in solar energy. The change in energy company can provide marginal savings, but reducing energy usage is recommended as the best way. Some ways of lowering the total energy costs can be through a pellet boiler or heat pump, but these actions will lead to higher costs in other resources. Investing in renewable energy means that the actor becomes a producer of energy rather than a pure user. The authors believe that a crucial aspect is not to make a dichotomy between solar energy and wind energy, but rather use it as a combination, this is of interest for all the customer segments as the combination reduces the need of selling and storing energy and gives the user a feeling of independence.

Independence from the energy grid is something that some of the farmers have talked about and could be a crucial part in the marketing of the product to this segment. The problem in this field is the technical barriers with being independent, as being independent of the power grid makes a need for some components which is not needed when connected to the power grid. Being independent is expensive as it requires a large battery, which is very expensive, even after government support. It is believed that the wind turbine will make the customer "more" independent rather than completely independent and a feeling of independence should rather be seen as a compliment in the value proposition.

7.3. Channel

The channel was proposed to be through Ventus Robur's salesmen before the interviews were held. The thought was that in this way, full responsibility could be made by Ventus Robur towards the customer. However, through interviews, it was found that the wind turbines should be sold through local sellers, as they already have a connection with the customers and thereby not need to build a new relationship to establish trust. The local re-seller should be able to work as a contact and warrant between Ventus Robur and the customer, and it also makes it easier to sell a combined system with solar and wind energy. After talking to some re-sellers of wind turbines, they expressed an interest in the product and proposed that they could work as re-seller for it when it is fully developed.

7.4. Actors

Adding more fields to the Osterwalder Business model canvas goes against Ladds (2018) research claiming that mostly the two Business model canvas components "customer segment" and value proposition lead to business success. However, the missing view of the ecosystem in Business model canvas except for partners in the Osterwalder business model canvas the "Partner" field is changed to "Actors", including competitors and other actors contributing to the business ecosystem.

The different actors in the market are not only the customers and seller, but the media and government are important, as both acts, and affects the market in many ways, allowing or denying the opportunities from using the wind energy with policies and publicity. The many organisations with interest in wind energy should also be treated as different actors that make the market.

The combination of solar power and wind power seem like a crucial component in order be able to deliver any value proposition regarding providing energy as the diversification when the sun and wind generate most energy can reduce the need of battery. Batteries are costly and bad for the environment, but for any off-grid solution, they are a must. However, the role of the solar panel companies must be discussed. They solve the same problem as a wind turbine, generating clean energy, making it a competing product for the customer, looking for an energy investment, whether it is a manufacturing plant, a farmer or anyone else, compared with investing in solar energy should be done in the same way as compared with other wind turbines. However, a growing market for solar energy for households is a potential opportunity for Ventus Robur as well as a wind turbine could be partly used on the same infrastructure. Going from being a small energy producer to a larger energy producer requires less than going through a consumer to a producer.

In the same way, other developers and sellers of small scale wind turbines in Sweden cannot be seen as competitors only, but rather as actors influencing the market. An increased interest in the competitors can lead to more sales, and thereby enlarges the market for small scale wind energy in Sweden, making it possible for Ventus Robur to grab a piece of it. After talking to a competitor, that invited the authors to come and look at his workshop and test area as well as provide help on technical development, it is clear that it is not only competition but an embryo to a potential network.

More small scale solar energy producer also creates initiatives for the state to change policies to encourage small scale energy, and it increases the economic incentives to develop the energy storage business.

One important actor is Energimyndigheten (and all it is under organisations) as they decide the public policies for small scale energy, batteries and small scale wind turbines. There is active lobbying towards Energimyndigheten, journalists, the public and the politicians from Svensk Vindkraftförening and others towards better policies for small scale energy. Becoming a member of them giving more power to the organisations is important in strengthening the ecosystem allowing the market to grow. Creating a bigger industry organisation for all kinds of small scale energy (Solar energy, Water energy and battery producers) might of interest to reach better policies. The same conclusion as Thorstensson (2009) can be recommended as well to create a standard organisation to certify small scale wind turbines.

