UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

Master Degree Project in Innovation and Industrial Management

Sustainable Business Model for Renewable Energy Technology in Rwanda

A case study of Autonome Infrastructure AB

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Master Degree Project No. 2016: 67
Graduate School

Abstract

During the last decades, business literature has gradually developed interest towards the concept of Business Model. While companies were starting to understand its potential, the design of Business Model has arrived to two main frameworks, the Business Model Canvas and the Value Proposition Canvas, which have been generally accepted for their ability to easily show the complexity of the organization. Meanwhile, the issues presented by pollution and climate change have required to companies a change in their models of business towards a more environmental and social purpose: the growing number of studies on Sustainable Business Model are a consequence of a new responsibility beyond the economic growth that companies have to face. The environmental emergency also contributed to shift the attention on new forms of energy solutions. Nevertheless, the novelty of the subject makes it difficult to find enough evidence to structure a Sustainable Business Model for renewable energy technologies and, in addition, the research restricts even more if companies need to understand the most feasible ways to bring these technologies to emerging markets in developing countries.

With the purpose of clarifying the confusion around this topic, this Master Thesis aims to balance the gaps in the literature of Business Models for Renewable Energy with the informations collected in a case study, focused on how to bring to Rwanda a Hybrid Solar Technology produced by Autonome Infrastructure AB. Therefore, this Thesis compares the Literature Review with the informations from the company and those on the socio-political context of the country, with the intention to find the combination of data that best fit the Sustainable Business Model for Autonomous Infrastructure.

Acknowledgements

This Master Thesis was written during the spring of 2016 at the School of Business, Economics and Law of the University of Gothenburg. I would like to express my gratitude to the people who helped me to realize this work.

First of all, I would like to thank my supervisors Evangelos Bourelos and Daniel Ljungberg, for the precision and the guidance they offered me during this period. I would also like to give my appreciation to Kent Samuelsson of Autonome Infrastructure AB, for giving me the opportunity to study the company he founded and explaining me its potential.

I also sincerely want to thank Ola Ekman at First to Know AB who, with introduced me with his enthusiasm to the opportunity of studying AI, while opening his network doors allowing me to speak to students, entrepreneurs and ambassadors about Rwanda.

Last, I am grateful to Anders Knutsson, for taking his time from his Thesis in Rwanda to participate to this study, giving me advices on the application of my research to Rwandan market that I would have hardly found elsewhere.

Thank you!

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TABLE OF CONTENTS

Chapter 1
INTRODUCTION

1.1 Problem Description

On May 15 2016, the renewable power production in Germany arrived to cover a total demand of 55 GW, forcing the country to sell the amount in excess coming from other sources. The same day, Portugal declared the intention to run the whole country only on renewable energies for four days, relying on solar, wind and hydroelectric solutions, and no CO2 emissions were released in the atmosphere. In a similar way, also Denmark was able to run on 42% just from wind plants during 2015, with a peak of 140% of the required energy derived only by wind. This events, which nowadays this might appear impressive, could be considered ordinary in few years with an incremental adoption of clean solutions for satisfying energy demand. In Europe, today, an average 25% of the energy consumption comes from natural sources, but countries like Austria and Sweden have already passed the threshold of 50%.
The 21st Conference of Parties held in Paris at the end of 2015 has shown the interests of the United Nations towards the issues related on climate warming and the positive impact of renewable energies on environment. Countries are now analyzing the content of the treatment which would impose them to organize themselves from 2020 in order to stabilize the temperature at 1.5° higher than in the pre-industrial age. The treatment would require a deeper commitment also from the big countries that did not applied for Kyoto Protocol, like China and US, which emissions heavily affect the environment. This event was also useful to shift the attention on the countries that would potentially experience the hardest impact of climate change, which not surprisingly are the ones still developing, mostly regarding the African continent. However, the flowing of information and knowledge about innovation that the world is experiencing today can turn to be an advantage also for them.

Many developing countries are getting more aware of the potential of green solutions, both from an economical and environmental perspective. As an example Morocco, which will host the next COP, is building a solar power plant of the dimension of its capital Rabat. At the moment, Morocco needs to import the 97% of its energy demand but, once the plant will be entirely completed by 2020, it will be able to cover the 42% of the demand through renewable sources. Also Costa Rica has been worldwide reported on news for running 75 days without using energy derived from no other sources but clean ones. Although the small dimension, it is impressive to see how renewable energies have a good degree of success also in developing realities, where other industries are still forming. These are just few examples, but they caught the attention on the incredible benefits for the domestic economy also of Sub-Saharan countries. Observing the experience of western realities, many of these countries are aware of the implications of alternative technologies in the growth process and, as a consequence, it is not hard to find these solutions in the core of development plans.

For the first time in history, what emerges is a worldwide common interest between the economic principles of profits and innovation and the environmental requirements imposed by climate change. Nevertheless, developing countries are still facing different social and political dynamics which might restrain domestic and foreign investments on renewable technologies. As a consequence, the new Business Model are facing a deep challenge based on rising economical, environmental and social paradigms.

The definition of Business Model in the literature shows many different interpretations and it is not always easy to find its role in the business: it clearly has to be independent but compatible with the strategy and tactics; it needs to be simple to read but complex enough to explain how a company wants to deliver its Value Proposition and, moreover, it requires enough flexibility to be changed when the situation requires it. Value Proposition has increased its key function while Business Model theory was moving towards a more Sustainable approach. The purpose of a Sustainable Business Model is to use the principles of Triple Bottom Line, which shifts the responsibility of a business towards

social-environmental perspectives rather than just economic: this combination should be able to increase economic viability of businesses in new market, while increasing social wealth and with no impacts on the nature. The change, therefore, leads to increase the attention on stakeholders interest, rather than the shareholder's ones. However, in the case of new markets in developing countries, the literature is not always exhaustive in giving the right informations about how to design a Model able to exploit their potential while minimizing their socio-political problems. For this reason, companies who wants to exploit the opportunities offered by evolving markets usually cannot find enough informations on how to do it and may hold back from doing it, with negative drawbacks also for these countries.

1.2 Company Overview

Autonome Infrastructure International AB is a Swedish energy company, founded in Gothenburg by Kent Samuelsson. The company is owned by Samster AB, another energy enterprise founded by Mr.Samuelsson. In 2013, the AI introduced a new technology, Autonomous Energy System: the energetic provision deriving from this novelty is represented by Solar Hybrid Panels, the result of an incremental innovation of previous solar panels and a valuable alternative to traditional diesel solutions. This system, in the basic version, is able to capture and provide energy in form of electricity, heat, air conditioning and warm water and it is usable in areas where normal panels would not be efficient.

On the one hand, traditional Solar Panels present different drawbacks, mostly connected to the deterioration in time and the efficiency decreasing when implemented in wormer environment. To maximize the efficiency, solar panels should reach a temperature of 25° to reach a power generation of 250W. As an example, in Sweden, where the panels' temperature reach 60°, the power generated is around 210W. As a consequence in African countries they would surpass by far the 100°, so temperatures would just be too high to reach efficiency. As a matter of fact, power production (P) in solar panels is generated

by the Current (J) and the Voltage (V) in the equation P=JV. In the application of this principle, when a solar panel is heated, there is a maximum point in which J and V are in their best combination to reach efficiency. Beyond this point, with higher temperatures, the heating produces a raise of the current and, at the same time, a decrease of the voltage. When this happens, the voltage is shown to decrease faster than the current increases, which makes it more difficult, sometimes not recommendable, to implement this technology in areas with higher temperature conditions. Moreover, solar panels lifespan is limited to 20 years with a decrease of 20% of energy output during this time.

On the other hand, traditional diesel solutions in higher temperatures environment could seem to be more efficient than solar panels. However, it has to be considered that, in the process of electricity production, only the 30% of the energy is collected, while the remaining 70% of heat produced is wasted for dispersion. Moreover, the initial investment cost represents only the 5% of the total lifetime investment, making it not only inefficient but also very expensive, without considering the environmental impact. For this reason, it seems there is space for alternative solutions, able to compensate the deficits shown by these technologies.

The solution proposed by AI uses Hybrid solar panels, a technology based on a cooling system installed beyond each panel, in order to maintain the surface temperature stable and get the maximum efficiency from the heat to produce electricity. Hybrid Solar Panels are able to generate 10% more electric power than traditional solution, plus free hot water and 50-80% more cooling, which increases the performance of any other solar panels, and it is cheaper and more efficient than thermal solutions. The panels are connected to a heat pump which needs, in order to function, an external source of energy, provided by part of the electricity collected by panels. A heat pump is able to carry the input thermal energy in the opposite direction to the normal flow of heat by absorbing energy through a cooling system, similar to normal fridge and freezer systems, and releasing it in a wormer sink. Most advanced electrically moved heat pumps are able to produce up to 4 times more energy output than the one used as input. The cool generated will partially be used to maintain the panels'

temperature stable, while the heat produced can be used to warm or converted to produce hot water and air conditioning. In addition, there is the possibility to increase the benefits by combining it with optional technologies, able to produce potable water or empower internet connection platforms. Moreover, the heat produced in this process can be stored for future use, as well as the electricity can be collected in batteries.

Compared to the traditional diesel technology, which Coefficient of Performance (COP) is 0,3 since only 30% of energy produced is effectually collected, AI system is able to reach a combination of 20% electricity, 40% hot water, 40% heat and 40% cold using 10% of the electricity to power the heat pump, reaching a COP of 15, with no additional investments for fuel.

The product is very easy to install: it is delivered in a container, which in its basic version contains the panels, the heat pump, the battery and the heat storage system. For this reason it does't require many additional costs and, if required, they would be mainly due to the connection to the grid, for increasing storing capacity or for connecting and combining it to other sources of sustainable energy, like wind or water turbines. In alternative, it is also possible to combine it with a diesel motor in order to get energy provision in unstable condition or when more capacity is required. There are more solutions available: depending on the dimension of the container, the number of panels delivered could be 80 or 160. The second option, as an example, during 8 hours of sun would collect 50-60kW of electricity and 150kW of heat, in normal conditions. The easy configuration would make the product feasible both facilities, such as farms, schools, factories, hospitals or airfields and environments like villages, rural areas, disaster camps or city districts. Moreover, what really makes this solution a valuable alternative to traditional technology is the possibility to have it On Grid or Off Grid.

1.3 Research Question

Despite the large amount of theory published so far, literature still lacks a satisfying Business Model definition. Also, since the patterns to follow when writing a BM are continuously challenged by the large need of innovative solutions, it is usually not easy to find many articles or studies on complete Business Models for renewable energy systems. The operation gets even harder if we want to associate developing countries to the research. For this reason, entering a new market in a developing countries needs a solution which catches the potential of Business Model combined with the social and the political condition of the country itself, able to enhance the value of the project for the both the company and the society.

In this case study, the social and political scenario on which the Business Model will be structured are related to Rwanda. The country has small dimension but, compared to its neighbors, the government is stable and it appears to be safe and institutionally reliable. What most interest foreign investors and entrepreneurs is the commitment of government in investing on the development of many industries, facilitated by politics that allow fast times to found a company and to get credits. In this context, there is the awareness that Energy Sector is essential to promote and achieve new targets, therefore the Government is deeply focusing on realizing the necessary infrastructure to ensure electricity to industries, administration offices, hospitals and also rural areas, which are still often without grid connection. Also, even the facilities already reached by the grid are still facing many problems linked to its quality, as continuous blackouts often force them to not operate, with large negative implications on economy.

As already mentioned, new technologies that may easily solve these problems are already working around the world and, for the particular socio-political context, foreign investors are watching at Rwanda as a possible, feasible starting point for geographical diversification in the African Continent. Nevertheless, much of BM literature is still lacking practical informations

regarding the implication of new technologies in developing countries, which creates confusion among investors.

In this condition, identifying the complementarity of economical, environmental and social impacts of renewable technology will give a structure to the value proposition, in this case the core of the Business Model. The research question then will be: “What is the Sustainable Business Model that AI can exploit to enter Rwandan Energy Market?”.

In order to answer this question, Business Model Canvas and Value Proposition Canvas, together with the characteristics of Sustainability, will be applied to the the particular aspects of AI technology and the Rwandan energy market.

Chapter 2
THEORETICAL FRAMEWORK

The purpose of this section is to provide a literature review referred to the concept of Business Model and how to apply it to the case study of AI. In particular, this theory review aims to find the details in the Business Model literature in order to build a Sustainable Business Model for renewable energy technology, which will be in the following section compared to the one realized on the Empirical Findings. To do so, the review starts from giving a definition on Business Model, the strategy to select the right one and how to develop it. After this, the concept of sustainability is applied in order to state its impact on Business Model. The research concludes through the definition of the structure of the Business Model Canvas combined with the knowledge on renewable energy technology, with particular reference to small enterprises adopting Customer-Side Business Model approach.

2.1 Definition of Business Model

The literature about Business Model has its basement on the early 90's, when companies started understanding its real potential in giving a direction to their business through the identification and the best combination of all its components. Before that moment, this potential was hidden by an accidental, sometimes casual design, often realized when the business was already initiated. However, despite two decades of research and literature, there is not a clear, unified definition of a Business Model yet.

A good Business Model is like scientific research: it starts with an hypothesis, followed by an application and finally mutual adjustments based on results and changes in circumstances (Magretta 2002). This explains quite well the nature of a BM and why the "one does fit all" rule is not allowed: every business needs its model and, as a consequence, the general Model needs to be flexible.

According to Shirky (2008) (cited in Trimi and Barbegal 2012), startups with a flexible business model are the ones that most likely will succeed in realizing their purpose and achieving results, because they allow entrepreneurs to modify it. For this, the idea of a fixed model results to be pretentious, as well as misleading. As a consequence, in the case of processing a Sustainable Business Model, the first step is to quickly compare the main ideas that research has produced so far in order to understand first what a Business Model is.