7.5. Is there a potential market in Sweden?

It is clear that there are customers interested in buying and using wind energy, either for a pure investment opportunity or create energy off-grid, but the market itself, needs to be created, again or reshaped. In the current shape of the market, it is mostly limited to off-grid or pure technical enthusiast, but in this customer segment, the scalability is limited, and entrance barriers exist. Market-creating activities need to be performed, not only to attract customers but to change the public opinion as well as the opinion of government organisations. The difference between a small wind turbine and a large one is huge regarding the economy of scale. Solar power, on the other hand, is almost linear regarding scale.

From the interviews, it is seen as a divided belief if it is possible to change the last ten years of market declination for small scale wind energy. The people with more general knowledge in the energy sector were positive to the initiative but was sceptical towards small scale energy generation as an alternative to large scale wind energy due to the big scale advantages. Large wind turbines have a lower price per kWh and lower climate footprint per kWh, making it more suitable to invest in large wind turbines if it can be afforded or if it is done for the sustainability aspect. However, this aspect can also be seen for solar energy, which is, a fast-growing market and an attractive investment for house owners. The interviews with resellers and developers of small scale wind turbines show that if the product-market fit is reached, the market is ready to be exploited, especially with the large interest in sustainability.

As the summer of 2018 was one of the hottest in a long time, the public opinion in environmentally friendly energy is very positive, and the resellers had seen a clear rise of interest in small scale wind turbines. The policies from the Swedish state is however not favouring small scale wind energy, but rather pushes for either large scale wind energy or solar power.

From the interviews, it can be found that around ten years ago, there was a market for small scale wind energy in Sweden. There was plenty of business engaged in this, and several projects in both public and private domains were interested in small scale energy. According to one of the interviewees, a former small scale wind turbine developer, the market died of two reasons, lack of support from the government and the many bad wind turbines causing accidents. It was hard to sell good wind turbines as they were much more expensive than the ones from China, the lack of Swedish standards made it easy for the Chinese turbines to promise more than they could deliver. Thorstensson (2009) proposed in the market study that a Swedish certification agency should be created which has happened the UK, for example, which is a much more accessible market, according to one of the interviews.

In conclusion, there is an interest in small scale wind turbines, but the lacking technology as well as sufficient governmental support to be able to provide a competitive turbine. As Cooper & Vlaskovits (2010) writes, all business models need to fill the three criteria's: The customer is willing to pay for the product, the price for acquiring a customer is lower than what they pay and that the market is large enough to support the business. With the current market setup, the market does not support such a business model proposed above. In the next chapter, a proposed PEST will be provided with the believed market conditions that are required for a wind turbine to be a feasible alternative to solar panels.

7.6. Future research

Future research in why the market for small scale wind energy has decreased the latest years could be done, whether it is the problems with gaining profit or some other aspect, as an increased amount of renewable energy should be seen as something positive for the society. More research in the actual societal benefit of small scale energy could be used in the debate whether Sweden and other nations, should invest in small scale energy or if the money should be invested in larger facilities. More knowledge in the field could also guide regulators in creating more suitable, and understandable, laws and regulations for small scale energy.

8. Practical implications

To be able to implement the new technology successfully, some critical aspects need to be performed by Ventus Robur, and the ecosystem around it.

Political

The policies for small scale wind turbines have to be the same on a national level, that would make it easier for the customer to know what it takes to be allowed to engage in wind energy and having the same type of investment subsidies would make the small scale wind energy more financially attractive. Making the need of building permit for larger wind turbines could make it more attractive in engaging in wind energy as a larger wind turbine is easier to make profitable or making it very clear what it takes to get a building permit for a larger wind turbine than 3 x 3 meter.

Economical

To secure the need for good payback time and payback for the customers, a standard certificate organisation could be created. Creating a standard for small scale wind energy would require a more transparent and easily understood market for the customer, which could help increase the amount of sold wind turbines in Sweden.