Much of what can be said for answering this question can be simply summarized in a similitude: a Business Model is like storytelling, continuously changing and improving. A good interpretation of this is provided by Magretta (2002), which underlines how these variations are made on the generic value chain, clarifying the objectives in order to find the successful model among the possible alternatives. Every Business Model is both result and cause of innovation of product, process, distribution or finance, or a combination of them. Thus, a Model is built upon the ability of a company to focus and enhance a particular aspect that makes it competitive, either relying on the activities combined in producing or delivering something new. Teece (2010) brings to this definition two elements that will enhance degree of success of BM, including the value capturing and value proposition. A successful Business Model cannot be defined without understanding that the final purpose is to explain how the company plans to capture the value, deliver it to customers and transform it into profits. As a matter of fact, this represents one of the main pillars on which the following literature has based on. In support of this, Teece (2010) gives a first configuration for creating value. The process starts from understanding and selecting the features included in the product or service, in order to make clear the benefits for customers which help to identify the target market segment and the potential revenues. The whole process is complete when the critical sources of profits are defined: this is represented, as will be later discussed, once the mechanism to capture value are designed on a solid value proposition.

A lot of the confusion on identifying the right explanation of a Business Model is based on the erroneous substitution with other definitions, such as business

strategy, tactics, business plan and concept, economic model, statement, description, architecture and so on. According to Zott, Amit and Massa (2011), up to 37% of the publications about business model studied don't contain a definition, giving it for granted, while only 44% tries to give a an idea of its composition. It emerges the necessary condition to give an organized structure to the various steps when defining a model. On this evidence, Morris, Schindehutte and Allen (2005) have collected 30 different descriptions of Business Model, and from the main key words they have been able to provide a very useful solution based on the identification of three general categories. Their order is not casual and implies a hierarchy that allows to build a model through first economic, then operational and finally strategic levels. The economic level collects all the basic informations on how to sustain the business through profits, which implies cost and revenues sources, pricing, margins and volumes. The operational level is focused on enabling the company to create value through internal processes and the design of infrastructure, which compose the architectural configuration. The strategic level, instead, collects those elements, such as positioning and interactions inside and outside the organization boundaries and growth opportunities, which allow the company to gain a competitive position in the market.

Another precise structural division of business model is given by Zott and Amit (2011), who consider the design of value creation as the representation of content, structure and governance. In other words, they imagine it as the definition of the goods and information exchanged, the parties involved and the control of the process.

Business Model rotates around the figure of value proposition, which starts to delineate its importance in the whole process. In addition, Baden-Fuller, C. and Morgan, M. S. (2010) underline the role of business model in identifying the parties, with a particular insight not only to potential market but also to stakeholders and shareholders. It is clear how the importance of business model has improved the correct but still partial idea of giving the company a path to follow, growing its potential in attracting investments.

The collection of these information helps to give a general idea of what are the main areas on which focusing when defining a Business Model. To sum up, it is necessary to create a flexible, structured plan, efficient in capturing value, managing interactions with customers, and showing the potential to shareholders.

2.2 Development of a Business Model

A very efficient starting point on how to develop a business model is to always consider two main questions: which choices have to be done to run an organization, and which will be their consequences (Casadesus-Masanell and Ricart 2010).

The main scope of a business model is to give quick and simple answers to the possible questions that may arise when evaluating a business. Magretta (2002) extremely simplified the definition of business model in being able to answer Peter Drucker's questions: "Who is the customer? And what does the customer value?" and "How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?".

Although this definition, also the development of a unified theory explaining how to build a correct business model is still lacking many information, basically because the variables of interrelation, value creation and market, among others, are really different in every business. Companies have to start writing their own model choosing among alternatives, and the most useful way seems to be the one of identifying the right questions to answer. This is underlined by Teece (2010), who considers the necessity of companies to be creative in identifying the right approach to use with customers, competitors and suppliers. Entrepreneurs have to be able not only to select the right model but also articulate and develop it, maintaining it flexible. The author also supports this by stating that the structures, processes ad systems implemented in a business

model are hard to replicate, also because it is necessary a deep insight on the variables, which usually are not easy to find.

With these purposes, it can be said that in developing a business model it is to primary focus on customers needs, the revenue source and the competitive situation of the market. Both Teece and Morris and Minet works collect these elements in a combination of questions that many help in defining the model, although some differences. On the one hand, Teece focuses more on the utility coming from the value capturing, the market potential and characteristics and the costs of producing. On the other, Morris and Minet have a slightly more strategic approach, based on the definition of source of advantage, the positioning in the market place and profit plan. Between the two, probably in a first moment the approach proposed by Teece results more pertinent, since it is common knowledge that business model has its own identity towards strategic plan.

2.3 Business Strategy and Business Model

Business models have not to be considered independent from Strategy, although they both have defined and different identities. This because the two tools have different roles but, despite this, they are very related and interconnected. Once the initial phase of a new business arises and it is necessary to elaborate a complete answer to all the questions mentioned so far, and since the alternatives which make a business model flexible are almost endless, strategy can turn really useful in order to chose the correct Model for a particular business.

In their work, Casadedus-Masanell and Ricart (2010) have identified strategy as a “plan of action” in order to achieve firm’s goals. They had a simple but useful intuition, that collects business model, strategy and tactics in a sequence of two-stage framework that confirms the theories of the authors cited until now. The first stage is referred to the choice of the business model based on the company’s study of value creation and value capture whereas, in the second,

the goals defined in the model are supported by tactic decision. Evidence in additional literature about this point of view is also provided by Morris, Schindehutte and Allen (2005), who underline the existence of business model founded upon strategic decisions. This helps to give a first definition, underlining the differences to the various elements. While business model gives a definition to how firms intend to create and capture the value, or identify the market size and potential profits, strategy's purpose is the one of selecting the right business model, whereas tactics collect all the marginal choices to realize what highlighted in the model.

It is a common view that strategy has to take into account all the possibilities that a firm may encounter, and one of the main aspect that a company has to face is competition. This is why strategy is very connected with competitive position. Porter (1996, cited in Morris, Schindehutte and Allen 2005), for example, defined strategy as the "creation of a unique and valuable position, involving a different set of activities". Competition is a critical factor in the success of a new venture, but the definition of the plan to deal with it is not outlined by the business model (Magretta 2012) and appears to be much more generic than the strategy (Teece 2010).

Strategy is then the process of creation of the system of activities and, therefore, of the business model. For this reason, business model and business strategy have to be considered under their complementarity, not as substitutes (Zott, Amit and Massa 2010). According to these authors, strategy has to deal with competitive advantage and value capture, whereas business model seems to be more incident on relationships creation, such as cooperation and partnership or joint venture. Moreover, it seems that business model has the important role to define the value proposition. In some cases, value proposition represents the core element on which all the other aspects will be based on.

2.4 Towards Sustainable Innovation

When facing new markets in developing countries, sustainability reveals to be an interesting factor of value creation, which makes it of considerable

importance to work the whole business model around it. According to Sinkovics et al. (2014), most of the developing countries, defined as rising stars or rising powers, are still not so surprisingly also the ones in which most of the population, the so called base of the pyramid (BOP), strives to survive. For this reason, what is required to do is to find the drivers and the features to work on a business model which captures and delivers mutual value both to the company and the whole society.

It is not easy to determine how a social responsibility could improve the benefits of the company, mostly because it is still unclear if it is necessary to find a concrete aspect in which sustainable policies can be placed in companies' strategy. As an example, entrepreneurial venture has a double effect of creating value, both in company and society but, as considered by Sinkovics et al. (2014), it is not "neither a necessary nor a sufficient condition for social value creation". Nevertheless, the same authors question why this condition is so widely considered by the literature as a base of any BOP market, if it was included in every model. Probably one explanation is that, when structuring a business model, it is necessary to state the political, economical and institutional environment (Sinkovics et al. 2014) and to improve the productivity while avoiding the forced exploitation of employees and natural resources (Boons and Lüdeke-Freund 2013). More in detail, the aim of the first authors is to build a business model that considers the manifestations of the social value it brings, since this may significantly differ from a developed to a developing economy. In other words, they consider two sets constraints when considering a business linked to BOP: binding constraints, such as the ones which limit growth (in this case, institutional and governmental failures to face problems) and firm-level ones. A well designed business model can deal with the seconds, while it is more difficult in case of the firsts. Similarly, Boons, Montalvo et al. (2013) state that sustainable business model of innovation is conditioned by two key actors, entrepreneurs and governments, that can influence the competitiveness of a market. Competitiveness, as it is easy to understand, is influenced by the ability of governments of developing the appropriate policies for an attractive environment. Social value results are much greater in

developing country: being the dynamics of emerging markets different from the ones in developed countries, a good alternative that keeps together sustainability and innovation is provided by Eco Management and Eco Innovation. EM purpose is to show how growth can unbundle from environmental degradation and move towards achievements of environmental policies, innovation and new technologies (Baker,2007, cited in Stubbs and Cocklin 2008). Similarly, Boons and Ludeke-Freund (2013) state how eco-innovation is often used as similitude of sustainable innovation.

BOP can be a starting point for those companies who want to build a sustainable business model. The same BOP is conceived on the purpose introduced by Prahalad (2005, cited in Michelini and Fiorentino 2012) of "serving the poor profitably", since these economies can be sources of an extremely rapid growth for those companies which can conciliate the opportunity with the social characteristics of the country. This is possible only through a change of mentality of companies, moving from the idea of these countries as an exploitation area to the one that sees them as different markets with different needs and requests, where technological innovation can be enhanced (Austin et al. 2007, cited in Michelini and Fiorentino 2012). A very interesting approach to sustainable business model is the one provided by Michelini and Fiorentino (2012), who propose a model resulting from the combination of knowledge from top of the pyramid and expertise found at the bottom.

At the base of these reflection there is the concept of "Triple Bottom Line" by John Elkington, in parallel to the development of the idea of business model. According to the author, it was necessary to increase the environmental and social dimension with the economic agenda to see effective results. The concept was initially matched with the 3P principle, "people, planet, profit", which underlined the multiple objective of the term, also used by Shell for the first Shell Report and adopted by the Netherlands.

TBL agenda, according to Elkington, in focusing on economic environmental and social value that is created or destroyed, has to rely on "seven drivers" (Elkington 2004):

1) Markets. First driven by compliance, now businesses have to face markets where competition can be very high. A key survive in this scenario will be to learn to spot market conditions that can jeopardize the process. Also, the pressure on growth of environmental, social and economic aspect will increase and TBL shows to be a good tool to achieve better results in the long term.

2) Values. The shift from hard to soft values is parallel to the change of view that every sequent generation has on them. As a consequence, the convictions on which businesses have been based for years may change, with bad drawbacks for the same companies.

3) Transparency. As internationalization is increasing, companies' belief, values, thinking, actions, priorities and commitments are more and more exposed. From a closed perspective we are going towards a more opened one, due to information technologies and evolved values.

4) Life-cycle technology. This revolution is very connected with transparency, since it is driven and, at the same time, driver of it. The perception TBL is changing companies attention from the acceptability of their products to their functions and performance (ex. cradle to crave, recycling or disposal).

5) Partners. Subversion to symbiosis. There will be an acceleration and increase of partnerships between businesses, which may imply challenging and working with companies within the same market, at the same time.

6) Time. Political decisions are conducted with a very short term approach and time based competition, as "just in time", require fast decision for the present. However, the sustainability agenda requires a shift towards longer periods of decades, sometimes centuries, creating alternatives scenarios of what the future may look like.

7) Corporate governance. This dimension is driven by the other revolutions. Sustainability challenges build around not only to product or process, but also the value chain, the business eco-systems and markets. The new questions arising are: “what is business for? Who should have a say in how companies are run? What is the appropriate balance between shareholders and other stakeholders? And what balance should be struck at the level of the TBL?”.

In stating the importance of sustainability, as the increasing wealth generation with the usual patterns would easily create worse environmental and social conditions, Elkington individualize 4 main types of company in what he calls the “Chrysalis economy”: corporate locusts, caterpillars, butterflies and honey bees. It is intuitive to identify the evolution pattern that characterizes this sequence and, for our purposes, the corporate honeybees are the ones to focus on.
Corporate Honeybee represent the category in which a growing number of government agencies, innovators, entrepreneurs and investors will try to convert in. According to the author, their impact is “not only sustainable but also strongly regenerative”. Key characteristics are (Elkington):

- sustainable business model conceived around the purpose of continuous improvement.
- ethics-based business principles.
- strategic sustainable management of natural resources.
- capacity for sustained heavy lifting.
- sociability and evolution of powerful symbiotic partnerships.
- sustainable production of natural, human, social, institutional and cultural capital.
- capacity to moderate the impacts of corporate caterpillars in its supply chain, to learn from mistakes of “locusts” and to boost corporate butterflies efforts.

2.5 Sustainable Business Model

Sustainable business model collects the principles of value creation through socio-technological innovation together with social and environmental targets. The purpose of SBM is to pursue firm's level targets considered under the triple bottom line approach (Stubbs and Cocklin 2008), preserving the environment and continuing evolving human's quality of life. Bocken 2013 (cited in Ludeke-Freund 2010) interprets it as "a business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society". Moreover, Boons, Montalvo et al. (2013) underlines the potential of SBM to "bridge the gap between radical and systemic sustainable innovation and firm strategies". However, it is not always clear how sustainability purposes can clearly turn into profits (Bocken, Short et al. 2014). Despite this, it is possible to trace in the literature some common patterns that allow to maximize value capturing and, at the same time, pursue the socio-environmental targets.

First of all, it can be valuable to state that there is a hierarchy composed of five evolving elements of sustainable business model (M. Høgevold, Svensson et al. 2014):

- *Corporate reasons:* intuitive initiatives by an individual inside the company, that become little by little accepted and incorporated, increasing organizational consciousness. This can improve the culture of the company, introducing the social and environmental elements of TBL, which can be a driving force at first, but they always have to be sustained by strong economical reasons for the well being of the company.
- *Environmental actions*: the basic changes in this sense (energy saving, recycling) can be a driver for a more complex stimulation for change in the future, usually due to the changing from intuitive to financial reasons.
- *Social boundaries*: they pass from "within organization" of the organization to "beyond organization" as the time pass and the consciousness becomes stronger and more evident. This involves business networks as well as supply

chain and stakeholders, and it evolves as corporate and environmental reasons become more mature.

- *Economic effects*: they pass from the initial cost-oriented perspective to arrive to the value-oriented one, with the development of the previous aspects.
- *Organizational Challenges*: they become holistic after the initial myopic, due to the implementation of financial factors, complex environmental actions, the passage to beyond-organizational boundaries and value-oriented economic effects.

The first step is to understand which elements of the generic definition of business model are able to enhance the sustainability of a business. Boons, Montalvo et al. (2013) identify three initial elements, "vital for sustainable innovation". First of all, value proposition has not to be conceived around a product or a service, but on the exchange of value and, since this has to receive a deep attention when building the BM, the value of the elements of the triple bottom line automatically come into focus. Second, the configuration of value creation, from which derives the approach of connection between suppliers and customers, has now to point also the the larger system in which the product is delivered, considering customer interface and supply chain. The emphasis regards the role of the firms, the networks and institutions: the introduction of a product in the market to gains competitive advantage does not only refer to the firms, but has to do also with their interconnection among each other, the relationship with governments, financiers and intermediates, a concept explained by the innovation system theory (Malerba 2002, cited in Boons and Montalvo et al. 2013). Furthermore, it has been underlined the importance of government support in the implementation of sustainable technologies, especially related to energy production. Finally, the distribution of costs and benefits, or the revenue model**,** gives concreteness to the definition of value creation.

These first insights suggest to look at SMB by two perspectives: Structural and Cultural. According to Stubbs and Cocklin (2008), the two aspects together introduce some advices to the organizations:

- Redefining business purpose. It has a comprehensive point of view than just a financial target. This is the result of a change in internal and external cultures and attitudes and the proactive support by stakeholders. Sustainability has to be considered as a business strategy, both by ethical and economical reasons.
- Reporting financial, environmental and social outcomes. The adoption of TBL doesn't mean that the company reached the sustainability purposes: TBL is not a sufficient condition to reach sustainability. However, it is not possible to reach valuable results aside financial ones if analysts don't consider the TBL approach when stating company's sustainability performance. TBL is then a tool to measure performance. Profits is a vehicle, and not only a result, to reach sustainable outcomes: "sustainable organizations must make a profit to exist but they don't just exist to make a profit".
- Stakeholder view of the firm is important for introducing sustainability visions. In other words, trust, honesty, equity and fairness are characteristics of stakeholders who focus on social and environmental outcomes, as well as financial.
- The role of leadership. Clearly, the sustainable vision of CEOs can strongly influences the one of stakeholders and the organization in general. Stake holders could actually become even more influent than shareholders, since "the organization's success is inextricably linked to the success of its stakeholders, which means a priority shift from shareholders to stakeholder perspective. As the culture of sustainability grows, the role of leader in pulling the organization to sustainable values diminishes.
- Nature and environmental sustainability. This point introduces the perspective of the role of nature as a stakeholder towards the organizations. The problem, when pursuing new sustainable objectives, is represented by the large capital amount required for investments. For this reason, it could be a solution to cooperate with competitors or actors in the network for a joint commitment

towards sustainable results. The renewable characteristics are used instead of the non-renewable ones, since technology has the ability to reduce or even eliminate waste and pollution. One of the main purposes of SBM then is represented by the reduction of ecological footprint.

- Retaining and reinvesting local capital. This can work if organizations work together for the common good, cooperatively with stakeholders for the TBL target and a temper of short-term objectives for allowing also socio-environmental objectives to be considered. Organizations can succeed easily in reaching sustainability when the whole system of which they are part seek for it.

In realizing a sustainable business model it is necessary to take in consideration the market on which the business will be conduced and, if this appears at its initial stage or has to be created from start, it is clear that the degree of uncertainty will raise. In these conditions, it is possible to combine six guiding principles (Thompson and MacMillan 2010):

1- Establish the ballpark of the enterprise, defining the drawbacks of its start, the cultural rules and competitive boundaries to be respected and identifying the economic and social outcomes dimensions.

2- Attend the socio-politics of the activity, focusing on finding and defining the role of key partners in order to avoid undesirable government intervention.

3- Identify and create an appropriate unit of business and defining the pattern to follow to reach outcomes.

4- Preplan a realistic approach of disengagement before the establishment.

5- Anticipate unintended consequences, since societal intervention could create consequences that are contrasting the economic ones.

6- Follow discovering driven principles, to increase aware about resources commitments since, at the beginning, discovery is more important than profits.

2.6 Business Model Canvas for Renewable Energy Technology

As every business model is like a storytelling for workshops, discussions and meetings about business, it has been necessary to find a simple, relevant and intuitive model that is able, however, to keep and show the complexity of the business idea and how the enterprise should work. Such business model, according to Osterwalder and Pigneur (2013), requires nine basic building blocks able to describe how the company intends to make money. To do so, the blocks cover four main areas of the business: customers, offer, infrastructure and financial viability. Here, every element influences the others, giving a real sense to the BM if taken as a whole. Together, they are the fundaments of Business Model Canvas. The following description of the blocks comprising the Canvas are integrated with the application of the last research on Business model for renewable energy by Richter. This study shows two generic business models, for renewable energy: *customer-side renewable energy business model* and *utility-side renewable business model.* For the purpose of this case study, only the first will be considered. As a matter of fact, Richter (2012) states that in this model generally places the property of systems up to 1 MW on customers like households and enterprises that participates to energy

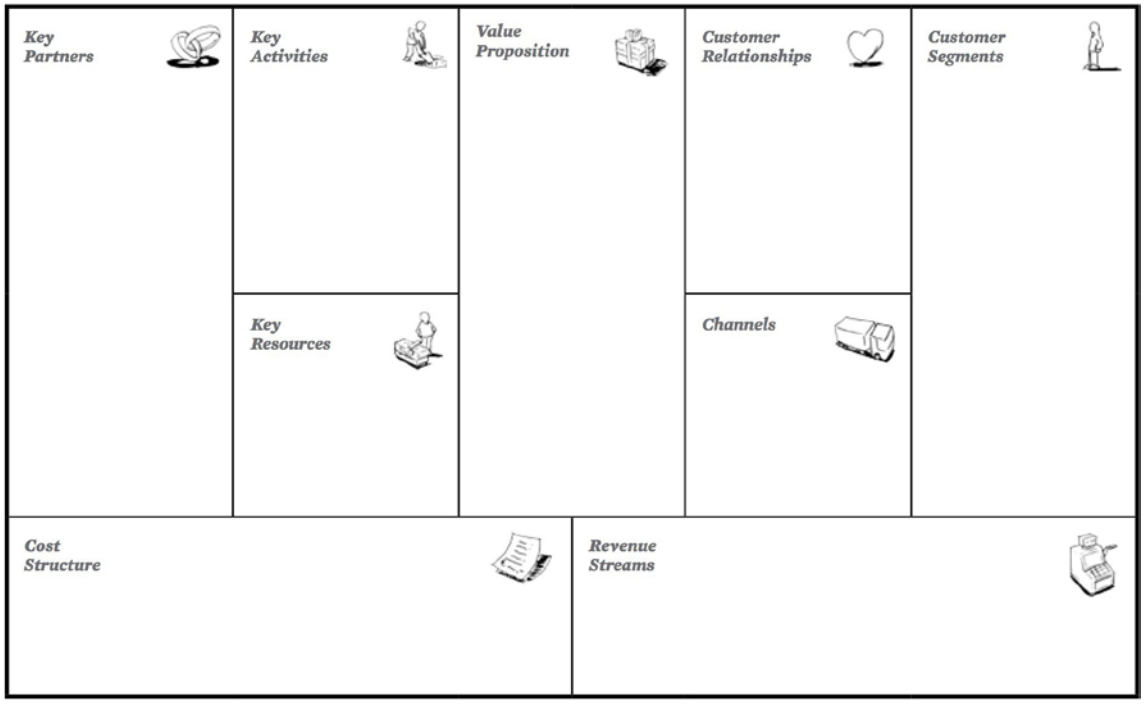

Figure 2.1: Business Model Canvas. Source: Osterwalder and Pigneur, 2010, pp. 14-42.

production, identifying photovoltaic and solar water heating as possible technologies. This model is created in order to capture value in a different way than the traditional utility one, since the possibility to produce energy is starting to extend to smaller customers. The following framework is based on the work of Osterwalder and Pigneur 2013:

1) Value proposition. This block describes the value that a set of products or services bring to a specific Customer Segment. The value proposition has a strong power on customers, as it can influence them to change from a company to another. It identifies the needs and problems to be satisfied and captures the value that customers give them. In other words, it is a collection of benefits that a company "offers to customers". This is why, as it will be explained in the next paragraph, an entire business model can be realized around the value proposition. The value proposition can relate to new needs with new products and services that satisfy them (Newness); can be based on a technological progress that implies an increase of performance (Performance); or can be tailored on the particular need of an individual customer (Customization) etc. According to Richter (2012), the value proposition from the customer-side collects comprehensive energy solutions, including consulting, financing, warranties and pre/post deal services, such as installation, operations and maintenance. These services need to be collected in a package as to catch the highest profitability, since the smaller scales could imply consistent losses if the utility offered each of them independently. A full service is able to collect more profits from single customers and to enlarge the potential customer segments, but more decentralized customers means more transaction costs, so it is still not clear which is the right mix to maximize the value capturing. Therefore, this value proposition is still at its early stage and much has to be done in order to ensure the utility to capture the value in the long run.

2) Customers segments. This block identifies the group of customers, people or organizations, that the company wants to refer to. Without precisely describing how to reach them it does not make any sense to continue with or start from other blocks, since customers represent the base on which the company survives. In doing so, a company could group them for common needs, behaviors, size etc. As the authors explain, there are some signals that allow to determine if customers belong to separate segments: their needs imply a different offer; the distribution channel are different; they require different kind of relationships; they have different profitability; they are willing to pay for different aspects of the offer. Examples of the types of customers segments are: mass market and niche market, that differ for the attention to make a distinction on customers segments, value proposition, distribution channels and customer relationship; segmented, trying to serve different but still connected customer segments; diversified market, serving very unrelated segments; multi sided platforms, serving interdependent, different customers. According to Richter (2012), as the renewable energy systems reach smaller scale, Utilities need to acquire more and more information about the increasing number of Customer Segments: some of them might also require tailored systems, so the new value proposition needs to incorporate as many solutions as possible.

3) Channels. This block is necessary to describe how a company delivers its value proposition to the identified customer segment. Companies relate to them through customer's touch points such as communication, distribution and sales channels. There are different channels configurations, as a company can be their owner, use partner channels or a combination of both. Partner channels can lower margins, but they allow the organization to exploit partner strengths and reach customers with more strength. There are 5 phases to follow: create awareness of the brand ("how do we raise awareness about our company's products or services?"; evaluate the value proposition ("How do we help customers evaluate our organization's

value proposition?"); purchase ("how do we allow customers to purchase specific products and services?"); delivery ("How do we deliver Value proposition to customers?"); after sales ("How do we provide post-purchase customer support?"). In the energy market channels are increasing their importance. As the Customer Segment block shows, the growing need to communicate with each customer and the number of services offered give the channels a big impact on customers expectations (Richter 2012).

4) Customer Relationship. This block describes the type of relationship a company wants to establish with its segments, which may be driven by customer acquisition, retention or boosting sales and it can have an influence on the customer experience. Some forms of Customer Relationships are: personal assistance, based on human interaction through call centers, sale points, via web etc; dedicated personal assistance, which assigns a customer a representative forming the most intimate form of CR; self service, which allows direct relationship with customers; automated services, a more sophisticated form of self service; communities, which are increasing tools to communicate with group of customers; co-creation, beyond customer-vendor relation, which allows customers to participate actively to the design of a new product or service. A good Customer Relationship is necessary to build a strong new value proposition (Richter 2012). This block becomes more complex as the role of the utility increases in the number of services tailored for customers, as their necessities tend to diversify.

5) Revenue stream. This block shows the cash that the customers are willing to pay for the value proposition that the company is providing them. Each revenue stream identified may have different mechanisms, for example "fixed list prices, bargaining, auctioning, market dependent, volume dependent or held management". There can be many ways to create revenue streams: asset sale; usage fee; subscription fees; lending/renting/

leasing; licensing; brokerage fees; advertising. In particular, as regards the Customer-Side in renewable energy Business Models, Revenue streams is considered by Richter (2012) as an obstacle for the shift from Utility-Side to Customer-Side. Utility-Side approach creates revenues from a high use of energy, so the target is to make customers consume as much of it as possible. For the shift imposed by the adoption of systems for auto production, Utility-Side has to think about a new approach which include *decoupling, dynamic pricing* and *flat rate tariffs. Decoupling* is a regulatory tool that induce Utilities to engage in Customer-Side, through a separation between revenues and volume of sales and, therefore, the fixed cost of recovery from the electricity delivered. This way the Utility will be more focused on customer relationship and not just volumes. The critics are related to the promotion of mediocrity and the protection of decrease of revenues through taxes. *Dynamic pricing* changes the traditional fixed-price/kWh to a flexible, real-time price, comprehensive of the wholesale price of energy (as an example, time-of-use price). This can reduce consumption in the peak hours towards lower-cost times. *Flat rate tariffs* instead charges to consumer a fixed price, no matters the consumption. The utility will be a "fee-based service provider" aimed to induce the customer to save energy. For doing this, it would produce a partnership with the consumer for pre-determined parameters, plus the connected services like installation of energy management equipment, efficiency upgrades, maintenance.

6) Key resources. This area is necessary to show the physical, financial, human and intellectual key assets the company owns and adopt to make the business model work. This allows to generate and deliver a value proposition, establish the touch-points to involve customers and generally all the other aspects analyzed so far. In the energy sector, Richter (2012) identifies these resources as the units used for generation. Moreover, he states that the management of systems in dispersed locations would

require more transaction costs, so new VP are called to face this problem (sustainability? maintenance).

7) Key activities. This block shows the most important actions for a company to make the business model work and operate successfully. Together with the key resources it makes part of those tools which allow to create a VP, reach market and create a relationship with them and base a revenue stream. There are some main areas in which Key Activities could be categorized: production, problem solving, platform/network creation, service provisioning and platform promotion. Richter (2012) points that how key activities are designed should depend on the composition and size of every single Utility. As already mentioned, *customer-side* Business Models should incorporate in their activities a wide package of services for every customer segment identified. Large businesses will be fully integrated in the value chain, while small firms will have to lower risk by adopting partnerships and focusing on distribution and retail.