Removing the boundaries between energy markets in Europe will probably lead to an increased electricity price in Sweden as the price for electricity, many other European countries are higher than Sweden. A price increase will make the savings larger when engaging in small scale energy. This will probably lead to a larger interest in both solar and wind energy, but it is likely to favour the solar energy market more than the wind energy, giving the government a big incitement to more actively subsides wind energy to diversify the energy generation peaks.

Social

There is currently a large interest in environmental questions in Sweden. However, the actual interest in taking action is not that large. The policies from the state are, however going in more environmentally friendly directions forcing people to take action through taxes, laws or subsidiaries. Using the social aspects as a driving force for the business is important, even if most of the customers are more interested in the financial aspects, the environmental aspect is important to raise money. If the CO2 savings made from the clean energy generated from the wind turbine is not bigger than the production of the wind turbine is going to be hard to motive the development both internal in the business and externally towards customers and the state.

Technological

One reason to engage in micro energy generation is the feeling of being independent of the power companies. The feeling of "independence" can easily be created by wind and solar energy, but to be independent energy storage is very important. Reaching a lower price on batteries, making it possible to store energy for more than one day would increase the incitement to engage in solar and wind energy as it would make people more independent.

The technology developed by Ventus Robur is believed to be able to generate more energy than the competitors, but it will still be limited to the laws of physics, making the location and the size of the wind turbine more important than the efficiency of the new technology. To be able to make the customer content with the product, it is important to give the customer a realistic view of what the limitations are on wind turbines. Placed in the right spot, it is possible to reach the economic limits, but in most location, the product will never pay itself back.

Safety and low maintenance are important. Even if, at least the first customers, will have a large technical interest, maintenance has to be very low. An estimated lifetime of competitors is around 25 years, and this has to be the same for Ventus Robur. The maintenance during these years has to be simple and can be made by unauthorised persons. The risk of accidents has to be minimal for the turbine as well, and it can be seen that the many failed projects 10 – 15 years ago has left a bad record of small scale wind energy on the market.

8.1. The proposed strategy for Ventus Robur AB

It can be seen that talking to the customers, what they want, and how they feel give a good result in customer development. The potential customers that were talked to show a clear interest in pilot projects and the manufacturing plant even proposed closer cooperation. Talking to the customer and market experts extended the network for Ventus Robur both regarding potential customers and competitors. Continuously talking to the potential customers and people with knowledge in the energy sector, engaging in the creation of networks, and further possibilities are crucial for the continued work of Ventus Robur. Opportunities to collaborate with competitors and researchers have also emerged during the interviews; this opportunity should be taken to strengthen the business ecosystem.

Continuously talking to the customer is necessary as the energy market is very dependent on energy price, the public opinion and government policies. As all these factors can change rapidly, the continues talk with the customer is essential. Talking with the actors in the networks also changes the market, making old views obsolete. The gathered information about the customer is also based on only a few interviews; getting a lot more data to get profound understanding is needed.

Technical verification and development are now key activities to find out the opportunities for the invention. Mapping out the performance and optimising the wind turbine is crucial to enter any market as a part of the differentiation. Testing the prototype in various locations and customers will increase the credibility, but to be able to start selling the wind turbine, a CE-certificate is needed. It is proposed to wait with this until the product is closer to the market.

Even though the state is slowly rolling back, it is financial support for solar panels; they are now proven and trusted in Sweden while small scale wind turbines still have a tarnished reputation. There is an option in looking into different business models; if there is, which the interviews have not indicated but can be a problem in requiring the first customers, there is an option in Ventus Robur providing the first customers with the wind turbines for rent instead of buying them. This could especially be applied for on the pilot customers if it is possible.

Collaborations with state organisations have been and will be further explored in order of reaching a higher acceptance of the technology in the market. Collaborating through the different organisations for wind energy both against and together with solar energy organisations can be a key to increase the interest in small scale energy generation.

Both re-sellers and other potential customers vocalised their interest in the product as long as it is commercially viable. The believed performance increase has not yet been verified by prototype testing. If the technology can be proven so effective that it can give a fulfilling payback time compared to solar panels, the problem "saving money for the customer compared to buying energy from the power grid" can be used, while this is unlikely further markets should be explored.

If the prototype performs over the expectations, a new version of the Osterwalder business model canvas and PEST would need to be carried out to accommodate for those changes. However, if the turbine performs according to expectations, the wind turbine is still not feasible for the current market climate as described in the PEST. As mentioned in the critique of the PEST, it is a snapshot of the current external forces. The one biggest factor that determines if the wind turbine is efficient or not is the electricity price, Sweden has a comparatively low electricity price but if the EU in the future would push for a homogenously priced electricity price that could change.

Further exploration of the competitors has to be made to understand what differs them, and how Ventus Robur can create a competitive edge to this. The current belief is that the technology developed by Ventus Robur if working good enough to proceed in the money-saving value proposition, it has to be so much better or cheaper than the competitors that it will be enough as a differentiating factor. However, finding a package solution, whether the customer group will be any of the explored above or some future potential market is believed to be crucial in successfully bringing the technology to the market. Finding a partner for Ventus Robur, like a solar panel company is strengthening not only the differentiation towards competitors but also increases the network for the Ventus Robur. Collaborating with a bigger partner can give benefits and trustworthiness to Ventus Robur towards potential customers and thereby increase the chances of successfully implementing the technology.

In summary, right now, the authors can see some issues for Ventus Robur´s product to be commercially viable. It is therefore proposed that the wind turbine could provide power to various other equipment that requires off-grid energy, primarily as a complement to solar panels.

8.2. Further implications

Further work on the Swedish regulatory market would improve the opportunities for people to engage in small scale wind energy. Looking into the British example of a certification agency would improve the trustworthiness of the products and could lead to more people investing. Including other renewable energy sources in the subsidiary for solar energy could also lead to a more diversified use of small scale energy generation.

The Swedish energy agency should look into their view of small scale energy, their current stand is that small scale energy is of small interest for the society, while this study shows that there is an interest from the people, and increasing the amount of renewable energy, even in smaller scale should be seen as positive. Making a national guideline for building permits for wind turbines could also lower the barriers in engaging in wind energy.

9. Conclusion

As stated in 1.2, the purpose of the report has been to perform a market study of the potential market of small scale wind turbines in rural areas. The market for solar panels is steadily growing, but the market for small scale wind turbines has steadily been regressing for years. The report has been limited to potential customers in rural areas since previous reports have stated that small turbines are troublesome in urban environments.

The interviews and subsequent analysis have shown that there is an obvious interest from potential customers towards the product. However, there are several demands on the product for it to be viable in the minds of the customers.

What are the opportunities for small scale wind power as a sustainable alternative in the Swedish area?

The study shows that there is an interest in investing in small scale energy generation as long as the financial aspects are good. It can be seen that the interest in solar energy is high and that a compliment to solar energy is welcomed. The market, however, is heavily dependent on policies today, making it hard to compete with. If subsidies and rules were easier, the potential can be used to increase the amount of clean energy generated in Sweden.

Selling to off-grid customers is a viable alternative, but the scalability of this market in Sweden is small and shrinking. Other markets that have not been explored can still be open for the technology, and further research in the field has to be done.

Who are the potential customers in rural areas?

The study shows that there can be a large opportunity in the sector of small scale energy if the investment is financially good. The study shows that there can be potential in both farmers, factory owners, camping spots amongst others. While the problem and the reason that there is not a small wind turbine everywhere is that it is very hard to make good earnings on it, this remains a problem, and the question cannot be fully answered.

Which value proposition is needed to gain potential sales in the preferred customer segment found above?

The wind turbine must deliver equal or better payback time about solar panels. Since the majority of the potential customers are situated in rural areas, they would prefer to conduct business with local resellers. Being environmentally friendly is considered to be positive but is overshadowed by financial gain.