8) Key partnership. This block describes the collaborations with suppliers and partners that create a network and allow the business model to work. As explained before, partnership can be useful for companies for exploiting external strengths. These could be formed by strategic alliances among both non-competitors or competitors; joint ventures for creating new businesses; buyer-supplier relationship. It can be useful to create and exploit optimization and economy of scales, reduce the risk and uncertainty and acquire particular resources and activities. Richter (2012) says that partnerships are useful for compensating with the resources that single Utilities are not able to generate alone, which could translate in a good strategy for entering a market. Kolk and Van Den Buuse (2012) also state the importance of partnership in developing countries and the role of financing mechanisms in finding new investors. In doing so, companies need a clear idea on the (non-)governmental organizations working in the

target country, since their knowledge and network can give a big contribution in this direction.

9) Cost structure. This block shows the expenditures to run an organization based on the most important purposes shown on the business model, such as CR, creating value and delivering VP, and it can be stated after identifying Key resources, key activities and key partnerships. Not every business model requires low cost structures, since they could be cost-driven, focused on minimize cost wherever possible, such as low cost VP, maximize automation or extensive outsourcing, or value-driven, for those businesses which are focused on value creation instead of low cost. The structure in renewable energy market focused on the customer-side requires more costs for including a wide range of services for each customer. Standardization could anyway exploit economies of scale and find a trade-off between costs and services offered.

2.7 Value Proposition Canvas

The value proposition canvas is a tool that allow to discuss and build a strong and tangible value proposition that perfectly fits to the business model in which it is involved. As a matter of fact, value proposition canvas works as a zoom-in into the business model in which it is integrated, allowing to focus in the details of why and how that value for customer is captured. As explained by Osterwalder, Pigneur et al. (2015), the value proposition design is able to create a common language of value creation inside the company, which allow to invent a new value proposition that fits in the business model but also to improve it or change it when necessary.

The value proposition design is composed considering two blocks, Customer Segments and Value Proposition. The first is referred to “customer profile” in order to understand the needs and the characteristics to observe and verify in the market, the latter is also called the “value map” and shows the way a

company choses to create value for the identified customer in order to attract them (Osterwalder, Pigneur et al. 2015). The goal is to reach the “Fit” between the two.

Customer profile

Customer profile design is able to provide a deeper insight on the characteristics of customers under the perspective of jobs, pains and gains. In order to achieve a good result in identifying the right customer segments, it is necessary to follow some steps, such as selecting the segment, identifying the jobs/tasks they are trying to complete, identify the pains and the gains and, finally, prioritize the results in each area.

1) Customer Jobs. Describes what the identified customers do in their life and their work, since it can be a good driver to state what problems they are trying to solve and the needs they want to satisfy, from customer’s perspective. It depends on the context and, based on this, there are limitations and constraints. Similarly, they can have different importance. There are three main jobs to distinguish from: - functional jobs, when customers want to achieve complete task or solve a specific problem, like eating healthy, report writing, professional help to clients etc; - social jobs, when customers want to show in a good way or get a higher status, which underlines a willingness to change the perception others have on them; - personal/emotional jobs, which differs from the social for the target customers are seeking, being more targeted on needs like security or feeling good. Customers may be seen from the perspective of performing supporting jobs. First, they could be buyer of value, that consists in comparing offers, chose which product to buy, completing a purchase etc. Second, they could be co-creator of value, like giving feedback of products or services delivered or participating to the design of a product or service. Last, they could transfer value, transferring or disposing a product.

2) Customer Pains. This area shows the problems and risks customers might show when trying to achieve a job, which may be linked to bad outcomes. Similarly to jobs importance, customer's pain can be extreme or moderate. There are three main kind of pains. First, undesired outcomes, problems and characteristics liked to functional, social, emotional, ancillary pains, or even characteristics customers don't like. Second, obstacles, that may impede customers to even start their jobs. Third, risks, that may imply negative consequences. A good way to state them is to be as much concrete as possible. According to Kolk and Van Den Buuse (2012), that main pains linked to the energy sector for customers in developing countries are the limit to the Grid access or the high costs of electricity when the Grid is available.

3) Customer Gains.This area illustrate the benefits and results the customers require or would surprise them. There are four types of customers gains. First, the required gains, without which it is not possible to deliver the product or service for it simply would not work. Basic functions are located in this definition. Second, expected gains, again relatively basic but not essentials for the good to work. Third, the desired gains, standing outside what really required from the solution but that customers would appreciate if asked. Last, the unexpected gains, able to make a large difference inasmuch beyond customer's expectations. As for the others, therefor, some gains are more essential than others. It is valuable to make a ranking of them, as for the other areas. As for developing countries, Kolk and Van Den Buuse (2012) particularly include off-grid solutions for increasing energy access, while enhancing social and environmental benefits.

In doing so, it is useful to not mix many segments in one, in order to not confuse the needs, trying to focus not only in one of typology of jobs, pains and gains but having a wide and concrete point of view on that, avoiding to identify only few of them or being too vague. Therefor, it is valuable to make a VP canvas for

every segment, paying attention in considering the jobs as the need or tasks to be done and gains as the concrete outcome they want to achieve.

The Value Map

This tool allows to state in a deeper way how to build a value proposition that fits the Customer Profile, in a more detailed way. In doing so, it splits the Value proposition in products and services, gain creators and pain relievers.
A good value proposition should be aligned to the ideal success of customer, focusing on the unsatisfied jobs, pains and gains which are important for customers, who will be willing to pay for. In doing so, it should be extremely well targeted in few aspects and try to go beyond the functional aspect and consider the emotional and social ones. It should be based on being differentiated and better than competitors in at least one of them, making them difficult to replicate.
In the specific field of sustainable business model, the value proposition is strengthen with some concepts. At the heart of this there is the shift from customer value, composed by a value proposition that requires a value delivery configuration and a value creating logic, to public value (Ludeke-Freund 2010). According to the authors, customer value is composed by customer equity in the company and customer value in the proper sense, but it needs an extended sense of customer value to bring value also to public. This means that customer value has to be designed both for creating private value and for offering a public value proposition based on sufficiency, efficiency and consistency. According to Ludeke-Freund (2010), there are 4 modes of value creation:

1) Creating value for individual customers and the company
2) Creating value for the company and the public
3) Creating value for the public and individual customers
4) Creating value for the public, individual customers and the company

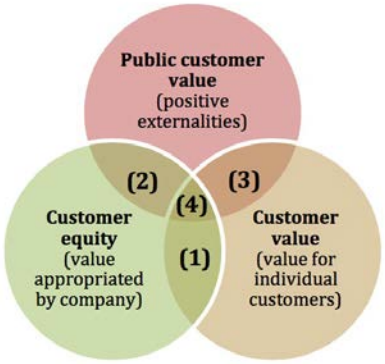

Figure 2.3: Concept of extended customer value. Source: Lüdeke-Freund, 2010, p. 19.

Point 4 of figure 2.3 is focused on creating value through sustainable innovative systems, typical of companies which have as a core business specific eco-system functions (Ludeke-Freund 2010).

1) Product and services. It is a simple list of what companies wants to deliver, in terms of products or services, on which to build the value proposition. In order to create value, products and services have to be connected to functional, emotional and social jobs; they can also be linked to supportive roles such as buyer, co-creator and transferrer, as shown in jobs area of customer's profile. Value proposition can be formed by products of different nature, such as physical, intangible, digital or financial. Relevance is important, from essential to nice to have.

2) Pain Relievers. Through this block the value proposition will be built on the description of how product or service will alleviate those pain that characterize customers after, during or before a job. A good value proposition should be based on the extreme pains, and it's not necessary to focus on too many, it depends, once again, on the relevance.

3) Gain Creators. Shows how the offer creates benefits to customers, being them expected or surprising. They can be functional. social, emotional or cost saving. Good questions to state the validity of the product or service delivered are: "Could your product or services produce benefits beyond

customers' expectations? Could they make their life easier? Do something customers are looking for? Help make adoption easier?".

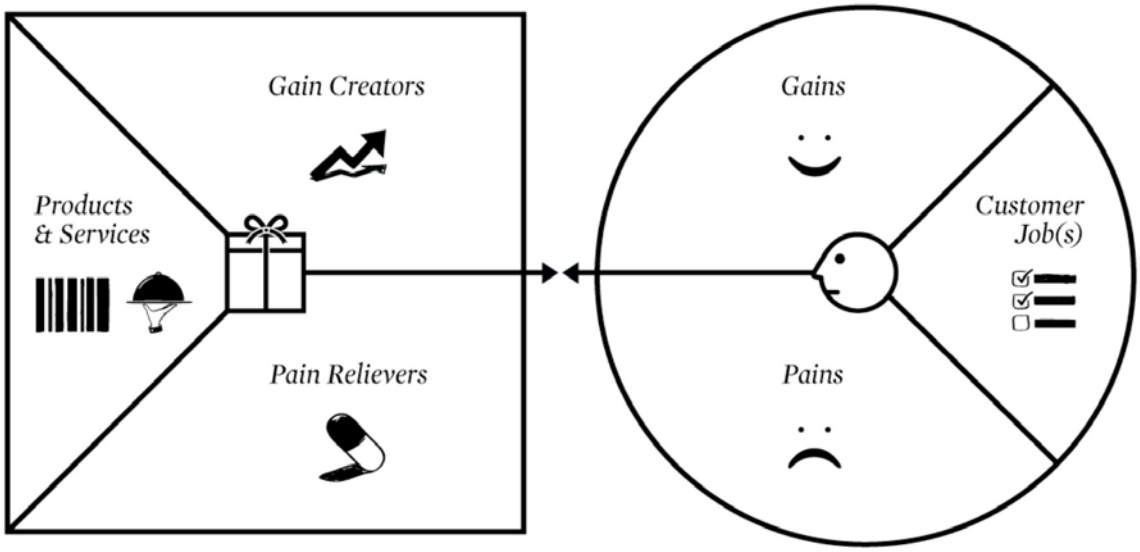

Figure 2.2: Value Proposition Canvas. Source: Osterwalder et al, 2014, pp.8-9

Fit

Fit is reached when customers are satisfied about the value proposition, but it is not easy to find and keep. To do so, it is necessary to take every aspect of gain creators and pain relievers and check their compatibility with jobs, gains and pains of customer profile. The fit arrives in three stages: - Problem-solution fit (on paper), where customers don't recognize or care too much about the value proposition and where the company needs to find jobs, pains and gains. - Product-market fit (in the market), where company tries to validate what found in the first phase through a long process. - Business model fit (in the bank), where business model fit is realized after there is the evidence that value proposition can produce profits by matching what customers want.

2.8 Criticisms of Business Model Canvas

Business model canvas has been used from thousands companies who wanted to start or reinvent their business. After this period, however, it is possible to state that not all the practices were appropriate and, for this, there is evidence of some drawbacks that could affect the expected results. According to Hong and Fauvel (2013), in a BMC there are three main positive features that might carry negative aspects: simplicity, practice orientation and plug&play principle. Simplicity, for instance, can turn into a lack of focus in analyzing competitors or competition structure, or lack of details in formulating business goals and performance measurements.

Business model critics are therefore related to a series of key aspects necessary for running every business. Kraaijenbrink (2012) (cited on Hong and Fauvel 2013) give his point of view on this. First, there is an exclusion of strategic purpose and objectives, since a BMC seem to be there only to satisfy the financial requirements of investors (social enterprises for example can't work on this). Second, it is excluded a notion of competition, which should be added as a block on the canvas. Third, there is abstraction for some elements and not for others. Also Maurya (2010) finds some issues he didn't find in Oserwalder's model, such as key performance indicators, totally missing, and again competitive advantage, in particular for those product or services that cannot be copied easily by competitors.

2.9 Conceptual Framework

The data collected through this literature review has been elaborated on the Business Model Canvas framework in figure 2.4. This image collects the informations regarding Sustainability and renewable energy technology in developing countries. The rest of the theory has been useful to define the strategy that allowed to identify the most feasible approach for the case study, the Customer-Side, which properties are included in the Model.