There has been a clear interest in Ventus Robur´s wind turbine based on the assumption that a payback period of 8-10 years can be achieved. Reasonable expectations would put the wind turbine at a longer payback time than required by potential customers. If there was any cost-effective way to store the produced energy, then that might change the entire landscape of self-produced power. However, right now, batteries are too expensive and do not provide enough storage capacity for the proposed clients.

In conclusion, the viability of the wind turbine is dependent on external factors that in no real way can be affected by Ventus Robur. A higher electricity price could provide the financial incentive for making the wind turbine a compliment to customers who have already invested in solar panels. For customers that want to be energy independent, the development of cost-efficient storage might incentivise this group towards investing in wind turbines as a complement to solar panels.

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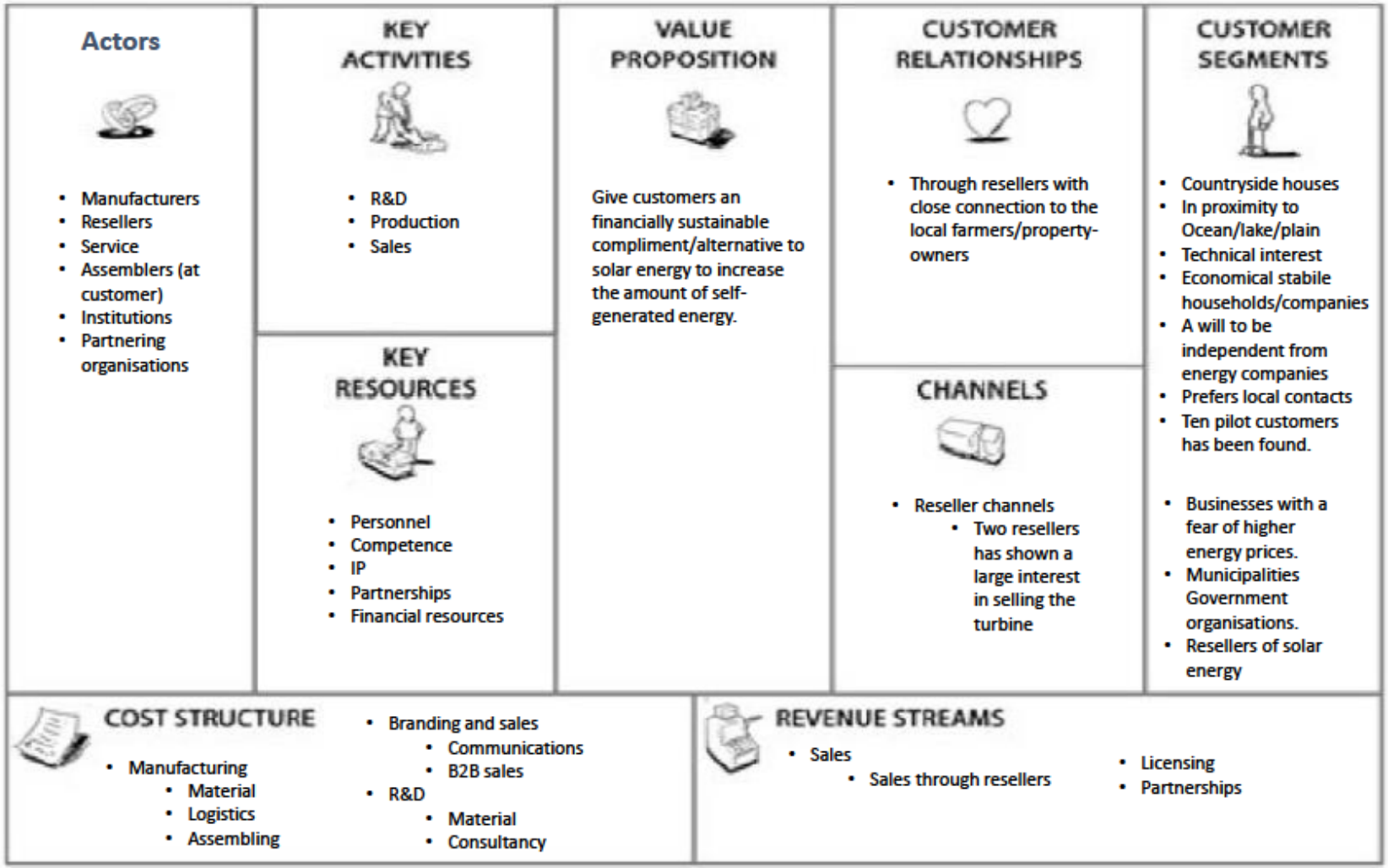
Appendix 1