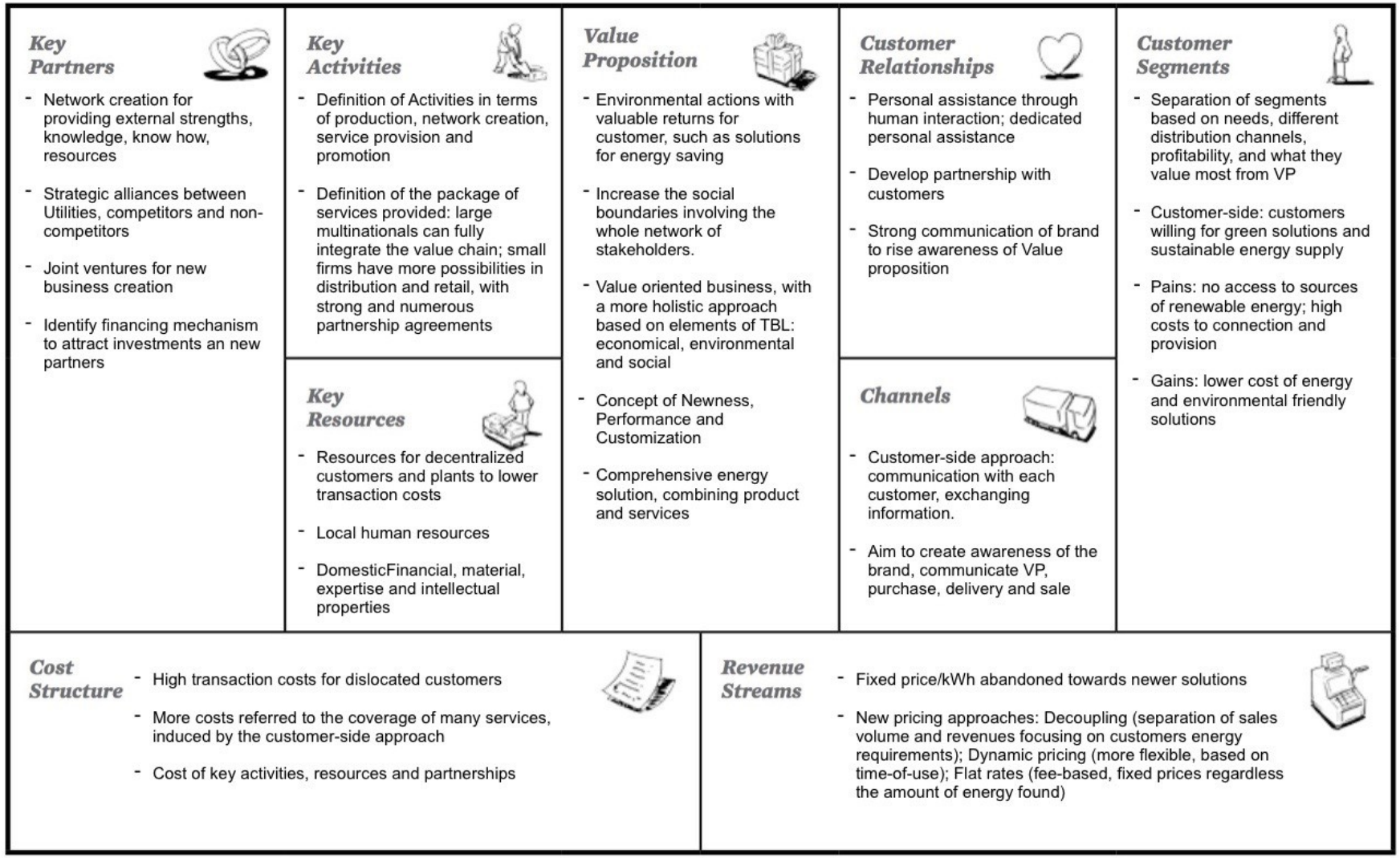

Figure 2.2, theoretical framework on Business model . Source: compiled by author

Chapter 3
METHODOLOGY

3.1 Inductive logic

The Business Model I worked on is the result of both theoretical and empirical findings. The results of primary and secondary informations have been applied to the models illustrated on the theory, and the theory has been used as a background of the investigations. This was realized through an inductive approach, due the need and the relevance of interviews and therefore the significance of empirical findings that a case study implies. However, it is not immediate to understand why, using this approach, theory influenced so heavily the whole result, since the Business Model was designed based on the Canvas rules but in inductive research, according to Bryman and Bell (2011), theory is considered as a outcome of the empirical findings. As the authors state, approaches to research are not likely to be considered independents, as it is usual to see the inductive approach necessitate some elements of deduction, and vice versa. In my case, a pure inductive approach would have been misleading in pursuing the generalizability of the specific Business Model, due to the difficulty to find the right informations the work required, and the Business Model Canvas analyzed in the theory gave me a solid structure. For this reason, I followed an *iterative* approach.

An iterative approach implies the use of empirical findings as a further step to the theory, in order to see how the latter is or is not reliable or strong enough. In creating a business model, it is necessary to adopt what Bryman and Bell (2011) define as the “repetitive interplay between the collection and analysis of data”, which happens in the grounded theory. Codification of data has been carried through a qualitative method that required a flexible and constant comparison of theory and findings.

3.2 Qualitative Study

As often referred to inductive approaches, enhanced by the flexible relation between theory and data, also my study had a qualitative connotation. Aside this first consideration, there are two more implications to this particular approach. First, it has been carried a research aimed to observe and interpret the social characteristics that may have a strong influence on the results, mostly through the use of data provided by involved people and documents. Second, as a consequence of this epistemological position, the results have been obtained trough a continuous interaction among individuals (Bryman and Bell 2011). Aside the correct canons, the qualitative study has been carried as to show the understanding of the social environment and the concrete application of the result.

The preference of a qualitative study has been considered as the research question is referred to a Sustainable Business Model aiming to state the possible implications of a new technology in a new environment. In this context, the research has shown two big obstacles. First, the company I studied is at its early stages. This consistently reduced the number of individuals from which to find a sufficient number of informations, which had to be replaced and balanced by a large research through documents. Since a real structure of the company is still lacking, some blocks of the business model have been built on hypothesis based on market research, rather than direct answers from interviewees. Second, also from the side of market research and understanding of Rwandan market, although the country's commitment on realizing and delivering the useful informations for attracting foreign ideas and investments, it has not been easy to find all the answers from the documents, the websites and the directly interested individuals. For this reasons, a qualitative study has been largely preferred to a quantitative one, since the author's intention was to collect as much information as possible in this early stage in order to reach a valuable, reliable and applicable result.

3.3 Case Study

The research design has been built around the possibility for Autonome Infrastructure International AB, a Swedish energy company, to exploit Rwandan market. The adoption of a case study design, which generally fits with qualitative research, has focused on observing and examining informations from documents and interviewees associated to the preparation of the Model (Bryman and Bell 2011).

As already explained, the aim of the thesis was to find a solution to implement a new technology in a developing country. Since the informations have not always been easy to collect and literature is still not yet able to provide sufficient answer to the case, it has been necessary to conduct an explorative case study. According to Brown (2006), this approach can be a solution when previous studies on the subject are not sufficient. Moreover, an intrinsic case helps to get insights into a particular case, rather than get notions of general cases (Bryman and Bell 2011).

The issues presented by this approach, related to validity and generalizability, have been contrasted by the construction of a more general business model, in the analysis, strictly related to the combination of the theory and the results of data collected. The theoretical analysis has been fundamental to the purpose of the whole work, and the data collected helped then to specify the problems and connections with the theory.

3.4 Empirical Findings

This section presents the data about the case study, considering the company profile, the characteristics of the technology and the energy market in Rwanda, together with some informations about the socio-political context of the country. The data about Rwandan market have been collected in order to find the best possibility to introduce AI system, so the features of the product have been

studied to see for which potential customers it could be beneficial. In parallel, the research also needed informations about the regulation of the market and the potential Swedish, Rwandan and International partners that might help entering the market. The results of the findings have been collected in a Business Model, which has been successively compared to the one produced through the theoretical framework. The result of this comparison is shown in the chapter dedicated to the analysis, which presents the Sustainable Business Model comprehensive of the informations I analyzed through the interviews, the documents and the articles of the literature.

Primary data - Interviews

The business model construction requires a series of structured and defined questions to get a precise answer. Business Model literature, and specifically the one related to Canvas, provides a series of necessary questions for each block, which may lead to think that the best method for interviewing individuals interested on the topic would be the structured one. However, in my case the subject of my study presented many unclear aspects, due to the difficulty on finding the right information about Rwandan market, the novelty of the technology and, as a consequence, also of the company. For this reason, a semi-structured and unstructured methods gave me more freedom in order to get more informations. The aim i was pursuing by this step was not the one to get precise answers, since the areas to analyze were many and not everyone of them could be completed through simple predefined questions. Instead, the purpose was the one to get as much informations as possible from the individuals I focused on, as to understand the subject from different angles and get the widest knowledge possible. In doing so, I tried to identify different interviewees that might have give me complementary informations.

Aside some exploratory interviews and meetings I participated on the topic, I found three main interviewees which differed on knowledge of the subject, so everyone of them contributed to some specific areas of the BM. Nevertheless, some common questions have been carried in order to understand the positive implications of the technology in Rwanda and some insights on the value

proposition, as well as some hypothesis on the revenues stream. The interview guide used in this process has referred to the Business Model Canvas by Osterwalder and Pigneur (2013) - Appendix 2 provides the Interview Guide.

First, I addressed to Mr. Kent Samuelsson, inventor of AI Hybrid Solar System technology. The first interview has been recorded and lasted 49 minutes and 19 seconds, whereas the next two ones have been conduced through phone and note collection. His knowledge allowed me to have a better understanding of the product, which gave a significant contribute in structuring the value proposition after the customer's need were identified. Although the lack of structure of the company in defining the main partners and activities to create, this interview has been useful in defining the main steps to carry on, the costs to it associated, the customer relationship and which are the main partnerships that should be built for the success of the project.

Second, I referred to Mr. Ola Ekman, CEO of First to know, who first introduced me to the project. The first interview was recorded for 49 minutes and 34 seconds, while the next three i took notes. The interview has been conducted first on an unstructured design, since I wanted to get his general point of view of the project. As the interview advanced, I started asking more specific questions according to the interview guide I had prepared. Thanks to his network and the knowledge he gain on the market, his contribution helped me to identify the possible customers and their specific needs. As a consequence, he also provided some data about the Value Proposition, together with some advice on the revenue streams and where to focus on defining the right partnerships.

Last, in order to get a deeper insight on the actors in the Rwandan, I contacted Anders Knutsson via Skype, for a recorded interview of 40 minutes and 16 seconds. Anders in a student in University of Gothenburg, and is conducting a thesis in Rwanda to study the investment barriers in the country. His competence allowed me to understand which are the pros and cons of investing in this country, and what are the most feasible ways to introduce a technology in that market. He also suggested me possible partners and gave me more insights about the local needs in terms of energy requirements, as well as data regarding the actual politics and regulations.

Secondary data - Document analysis

Due to the limited possibility to pose questions to individuals that a new project can imply, most of the market research has been conducted on documents provided by Ola Ekman and some found through internet research. The findings can be divided in two main areas: one generic research on Rwandan energy market and one, more specific, connected to the particular regulations to follow when implementing a PV, water heating plant. The reason why I chose to research also this kind of information is because, in order to find the business model that most fits the case study, i needed those informations about the characteristics of Rwandan customers, the Regulatory framework and the socio-political situation that I did not find in the interviews. For doing this, i collected the most recent documents. As for the first part, the main sources have been the African Development Bank Group and SIDA, the Swedish International Development Cooperation Agency, plus some articles and other reports from European Countries. Also reports coming from Mr. Edman network have been analyzed.The second part, instead, was much more specific and had to be researched on Rwandan official institutions websites. In particular, RURA, Rwanda Utilities Regulatory Authority, that provided some of the regulations needed. Despite this, much of the informations, mostly linked to the concept of off-grid, is still missing, but RURA is working to a new law that should be available in some months.

Chapter 4

EMPIRICAL FINDINGS

This section aims to provide data about Rwanda Energy Market and the socio-political situation of the country, the customer needs and how the technology can satisfy them in the best way. The Value Proposition Canvas and the Business Model Canvas will collect the data around the value delivered to the identified customers but, in order to do it, many informations are needed. First, it is necessary to understand the customer needs trough an overview of the country and the energetic problems faced by the population. Once the overview is able to give a sufficiently deep insight on the customers, it is required to understand the regulations around energy production, the licenses and rules that have to be followed, according to the specific features of the technology. The application of this study will be combined with the informations collected during the interviews to complete the Sustainable Business Model.

4.1 Rwanda Energy Market

Rwanda is focused on developing and improving its main industries and appears to be one of the most attractive countries in Africa for business. According to Christine Nkulikiyinka, Rwandan Ambassador for Scandinavia countries, and Rwandan Development Board, Rwanda is the third easiest place in Africa to do business, as it takes six hours to start a new one. It is also the 4th easiest country globally to get a credit and the 12th to buy a property. There is also a very low degree of corruption, being the 4th least corrupt african country, ranked 44 globally, which allows also a considerable high level of competition. Moreover, it is the safest country in Africa, the unemployment rate is 3.4%, with a percentage of poverty dropped of 39% in 2014. The target is to have an average GDP growth of 11,5% till 2020, with the purpose to make Rwanda a middle income country. The benefits will contribute on the growth of 8,5% of agriculture, already the principal sector in the country, a 14% increase of the

industry and 13,5% of services, including large investments on tourism. This is more impressive if we think that the country is among the smallest of Africa.

In this context, the energy sector appears to have a principal role, since the quality of the infrastructures do not always match the country's parameters and requirements of development.

According to the Energy Mapping Study in Rwanda by Sida, at the moment Rwanda is ranked worldwide among the lowest per capita electricity consumption rates, at 42kWh per annum. This data rises up to an average of 478 kWh for sub-Saharan Africa and 1,200 kWh for developing countries. Lighting in rural areas is provided by kerosene, while other energy sources, such as solar, are limited. On-grid electricity access is still limited in most rural areas: there, users would mainly use it to charge phones, radios and light their houses for few hours a day. Access to electricity from 2007 to 2011 increased by 160%[1], of which households are the main consumers (51%), according to Mininfra (2015), and the purpose is to pass from a total 16% to a 70% in 2018 through increase of on-grid and off-grid solution, using hydro mini grids and solar home systems.

According to the Rwanda Energy Policy and the Energy Sector Strategic Plan (ESSP 2015), the country wants to increase the production from 185 MW to 563 MW in 2018, reducing carbon fuels of 10% and increasing the efficiency of the grid saving up to 10%. This target is integrated by the purpose to improve the electricity access by 70%, of which 48% on grid while the remaining 22% off grid, an ambitious project since they are at the moment at 2%. The Energy Access Roll-Out Program (EARP), is the one that set to achieve the 48% on-grid connection rate. This program has seen a number of development partners, including World Bank, the African Development Bank (AfDB), the Arab Bank for Economic Development in Africa (BADEA), the Belgium Technical Corporation), the Netherlands, Japan, the OPEC Fund for International Development (OFID), and the Saudi Fund. As regards off-grid, one of the most important facts that make off-grid solution attractive and challenging in the country is that, according

[1] http://www.afdb.org/fileadmin/uploads/afdb/Documents/Project-and-Operations/Rwanda_-_Energy_Sector_Review_and_Action_Plan.pdf

to SIDA, the technologies delivered with no necessity of grid connection are not requiring a particular regime as it happens for the on-grid ones. Therefore, being not covered by EARP, privates have the challenge to deliver this products under normal market mechanism (however RURA, Rwanda utilities regulatory authority, is now studying an off-grid regulation, which will be soon released). These private players have recently organized themselves under an association named “Energy Private Developers”, recognized by government, that have participated to RURA’s grid code and Public-Private Partnership law.

According to SIDA draft on energy mapping in Rwanda, the main consumers are households (91%), which energy usage belongs to traditional fuels such as wood, followed by the transport sector (4%), industry (3%), and public services (2%) (MININFRA, 2015). What emerged is the necessity of stable and continuous energy provision, since it is not impossible for schools, factories, or hospitals, to receive bad quality and insufficient provision. This increases more in rural areas, where usually there is not connection to the grid. Energy provision is essential no matters where, but developing countries like Rwanda, which is now experimenting the potential of internet connection for education and communication, as an example, have no other starting point but good quality energy to achieve any result.

The Rwanda National Strategy for Climate Change and Low Carbon Development of 2011, appears as a first step to lower carbon emission in the country, in favor to more renewable solutions, which did not took a different direction from the previous actions against climate change, carried on by the ratification of United Nations Framework Convention on Climate Change (UNFCCC) in 1998, and the Kyoto Protocol in 2003. The strategy identifies Agriculture, Energy and Transport as the big wins to pursue from the three main causes of GHG emissions but, for the wide dimension, for these programs it will take years to be completely implemented. This is also in common with SIDA strategy for the development cooperation, since this strategy includes, as an expected result, “a better environment, limited climate impact and greater resilience to environmental impact, climate change and natural disasters”. Energy’s impact on this purpose is quite obvious. According to SIDA, there is a

connection between energy availability and access and the growth of opportunities and general life condition of people. Some of the interventions identified are related to: off-grid energy for productive use, for agriculture, schools and entrepreneurship, though the empowerment of the power sector.

One of the main interests of the people regards the possibility to generate their own energy, as to arrive to the self sufficient. This is possible for two conditions. On the one side, the level of competition, the low rate of corruption are underlined by an increasing detailed regulation by the government, which is aware of the necessity and the possibility of this resource and, as a consequence, shows interest in giving a structure on regulation to attract foreign knowledge and investments. The government, according to SIDA report, has contributed significantly in the electrification direction though a stable, proactive and favorable environment in order to reach the targets.

On the other hand, Rwanda does not show any important site of oil extraction. In contrast, although the small dimension, the country shows a large diversity of environments, which can be source and base of many alternative, clean technologies for energy production. As an example, the country showed 78 sites for hydropower solutions, of which 70% connected to grid is generated by private players, allowed by the government under Independent Power Providers (IPP) solutions. Nevertheless, it is also investing in geothermal exploration and, of course, there is still possibility for traditional technologies exploiting wind and sun.

According to SIDA and EDPRS, among the main thematic areas of economic transformation for rapid growth there is the one of private sector, increasing investments in priority sectors, and pursuing a green economy approach to this transformation.

4.2 Photovoltaic Market

Rwanda shows a moderate daily solar radiation of 4 – 6 kWh (5.2 Wh/m2/day1) per square meter which could be used as source of solar power. This is already

a good potential for solar PV implementation but, as in most of the regions of this area, irradiation is quite variable and in the cloudy season it can arrive under 4.5 Wh/m2/day. As regards this particular source of energy, despite the high costs faced worldwide for on-grid installations, no matters the solar irradiation, it has been shown a big economic potential on the use of solar energy for electricity production in isolated off-grid areas.

According to The Solar Energy Market in Rwanda by the German Federal Ministry of Economics and technology, there are two main uses of PV that Rwanda has shown interest on, such as clinics, schools and administrative offices in remote centers on the one hand and, on the other, solar water heating, which is going to substitute biomass and electricity water heating, with a significant impact on environment and the costs to it associated.

In general, PV is considered as a side business from most of energetic companies. The projects don't appear to follow a particular standard and there is a certain differentiation. Moreover, it seems there has not been a big effort for creating skills for maintenance, which translated into a number of technical problems.

Nevertheless, the quality of energy systems is making big progress,attracting the attention of other countries in the region. Aside the energetic production capacity, Rwanda has planned a program of rehabilitation of transmission and distribution of the service, which has so far diminished the losses of electricity from 25% in 2005 to 19% in 2011.

The demand should increase relating to the high prices for fuel and electricity, the economic growth and the exportations possibilities are willing to create a good base for implementing PV equipment in the country. The particular dimension of Rwanda, moreover, will allow a fast growth of the grid, which may also imply as a consequence the decreasing need for off-grid solution. At the moment, however, the necessity is the one to raise this solution, as mentioned above.

An undeveloped market opportunity is related also to Solar Water Heating, since hotels, households, institutions and industries use electricity to heat water, with extremely high costs. This market is at its initial stages, there is not yet a

developed competition and the technologies have a very high price. Government commitment towards this solution will emerge in the new buildings planning, which will include Solar Water Heating in their design.

Government is not directly committed on financing solar, but it is involved on tenders and contracts. Moreover, it has removed taxes on solar equipment, with an expected reduction of prices

4.3 Ownership and Risk Taking in Rwanda

The power sector development plan expecting $1.5 billion from the private sector for the next 5 years. The possibility to exploit these resources have to be carried through an improvement of the business environment by the government. The principal risks that may arise at this point are an insufficient project development (technical risk) and the inability of REG to pay for its increasing obligations, and the lack of trust that is deriving (political risk).

For this reason, the need of development of instruments for risk reduction seems essential and, by this point of view, development partners can turn to be useful.

According to Rwanda Energy Sector Review and Action Plan by African Development Bank Group, the essential requirements for preparing a financial plan of an energy project considers an equilibrium among three main components:

- Ownership structure. The configuration of the property is quite elastic, being possible to structure it as purely private, purely public or a mix of both. This should be decided depending on the nature of the project and the possibility for the shareholders to collaborate to the implementation of the project. This structure should be flexible depending on the various constraints and requirements that may be faced. As for the ownership, it is necessary to state that for foreign investors the possibilities are two: Public-Private Partnership (PPP) and Independent Power Producer (IPP). Public-Private

Partnership, first considered as just a joint participation in the holding of a company, has grown its definition in many long-term agreements: aside the traditional joint shareholding, it includes public contribution to debt and subsidized or public purchase of output. As for Rwanda, MININFRA and REG and RDB are developing PPP policies and strategies, identifying or analyzing the projects, managing monitoring and transactions and applying contracts. As stated by the Ministry of The Infrastructure on Rwanda Energy Policy, PPP are fundamental in energy sector and it is especially suitable in rural energy provision and off-grid systems. Independent Power Producer are also important in Rwandan market. Over 70% of hydroelectric solutions are built under this regime. IPP projects are assisted by MININFRA, and the last counterpart is REG as the only purchaser. Private companies who don't want to establish a PPP can rely on this structure.

- Financial structure. It is important to find the exact portion of the project that will be financed by equity and that which will be financed by debt. Usually, for energy project equity wares from a 20% up to 40% of the total cost. The higher the percentage, the higher the willingness for lenders to consider a commitment towards the project. However, sponsors and other equity owners will prefer lower ratios in order to diversify their risk and not being too involved in only one project. The exact ratio should then depend on the single project characteristics: creditworthiness of the sponsors, which risks they may be involved in and risks and the location.

- Security Package. In this phase, it is essential to find out the possible risks and demonstrate the measures of their allocation and mitigation. These risks are related to events that could endanger the project during development, construction and operation. The main risk here is the rejection of the government and the financiers, which is high but doesn't involve too much costs. The most important thing is to convince them that: (1) Costs will not increase beyond the projections and, if, this happens, someone else will take the burden before the raise affects the projections, (2) in the same logic,

revenues should not fall shorter than projections, with the same consequence if this happens, and (3) the financing is safe and profits can be transferred and ,in case this would not happen, there is a plan to cover the costs for non-transferability.

4.4 Regulation

The regulation on electric power is provided by RURA. This authority defines the main steps to take in order to implement the technologies, basically dividing them in terms of generation, transmission and distribution, the connection or not to the grid, the differentiation on rules for urbanized and rural areas.

Off-grid simplifications are contained in an independent regulation for governing the simplified licensing framework for rural electrification in Rwanda, allowing faster investments for grid creation and connection or adoption of isolated, off-grid solutions (Appendix 1 gives insights on tariffs and energy demand).

What is first interesting for foreign investors on power generators is the different approach to on-grid and off-grid. While the first is largely and accurately defined, the second is still lacking a proper regulation, which should be released during the second half of 2016. Nevertheless, as already discussed the country is very interested on off-grid solutions and it is possible to find some information about their implication in the on-grid framework. The main rule is driven by exemptions procedures from the Grid Code. In the Network Code of the document, a brief explanation says : *"for Off-Grid networks, all Grid Code requirements shall be applied with the appropriate Exemptions granted by the Authority as agreed upon between the Authority and the Participant(s)".* Similarly, the Governance Code says that any Grid Code participant or Customer could ask for exemption, granted from the authority, of which of main interest for my purpose is to "alleviate off-grid supply arrangements from complying with on-grid requirements".

The regulation becomes more strict in case of Grid connection. On-grid solutions are much more defined in terms of production, transmission,

distribution, domestic trade and international trade. These processes are allowed only through licensing granted, if accepted, at most in 60 days under a fee payment, as explained in the *"Electricity Licensing Regulations Adopted By The Regulatory Board of RURA".* However, the article 6, Chapter 2 on License Regime and Licence Requirements, states an important exemption from the license for electricity auto-production projects for less than 50 kW. These projects, according to RURA, should just be declared to the authority, but no further requirements should be accomplished.

In case of Autonomous generation, the Rwanda Energy Policy of 17 March 2015 by the Ministry of Infrastructure confirms the exemption from license for projects under 50 kW of capacity. It also states that production, transmission and distribution through connection to the grid should be authorized and, if established in private properties, they should not be violation of public and State domain. RURA is now studying a simplified regulation to facilitates the adoption of autonomous generators.

Last, there are many simplifications for Isolated Grids in Rural areas. Isolated Grids are a distribution network without connection to the transmission network. Very Small Isolated Grids (<50 kW) should be only notified to the Authority prior to their installation.

Also interesting is the regulation of Solar Water Heating, always by RURA. Article 8 on "Exemptions from Solar Water Heating Installations" gives the power to the Authority to grant an exemption from regulation to the contractor of a cogeneration plant using electricity generated by renewable energy, of which excess is used to heat water. The exemption, as for electricity generation, should be submitted and approved before the installation.

4.5 Challenges for the sector

According to Energy sector Review and Action Plan, there are three key constraints that have to be faced. First, the private sector have to pass from the nascent to mature phase, in order to apart additional improvements as a growth driver. Second, a consistent constraint to economic growth, human development and export remains the one of inadequate infrastructure. Last, there is a bottleneck to achieving the expected results in the institutional and technical capacity.

4.6 Sustainable Business Model Canvas for AI

4.6.1 Customer segment

Both the interviews and market research are clear in identifying the same potential customers that may benefit from this technology. The main customers would be government and public administration offices, private activities and rural areas.

One of the starting points, which will also be integrated in the key activities block, refers to how each segment individualized would benefit most from the product. As a matter of fact, this technology is very flexible and able to adapt to different needs: it can be connected to grid or used as a stand alone energy provider, with no necessity to attach it to the grid; it can be used for electricity production, but also for heating, cooling, warming water etc. Depending on the different use, it will be possible to define who should be the customer target in the first period.

As emerged by the interview with mr. Ola Ekman, the main idea is to move in a first moment in the easiest possible way, serving the customer which would allow a fast return on investment. First to consider, rural areas are characterized

by large need of parallel investments, and the population would probably not be able to pay for the whole investment. It also emerged that, even if the government has shown openness to such foreign technologies, it is quite expensive in terms of time to apply and start providing energy to public offices. The implementation for the government would require a demonstration of the validity of the project through a pilot, which would be faster to build in different contexts. However, according to Mr. Ekman the most feasible solutions evidenced are represented by hospitals, schools and administrative offices. What briefly explained shows how these two segments require much more risks, time and efforts at a early stage, so the only alternative to start implementing the project would fall on private activities. The big agricultural sector already structured in the whole country, together with the development of new industries, would exploit at best the qualities of this technologies, since they would require different forms of energy and not just electricity. Moreover, being these activities located outside the city, it would be more feasible to find the space in which install the "device". Smaller targets, for this reason, could make it easier for a first introduction of AI in Rwanda.

Since the features of AI technology, as explained by Kent Samuelsson, allow the potential customers to decide if implementing it to the grid or not, it is necessary to state which is the best alternative. As regards the grid, the regulatory agency RURA requires to follow some laws, basically focused on the process for licensing, which is required for production, transmission and distribution of electricity, and can be received through an application, which verifies some basic aspects of the energy producer. However, this procedure is not required for plants that produce up to 50 kW. The licensing is also made easier for producing energy and connecting to the grid in rural areas. The tariffs will be decided and communicated by RURA. In a first moment, for the private sector specific purpose, the off grid solution is the one that allows more flexibility and speed in implementing the technology.

Customer Jobs

Referring to the identified targets of private sector, not much could be said about the social or the emotional jobs that such a sustainable technology would

bring to the customers. However, as regards the social impact, sustainable, environmental friendly solutions always carry some benefits in term of reputation, which could emerge even in this development phase.

The main benefit of this technology would refer anyway to functional jobs and the basic needs factories would face. Rwanda energy provision is still very unstable, and it is not unusual to face the collapse of the delivery which has, according to interviews, quite clear bad consequences for factories. An advanced technology, which could allow stable delivery of energy, would have a large impact in such activities. Moreover, the complementarity of various forms of energy, derived by clean production, would lower costs and potentially increase the competitive advantage, in a situation where the economical development also requires an increase of production.

Customer Pains

According to Mr. Ola Ekman, as mentioned in the jobs block, there is still lack of quality electric provision, which has large implications on the development of the sector. It is not reasonable, in whatever environment, to imagine possible to operate without energy, from school, to internet connection, to the functioning of machines and transportations. A bad functioning of this primary need can imply costs not only for the single factory, but for the whole society.

Moreover, it has to be said that traditional diesel solution have a double drawback. First and most logical, the environmental consequences. Second, it is very expensive to operate, since according to Kent Samuelsson 95% of the entire lifetime cost of a diesel solution is represented by the cost of fuel, which has as a consequence large impact on the final cost of the products. Most of the people in the country cannot purchase energy due to the high tariffs. Moreover, despite the progress making Rwanda more attractive than the neighbor countries, the political instability is still considered a drawback from investments, which retards development of knowledge, skills and economic results.

Customer Gains

A direct consequence of what just said about the pains would see customers reasonably willing to diminish the production costs, increase the efficiency of machines and possibly avoid huge maintenance costs for machinery breakdowns, due to unstable electric provision. For this reason, customers would see particular gains in implementing stable, clean energetic technologies balancing environmental sustainability, quality of energy provision and lower costs. Moreover, the transfer of knowledge may contribute in creating expert profiles and give occupation.