1. Vad tänker du om hållbarhet?
    a. Vad är företagets syn på hållbarhet?
    b. Vad gör ni nu för att vara hållbara?
2. Syn på socleller
    a. Pris?
    b. Återbetalningstid?
    c. Batteri?
3. Andra metoder för hålllbar elgenerering
    a. Använder de något nu?
    b. Köper de ”ren” elektricitet?
4. Friehet att kunna generera egen el
    a. Viktigt eller inte?
    b. Har de egna energikällor just nu? (Dieselgenerator?)
5. För att ni skulle investera i småskalig elgenereing, vilka aspekter är viktiga?
    a. Vad skulle dom betala?
    b. Rimlig återbetalningstid?
    c. Vad är viktigast?
6. Teknikfrågor
    a. Storlek?
    b. Kapacitet?
    c. Ljud/skuggning
    d. Design
7. Syn på ny teknik?
8. Vad kan dom använda energin till?
9. Lagringssätt?
10. Har de plats för vindkraft?

1. Har ni tittat på vindkraft tidigare? (Andra partners)
    a. Varför?
    b. Varför inte?
    c. Bra/dåligt?
    d. Vad skulle få dem att ändra sig?
2. Din inställning till småskaligvindkraft?
    a. Varför?
3. Hinder för småskalig vindkraft?
4. Varför småskalig sol men inte vind?
    a. Framtida policys för eller emot småskalig el generering
5. Framtiden för småskalig vindkraft?
    a. Blir de fler incitament framöver?
    b. Din inställning till statens inställning?
    c. Vad tycker du om nuvarande policyerna?
6. Vad dom tror om den svenska marknaden?
7. Vad var det som inte gick ihop? (För konkursade bolag)
8. Anser ni att småskalig vindkraft är hållbart?
9. Viktiga aktörer på marknaden?
10. Potentiella områden för småskalig vindkraft?

Appendix 2


Actors
Manufacturers
Resellers
Service
Assemblers (at customer)
Institutions
Partnering organisations
KEY ACTIVITIES
R&D
Production
Sales
KEY RESOURCES
Personnel
Competence
IP
Partnerships
Financial resources
VALUE PROPOSITION
Give customers an financially sustainable compliment/alternative to solar energy to increase the amount of self-generated energy.
CUSTOMER RELATIONSHIPS
Through resellers with close connection to the local farmers/property-owners
CHANNELS
Reseller channels
Two resellers has shown a large interest in selling the turbine
CUSTOMER SEGMENTS
Countryside houses
In proximity to Ocean/lake/plain
Technical interest
Economical stabile households/companies
A will to be independent from energy companies
Prefers local contacts
Ten pilot customers has been found.
Businesses with a fear of higher energy prices.
Municipalities Government organisations.
Resellers of solar energy
COST STRUCTURE
Manufacturing
Material
Logistics
Assembling
Branding and sales
Communications
B2B sales
R&D
Material
Consultancy
REVENUE STREAMS
Sales
Sales through resellers
Licensing
Partnerships