4.6.2 Value Proposition

The Value Proposition around AI technology covers many aspects and needs, as can be demonstrated by the large amount of customers that it can reach and serve. In the particular case of private sector, the valuable benefits consist in electricity and water heating principally for industries, while electricity for irrigation and heating for drying crop in agriculture. The product feature are already bundled, and it arrives with the configuration necessary to the customer. Moreover, it is provided all the necessary for the installation, which is very simple since it doesn't require much additional work, and the future maintenance. The additional features would remain still valuable, but a very appreciated feature of this solution is that the electricity implied in the heat pump could be used to produce different levels of the other forms of energy, depending on the identity and need of the customer. The stability of the energy would imply the benefits described so far, avoiding a lot of expensive costs for the users. The only necessity of electricity would make the AI solution worthless, for this reason the identified customers appear as the highest beneficiaries in a first moment.

According to the description of the technology, it is possible to state something important about the value proposition. First, it appears as a new technology,

which means new, different benefits for customers. Second, the implication of the production of energy under different forms is completely new: it clearly distinguishes from traditional diesel based technologies and from many other sustainable ones. The coefficient of performance arrives to 15, up to 1400% more than traditional solution, so the value is also built around the concept of performance. Third, as already mentioned, it is clear the implication of the possibilities of adaptability of the technology to the needs required, through a balance of the energetic output, at the base of Customization. These three concept are fundamental for the structure of the value AI is able to deliver, with possible implications to many different users configurations.

Products & Services

As mentioned, the products and services offered are very adapted to every single customer from the early stage. This means that, after the study of feasibility, license and needs of the customers, users will see the installation of the container, which will carry all the necessary features, in the area they choose. The technology will also not be invasive beyond the area covered by the panels and the container. From the moment of the integration of the product to their own facility, it will start operating. All the maintenance will be provided in case of necessity. This solution will be able to face the basic needs and the functional jobs described so far. The essential elements will be electricity, heating and warm water, while the other elements will remain “nice to have” and could be leveled in order to obtain more of what customers need.

Pain Relievers

The most relevant pains that factory owners are facing in Rwanda now, in terms of energy, are the cost of electricity and the quality of it. The unsatisfying solutions provided by traditional diesel systems, together with the yet scarce grid connection, make it difficult operate for the existing factories and nearly impossible the construction of new ones in more rural areas. AI solution would be able to avoid the risks linked to the bad quality of the system, and improving the efficiency of the production, which translates in lower costs, higher income

and higher satisfaction for producers. Solving the problems presented from the actual technologies is a motor for increasing the possibility to expand the business. Also, AI Off-Grid system configuration is able to get over the licenses requirements and does not require Grid connection.

Gain creators

An off-grid solution that allows such a wide range of possibilities in terms of energy provisions is something very rare. It doesn't require costs about connection to the grid, and it appears not to be expensive in terms of licenses, nor additional costs due to installation. Customers should be aware of what they have to expect from the technology, but they could also be surprised by the possibility to attach it to the grid in a second moment, and potentially become energy producers, or use additional features purchasing optionals for, as an example, connecting to internet, or get potable water, something important in those areas. For these reasons, this product would be able to balance the inefficiencies of the infrastructure and, at the same time, increase the occupational level and expertise.

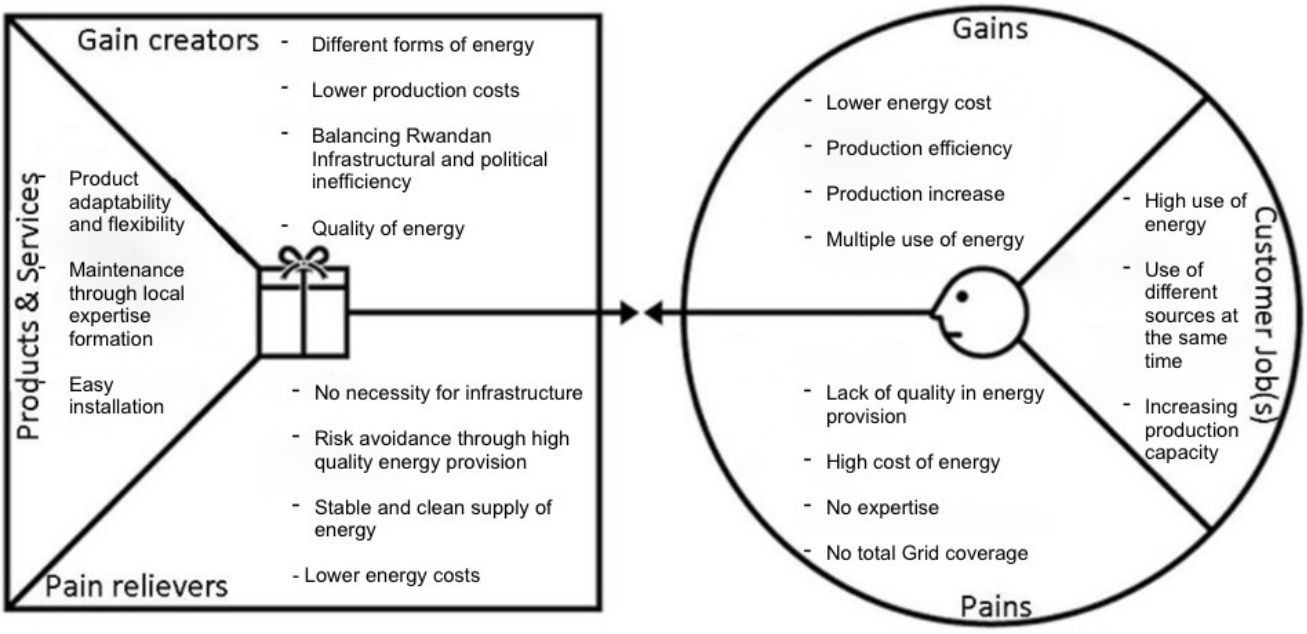

Figure 4.1 Value Proposition Canvas. Source: compiled by author

4.6.3 Channels

AI still does not have identified a possible distribution company. However, being everything collected into a container, for this case the delivery of the product does not require extremely specific transportation. The transportation market shows a wide range of solutions, which provide the delivery service to the location plus other connected services, such as insurance against external damages or warehouse services. After the delivery, the logistics would be up to the single customers, depending on their availability of space and the requirements of the regulations.

One of the most important aspects the Channels block regards the communication to the customers. In this case, as it will be discussed in the next paragraph, Ola Ekman suggested that it will be valuable to communicate with customers through a Customer Support Office, which could be managed by local trained people. As for raising awareness about the product and services, Anders Knutsson suggested that the best way is to contact the local partner, who has the knowledge ad the network to find the right customers. Also local organizations, as it will be discussed later in the partnership block, are good resources in this phase.

4.6.4 Customer Relationship

Once defined the customers segment, it is necessary to define what are the specific services AI should build around the value proposition. This phase as a consequence has to identify the main activities to provide to each customer segment based on their necessity, in order to give them the best experience. Ola Ekman suggests that from the moment the customers will decide to adopt AI solution it will be hard for them to change energy supplier, due to high switching costs very common in energy sector. However, it could be hard for AI to find the private customers at the beginning and, since they would require very targeted touch point, word of mouth could be a very good instrument to increase

the recognition, according also to Anders Knutsson. Therefore, a good service in pre and post delivering is valuable in order to build a strong reputation.
According to mr. Kent Samuelsson, two of the main activities on which to focus in this case are installation and maintenance: both of them require knowledge of the technology but it is difficult at the initial approach to find enough local expertise, even more from Sweden. Moreover, especially installation will require a study on the feasibility, together with the identification of the needs of each customer. Due to the difference of customers, the technology should be adapted to each case, and this could imply problems if everything was realized in Sweden. Also, the characteristics of AI technology allow to change the way it interacts and work for the customer. It is not difficult, if required, to change in a second moment from Off-Grid to On-Grid disposition, or a combination of the two, but at that point the whole process should be run in the place. For this reason, since it would be initially difficult to give a fast response to the many requests that may arise, the idea Kent Samuelsson suggested is to train local people to the different customers needs. If realized, the implication on the business model could show two positive effects. The first, as foretold, would be the speed of the reaction whenever a new request would come out: fast solutions of problems, mostly in factories on health centers, may imply high costs and life savings, but also ensure a faster communication with AI. The second consequence is very important for the sustainable point of view of the Business Model. According to Triple Bottom Line Principle, good Business Models should include not only informations about their economically viability, but also about how their application can positively affect environment and society. What can be done in this case is training local people to jobs that were not accessible before, which would increase the business value.
Together, fast response to necessities and local human resources should guarantee both economical and social achievement, as well as development of trust from the population and the institutions, which will help AI to get closer to the potential customers.

4.6.5 Revenue Stream

The Revenue stream represents the final part of the Customer's side of the Canvas. The purpose is the one to find the best delivery method in order to reach the higher results in terms of profits. In this phase it is very important to rely on the customer segments identified, as the revenues will be highly influenced by their characteristics, mostly in a country like Rwanda where potential customers have very different needs and purchasing power.

The issue here is related to the difference on requirements by customers is enhanced by the early stage of the company, which means for AI a quite high flexibility in identifying the right method. As a matter of fact, this condition has emerged in the interviews results, showing different but still compatible opinions.

On the one hand, Mr. Kent Samuelsson declared the intention to directly sell the final product to the customers. According to him, the problem in an alternative solution arises since in further areas in Rwanda it would not be possible to monitor the product from improper use, but this could partially avoided if local human capital was employed, as explained in the previous paragraph. Anyway, also other solutions should be studied in this case. The model provided by Mr. Samuelsson include two main possibilities in terms of sales model. The basic version would be a pure sale of the product. In this case, AI would sell the product to the customer, which should be trained and able to fix any problem related to its maintenance. The earnings for AI would be based in this case on the only sale of the product, so any responsibility would be transferred to the customer, but there could also be earnings from delivering of other parts. A second evolved version could be the Full Service Sale, which would include in the price also the services of maintenance and installation from AI, increasing company's responsibility but also its presence for the customer. Nevertheless, in a first stage the possibility to find a customer willing to pay for the whole package is quite uncertain, as well as the one to propose different leases. Public institutions and Government have demonstrated to be more interested to signing contracts for buying energy rather than expending large amount. It is

also probable that local industry do not have the necessary to invest in the total purchasing and, as a consequence, also rural areas. Probably, in a first stage it is easier to focus on other sale models.

On the other hand, Mr. Ola Ekman shown a different point of view. The main idea emerged as the possibility to be energy providers for customers, while retaining the property of the technology. This could increase the feasibility when trying to enter the market, as the customers would only be charged of the price of the electricity provided. For AI, this could turn to be an advantage since the breakeven point would be very short compared to similar technologies. Regardless the need of customers to connect or not AI panels to the Grid, in order to decrease the risk the first step in this direction would be to find a partner, which could be the government, as regards hospitals and other public infrastructures, or a local partner. The latter seems to be the most feasible solution for the moment and, since Rwanda laws impose a local partner willing to invest in the project, AI should opt for the *Independent Power Producer* structure. In agreement with Kent Samuelsson, the joint venture created could be formalized in a new company, which would buy the product from AI and co-own it with a local partner. Every configuration of the technology should also refer to the respective regulation and the relationship with the customer would be the one defined by the previous paragraph, this way the new company would own the profits form energy and maintenance provision to customers. After that moment, if AI was interested in selling the technology after a certain period of time, the company would have the flexibility to exit the joint venture.

Although the last alternative presents as more risky, Ola Ekman states that it is also the one that may allow much more flexibility to AI, and the one with more probabilities of success in a first moment. If the technology has demonstrated to work, it would be easier in a second moment to attract the attention of public institutions for their adoption of AI solution. Moreover, this model presents benefits for reaching the customer segment identified, since a local partner would have enough knowledge of the area and a more developed network to exploit.

4.6.6 Key Resources

Key resources are defined through the physical, financial, human and intellectual definition of the assets the company owns in order to make the business model work. Mr. Kent Samuelsson has given the informations required by this section, although as a new born company sometimes they are missing, due to the fact that AI alone is not able to produce everything it needs.

For the main resources AI refers to Samster AB, which at the moment owns the 100% of the company. Samster AB is a Swedish energy company strongly committed in production, conservation, flow control and consumption of alternative energy. One of the main valuable resources Samster is able to give to AI is the human resource and knowledge, since it has the expertise to build the whole product internally.

Samster produces the Solar hybrid panels, the core resource of AI technology. As for the other components, Samster itself relies on some suppliers, which may vary depending on the nature and the dimensions of the component. The heat pumps, for example, are provided by Nybe or Thermia, but suppliers of containers and tanks for storing warm water still have to be identified. One of the main valuable resources Samster is able to give to AI is the human resource and knowledge, since it has the expertise to build the whole product internally.

As for intellectual rights, the company still not have applied for patents, but is taking in consideration the possibility to do in. Hybrid solar panels are available in the market, so only the property rights of few details will be registered, but what makes AI more valuable is the possibility to combine them to a heat pump and generate warm water.

4.6.7 Key Activities

The Key Activities block have been discussed with mr. Kent Samuelsson and mr. Ola Ekman, which brought us to develop a plan of 3 main stages.

The first stage is related to the validity of the product. Since the technology requires a prototype, the first step is to build it collecting all the components from Samster and external suppliers. The physical demonstration of product capacity is necessary in the early stage of the company for attracting the attention of Swedish potential partners, investors and risk taking organizations both from the private and public sector, which may largely help in the development and insertion of the company in a different market like the one in Rwanda. With the right elements, Kent Samuelsson defined a time 2 months for the construction of the prototype. After this point, when all the demonstrations and simulations have been conducted and when all the partners have been identified, according to mr. Samuelsson the new units could be ready for commercial delivery in 8 months.

The second stage, as explained by Ola Ekman, will be to approach the market by finding a local investor and, as a consequence, establish an Independent Power Production. This process will be conduced in parallel with the identification of a factory where to test the product, together with the communication of the simulation results. The scope of this stage is to build a Pilot, in order to understand in first moment what are the main needs of local customers and where the technology can be improve to reach the most of its efficiency while, in a second moment, this will work as a proof of the validity of the project once the institutional actors will be involved. This stage is of course supported by the application and subscription all the eventual licenses required from RURA.