Appendix 3

	POTENTIAL OF THE MARKET	CURRENT MARKET VIEW	VALUE PROPOSITION
ADVISOR ON AN ENERGY INDUSTRY ASSOCIATION	Small scale energy is a market that is hard to enter, as the economic benefits from scaling are large.		Reaching a small scale market has to deliver something more than just electricity to the owner, such as sustainability or being self-sustained.
EXPERT ON SMALL SCALE WIND ENERGY	the small scale market as very harsh to make a living off, but also talks about the potential areas for it like the off-grid measurement units or for people wanting to be self-sustaining	Small scale turbines for consumers is hard to make profits as no support for the turbine is to get from the government	It has to be comparable to solar energy. Bringing a viable option for living off the grid for example.
MEMBER OF THE BOARD IN SEVERAL ENERGY AND WIND POWER ORGANISATIONS	She does not believe in small scale solution for the "average swede" but that it might be a niche market suitable like farmers.	Scale benefits of large power plants and that the average wind speed in large parts of Sweden is too low.	Creating self-sustaining homes is hard to achieve and expensive. An economical and complete solution is needed.

FORMER CEO OF A SMALL SCALE WIND TURBINE COMPANY	Since the market got ruined by bad turbines around ten years ago, but the big interest in renewable energy will revive the market if someone creates a good turbine.	The lack of subventions compared to solar energy together with a lot of entrants selling cheaper, and bad, wind turbines killed the market for small scale wind. He sold around 50 wind turbines	Provide a good and robust wind turbine and focus of farmers or/and off-grid houses.
CEO OF A WEB STORE FOR OFF-GRID EQUIPMENT	They have a customer asking for a vertical wind turbine, and the large dependence of electricity provides a good market for off-grid electricity.	They sell a couple of hundred wind turbines per year, mostly for customers who cannot depend on solar only, mostly for properties used not only during the summer.	Small and reliable, easy to assemble. The noise level is an important factor.
SUSTAINABLE-CONSTRUCTION ENGINEER AT ARCHITECTURAL OFFICE	Positive to it as it can bring some value to the building regarding sustainable energy and good marketing. The competition with solar energy is very hard, and a technical revolution would be needed to reach the market for urban wind energy.	Has tried implementing wind energy in some recent projects with apartment blocks. The customer has never accepted the low amount of energy generated by a small scale wind turbine.	Sound and vibrations are an important aspect as well as design.
CEO OF A WEBSITE SELLING FARMING EQUIPMENT	They used to sell the turbines to farmers who wanted to be energy independent. He said that the market is existing and encouraged us	They used to sell small scale wind turbines for around ten years ago when it was a very active market, but the	The payback-time and ROI must be comparable to solar panels.

	to speed up the development as now is good timing and said that they gladly work as a reseller.	turbines they sold was very bad and resulted in a lot of problems.	
CEO OF A LARGE SCALE WIND ENERGY COMPANY IN NORTHERN SWEDEN.	Policies make it hard to get a financially successful small scale investment.	The north of Sweden is very suitable for wind energy, using the mountaintops, and the cloudy weather and snow make solar energy less attractive investment compared to the southern parts of Sweden	
ENERGY ENGINEER AT A LARGE SWEDISH PUBLIC REAL ESTATE COMPANY.		They have recently started investing in solar energy but have not previously had any interest in small scale wind energy.	They are keeping their buildings for a long time so the payback time can be a very long time if the product gives other values to the buildings. It is important to "show" that you invest in sustainable energy, in that way a wind turbine is good.
ENERGY ENGINEER IN A PROJECT FOR OFF-GRID SOLUTIONS IN A LARGE SWEDISH ENERGY COMPANY	He says that small scale generation will probably continue to grow and that it is good for the electric grid as it requires less transport. He thinks that the energy prices will rise, and most probably be more	The economic gains with larger power plants are more economical than small scale. He says it is easier to use wind turbines if you are off grid as it	

	fluctuating giving a reason to invest in small scale energy.	requires fewer components, but it is very few who are off-grid.	
FORMER SMALLSCALE WIND TURBINE DEVELOPER	Large potential market with a big interest in renewable energy. But the quality must be high.	It is a very complicated market with a lot of risks (bad wind turbines). It is hard to make a wind turbine profitable. The policies are not preferable for wind energy.	Lower the energy cost and make people more independent on the larger energy companies. Provide a good turbine without the need for building permit; if people want more energy, they should build more turbines.

Appendix 4

	CUSTOMER PAIN	CUSTOMER GAIN	CHANNEL	PRODUCT
FARMER FROM SMÅLAND	Uses a lot of energy. Solar energy is mostly produced when not used. His solar panels cannot be used during power breaks, and batteries are not worth the investment right now.	Save money on the energy bill. The availability to use energy during power breaks. Gives a feeling of being self-sustained and less dependent on power companies. Interest from neighbours/friends/customers.	Wants a local re-seller. That gives a personal relationship and good options to gain technical support.	Can invest around 300 000 SEK Max size 10 x 10 meter. Same ROI and Payback-time as solar
DEVELOPS OFF-GRID "ATTEFALLSHUS" (30M^2 HOUSES)	Solar energy is mostly produced when not used.	A more diversified electricity generation than only solar energy making storage less crucial. Having a wind turbine can create a good marketing value.	B2B sales directly from Ventus Robur.	3 x 3 Meter is a good size. A power rating on 3 kW works. It is crucial that the sound is low and vibrations should not be transferred into the house

MANUFACTURING PLANT PLACED CLOSE TO A LARGE LAKE.	Uses a lot of energy and pays a lot for electricity. Believes in higher energy prices in the future. Solar energy is mostly produced when not used.	Lower the energy costs in the manufacturing plant. Brings a good commercial value as sustainable energy generation is highly regarded.		Can invest around 600 000 SEK Maximum of 8 year payback time. The most crucial worry they had about putting up a wind turbine on the manufacturing plant is the noise and vibrations. Size doesn't matter.
ADVISOR AND MARKET EXPERT ON A CAMPING INDUSTRY ASSOCIATION.	I am using a lot of energy during the summer. Heating water requires a lot of energy.	A wind-turbine can create a more diversified energy generation; heating water is needed more in less sunny days. A wind-turbine can be good for marketing to both customers and employees.		Payback time around 8 – 10 years. Making an investment equal to solar energy is a must. Size of investment is not a big problem.

COUNTRYSIDE HOUSE OWNER.	Had an urge to engage in clean energy. Wanted to go off-grid.	Reduce climate-footprint Reduce the need for a large energy company.	Doesn't matter.	Not needing a building permit is a good thing. Maximum size of 10 x 10 meter. The battery would be very appreciated. Low noise was important. The design was important.
COUNTRYSIDE HOUSE OWNER CURRENTLY HAVING A WIND TURBINE.	Lower energy cost.	His wind turbine has not solved any problems, only created new ones.		Low maintenance. Silent and no noise. Less than 15 years of payback-time. "Okay" return on investment. It must be safe.

CEO OF A HYDROGEN STORAGE COMPANY	Using only solar energy needs large storage capacity to be off-grid. High energy prices during winter when solar energy is less viable.	Make a more diversified energy generation and require less storage capacity.		Maintenance free. Can only be a compliment to solar. Only a viable option if the buyer is total off-grid.
FARMER AND LARGE WIND TURBINE OWNER	High electricity bill. Urge to generate clean energy.	Bragging rights Large wind turbines are more profitable and better for the environment. But he sees a market for people who wants a hobby and want to get independent of energy.	Wants a local re-seller. That gives a personal relationship and good options to gain technical support.	Only interested in very large wind turbines. Easy to assemble and maintain.

Appendix 5

Metrics

To avoid vanity metrics, a metric scorecard was created. The theory claims that it is a risk with the customer development methodology that companies spend too much time talking to customers while they could have started executing their business instead. The scorecard was created to keep track of the result from the interviews, and a fulfilled scorecard can be used in the future as a signal of go/no go for the business model.

Proposed Metrics	**Goal**	**Fulfilled**
Pilot customers	10	4
Interest in Self-sustaining	10	3
Value environment over financials	10	1
Values Profitability over environment	10	3
Worries about future energy prices	10	8
Wants to buy from a local re-seller	10	2