The third stage is driven by the result of the pilot in Rwandan context. This will be useful on two sides. On the one hand, it will make it faster to show the potential to new customers while, on the other, it will be easier to demonstrate the benefits to Government, which already shown its interest as a contractor. Due to the flexible properties of AI technology, the combination of these two elements would bring the company to shift from small scale producer to a larger scale market, through the diversification of customers. Ola Ekman also suggests that, once the scale has reached a wider level and the human resources trained for the maintenance as shown in the Customer Relationship

block, it could be more valuable to transfer the production in Rwanda: this would decrease expedition costs, together with the positive effect on the occupational level and transfer of knowledge to the population, which would significantly affect the social purpose of the business.

4.6.8 Key Partnership

The partnership block presents the most complex structure. Many of them still have to be found, as Mr. Samuelsson said. In Sweden, it will be required the identification of container suppliers and shipping services to Rwanda, while in Rwanda the partnership will be strongly influenced by the local regulations and private or public partners.

As for Sweden, the first step will require to establish partnerships with suppliers. Kent Samuelsson is already relying on various companies for heat pump supply, such as Nibe and Therma V, but as for the containers no company has still been identified. Nevertheless, through an internet research it is quite easy to find many companies based in Gothenburg, specialized in delivery of customized containers.

Parallel to what required by a construction point of view, what is really necessary is to establish development partnerships able to ensure a the introduction on Rwandan Market. According to the interviews and secondary data, there are many options available both from Swedish or other european organizations and internal Rwandan institutions.

As for the first case, Ola Ekman suggested EKN, the Swedish Export Credit Board. EKN is an insurer company that help small-medium sized companies to penetrate new markets. Its core business is the one to make payment and financing guarantee against non-payment, which turns to be useful in developing countries, where insolvency risk is higher. The process of insurance sees the company application with the description of the export transaction. EKN establishes the conditions and price of covering the non-payment risk to the bank. In case of Rwanda, the premium price will be evaluated on the

country's risk assessment, which is evaluated 6 out of 7[2]. In case of non-payment, EKN pays a compensation and takes over the claim. This process requires a lot of informations about the customer segment AI chose to serve, so it would be used more in a second moment when the pilot has been installed and the informations are more defined[3].

As for Rwanda, two main potential partners emerged from interviews with Anders Knutsson.

The first is the Energy private Developers (EPD), a professional association that groups energy companies in Rwanda. Its objectives are to become a hub of partnership and development of energy sector in Rwanda, sharing experiences, practices and network and enhance international cooperation in order to get more knowledge and new partnerships. More in the specific, the EPD helps foreign investors to penetrate Rwandan market, through connecting and coordinating them to stakeholders. Mostly all the big actors of Rwanda energy scenario, such as RURA, REG and RDB, are partners of EPD.

The second potential partner identified by Anders is Rwanda Investment Group. RIG is a holding company founded by local entrepreneurs with the intention to invest on energy sector, in order to facilitate social-economic development.

Other potential partners interested on Rwandan market are is the World Bank Global Environment Facility, interested in developing entrepreneurship, incubation and promotion of PV and renewable energy systems.

4.6.9. Cost Structure

On this block it is possible to see the main costs the company should face after having clear all the other areas of the BM. Since the company has not started producing the prototype yet, it is difficult to be precise in determining the exact costs for the company. For this reason, the definition of the expenditures for each stage can make the situation clearer.

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[2] http://ekn.se/en/Countries/Countrylist/Country-selection/?pageid=34&__c=214#

[3] Source: http://ekn.se/en/Moduler-och-funktioner/Smaller-companies/How-it-works/

As for the first stage, Kent Samuelsson suggested that the main cost will be based on the realization of the prototype, and the adjustments to it referred. Samster should find all the necessary components through its own channels, while as for the container there are many available solutions within the area of Gothenburg able to provide competitive prices and minimized costs of transportation. The main costs for components will refer to the panels production and the purchase of the battery, the tanks and the storage system of heat. The cost of installation should also include the human resources, the surface of the land used for running the technology, the patenting costs and also the ones of connection to the grid, depending on the Swedish regulations. On the second stage, the Pilot will require costs of logistic and shipping the technology from Sweden to Rwanda, the fees related to the licenses, the installation costs and the maintenance. Also the costs related to the contract with risk insurance companies such as EKN shalle be considered once their assessment has been completed.Once this stage is completed, when more products will be required, AI could exploit economies of scale to reduce the impact of fixed costs. Also, as Mr. Ekman suggests the purpose of shifting the production in Rwanda, shipping costs could be largely diminished.

4.7 Conceptual Framework

The results of the empirical findings are collected in the Business Model Canvas framework of Figure 4.2. The nine block collect the informations about the interviews and secondary data for building a Sustainable Business Model to be compared, in the next section, with the Theoretical Framework one.

Key Partners

1st STAGE

SAMSTER AB: supply of components and human resources for prototype construction, simulation and demonstration.

2nd STAGE

Joint venture with local partner through Independent Power Production agreement.
Other examples of possible partnership: RIG and EPD

3rd STAGE

EKN partnership for risk insurance.
Local Government agreement for implication of the technology in public facilities

Key Activities

- 1st STAGE: supply organization; site identification; license agreements; prototype construction; simulations and demonstrations; patent
- 2nd STAGE: local partnership and authority agreements; pilot trial; identification of customer
- 3rd STAGE: network enlargement, new private customers; governments contracts for energy supply

Key Resources

- Acquisition of physical components from Samster and identified suppliers
- Human resources and Know how from Samster
- Financial resources from Swedish institutions/partners

Value Proposition

- Flexibility in reaching large range of customer needs
- Different sources of energy, with different combinations based on the necessity
- Tailored energy provision solution
- Easy configuration and installation
- Stability and quality of energy delivered
- Cost saving compared to traditional solutions
- Maintenance post-delivery
- Possibility of independence from Rwandan Grid infrastructure

Customer Relationships

- Customer support and maintenance
- Pre/post delivery service
- Communication with potential customer to understand the need, in order to balance the different forms of energy
- Fast response to necessities
- Local touchpoint

Channels

- Transportation company from harbor to harbor and local transportation from harbor to delivery site
- Local partners and organizations network
- Local management of the plants

Customer Segments

- Private customers in the second stage, mainly factories and farms.
- Public facilities and institutional offices in the third stage, in parallel to wider private customer segments.

Customers chosen according to the following jobs:

- High use of energy
- Use of different sources at the same time
- Increasing production capacity
- Need of reliable energy supply

Cost Structure

1st Stage:
- Components and prototype costs
- Partnership for financing, site rental
- Patent application

2nd Stage:
- Shipping and delivering costs
- Components, production and installation of pilot
- Regulation authority fees (if required)
- EKN service costs

Revenue Streams

- Contract of energy production and provision for private customers in the first stage
- Tariff based provision according to RURA laws of Off-Grid or On-Grid, depending on the size and the nature of the solution adopted by each customer
- Possibility to sell the product to the local partner after the payback time

Figure 4.2: AI Sustainable Business Canvas. Source: designed by author

Chapter 5
ANALYSIS

This section aims to show and compare the results of the theoretical framework and the empirical findings. The purpose is to proof the common results and the differences between the two frameworks, in order to build a final Model which improves the theory with the combination of empirical data: the analysis will be done on the four main areas of the business model, such as Customer Profile and Value Map, Customer Interface, Infrastructure and Revenue model, where the compatibility of each block will be verified and discussed. In particular, the analysis will focus only on the Customer-Side of the Sustainable Business Model since, according to Richter (2012), it is the one which fits most the case of a small autonomous energy system. The results will be useful for AI to generate a more reliable Business Model, increasing the generalizability and the validity of a Sustainable Business Model for renewable energy systems in developing countries.

5.1 Comparison of Theoretical Framework and Empirical Findings

Table 5.1 shows the relation between Theoretical and Empirical data. After comparing the results, the following step will be to understand the nature of the matches and the differences between the two models

Theoretical framework	Matching Analysis	Empirical Findings
Customer Segment and Value Proposition		
Delivery of the technology to identified segments, divided through needs, distribution channels, profitability.	Match	Division of customers on private enterprises and, in a second moment, Public facilities. Rural areas are a future option due to uncertain returns
Customers looking for green solutions and sustainable energy supply. Gains: lower cost of energy and environmental friendly solutions. Pains: High cost of electricity or no connection	No match	Jobs: need of reliable supply, increase of production. Gains: lower energy costs, production efficiency, quality of energy, multiple forms of energy. Pains: high cost of energy, lack of quality

New, customized and performant solution for energy saving through environmental and social outcomes, including no emissions	Match	Autonomous solution, flexible in producing different forms of energy and adaptable to customer needs, easy to install and transport

Pre/post deal services, warranties, involvement of stakeholders (shareholders, customers, suppliers, employees, society and nature)	Match	AI wants to deliver a full service built around the product and its configuration based on customer needs, using local human resources and partners
<u>Customer Interface - Customer Relationship and Channels</u>		
Personal, dedicated assistance through human interaction	Match	Communication with Customer for understanding requirements, support and maintenance
Purpose of developing partnerships with customers	No match	Decentralized customers need high transaction costs and focus on touchpoint
Communication of the brand to raise awareness of value proposition	No match	Purpose of fast response to necessities and local touchpoint. No marketing activities are planned yet.
<u>Infrastructure - Key Partners, Activities and Resources</u>		
Partnership development is essential, even more on the Customer-Side BM: network provides strengths and knowledge, so there is the need of strategic alliances and local joint ventures	Match	AI has an important relationship with Samster, which can provide expertise and components. However, the main partnerships still have to be concluded will be structured during the second and the third stages
Customer-Side BM: small enterprises should manage distribution and retail	No match	Activities in stages; vertical integration in the value chain
Local human resources, resources for decentralized customers for diminish the transaction costs	Match	Only human resources have been identified so far, still missing the strategy for capturing value from decentralized customers
Small firms have more possibilities in distribution and retail	No match	AI solution is very flexible and can be the core element of vertical integration in the value chain
<u>Revenue Stream and Cost structure</u>		
High transaction costs for dislocated customers and services provided	No match	No cost structure for dislocated customers have still been identified, though the purpose is hire/train local human resources
Costs for components, activities, partnership	Match	High costs for prototype construction, pilot implementation and shipping. Cost for EKN will be included

Customer-Side BM: fixed prices abandoned towards new methods (decoupling, dynamic prices, flat rates)	No match	AI includes prices are based on the tariffs defined RURA; possibility to sell the product

Table 5.1: Comparison between Theoretical framework and empirical findings. Source: compiled by author

5.2 Customer Profile and Value map

The properties of AI technology allow to satisfy the needs that different customers may perceive. The results of the interviews in the empirical findings are in line with the theoretical framework in identifying many possible segments, among which rural areas, public entities and private enterprises. The nature of the technology and the possibilities that the company faces in this stage of development allow to choose the private sector as the most feasible option, however the flexibility of the product will allow to shift to other segments whenever the possibility arises.

A deeper analysis of both the customer profile and the value map as presented in the Value Proposition Canvas by Osterwalder and Pigneur (2015) still presents unclear concept of sustainability and developing countries characteristics. In particular, as regards the customer profile, the comparison of the literature and the empirics show how developing countries are affected by scarce grid connection, the lack of quality of the existing infrastructure and prohibitive electricity costs. However, in giving information about the pains and gains in developing countries, Kolk and Van Der Buusen (2012) lack to consider the nature of the activities (jobs) and the political pains related to the instability, as well as the lack of expertise that does not allow internal development of renewable solutions emerged from primary and secondary data. This lack of focus is also criticized by Fauvel (2013), which states that it could bring too much simplicity to business model and, therefore, theory needs to consider jobs of developing countries in a deeper way. Entering Rwandan market will require AI consideration of the particular need of reliable supply of energy and the increase of production that developing countries have to exploit while focusing,

in doing so, not only lower energy costs and environmental friendly solution but also on increased efficiency, higher quality and the delivery of many forms of energy in a single solution.

The Customer-Side orientation of the Business Model is matching the value proposition. However, AI has to find an economical viable solution to bundle a series of services around the product, depending on the revenue model that it will chose. Adopting this approach, a small company has to face the transaction costs implied in the service of many decentralized single customers. For this purpose, the main target that AI should remember in this case is not only the economical implications of the solution, but also the environmental and social ones, as Elkington (2004) suggests. In this context, developing local expertise as suggested by interviewees could be a good leverage in contrasting transaction costs. AI could both create an office of trained workers for installation and maintenance or create workshops for human resources of the enterprises in which the solution has been implied. This way, the expertise would already be decentralized and ready to intervene once a problem is detected.

What just evidenced in the empirical findings finds a strong basement in the theory of Business Model, which role is becoming to enhance the economical, environmental and social effects of the business in the long run. The impact of these politics are mainly the social boundaries beyond the organization (Høgevold, Svensson et al. 2014) and the involvement of local stakeholders such as customers, suppliers, partners and human resources can be able to capture value and improve the quality of life in developing countries. Also nature, under the principles of TBL by Elkington (2004) has to be considered as a stakeholder.

In this case, theoretical framework and empirical finding appear compatible and there are not large implications that the latter could contribute in. However, it could be valuable to study how and in which degree political instability and lack of skills can affect a developing country in adopting new energetic solutions. By its side, AI could be able to increase the social purpose by approving know-how

and skills, while compensating the pains related to the unstable energetic infrastructure and exploiting the opportunity of growth that Rwanda is showing.

5.3 Customer Interface - Channels and Customer Relationship

In the Customer-Side approach, the particular focus on the needs and requirements of customers underlines a mutual significance between the block of Channels and Customer Relationship. About that, according to Richter (2012) the more the Utility endeavors in finding new services to bundle to the principal, the more this will have a positive impact on customer expectations. To do this, the new approach needs to find a way to separate from the traditional Utility-Customer relationship based mainly on the stand alone energy supply and create a wider experience for Customers. Small businesses can challenge these requirements by vertically integrating in the value chain, maintaining the focus on retail and consumption, where the expectations of the customers become critical.

In this context, especially for the channels, empirical findings do not show a strong theoretical match.

As already mentioned, one of the main drawbacks presented by the Customer-Side approach is given by the transaction costs. What AI delivers is a small solution, which can be potentially implied in very small environments and allows to private customer to auto produce the energy they need. This implies that, mostly in a first moment, customers could be placed in different areas, making it difficult to reach them. However, in order to stay closer to customers, Richter (2012) suggests that Utilities should try to build partnerships with them, making them active part in the business. In this sense, developing IPP through local partnerships could be more effective in reaching different faraway customers. Also, as mentioned by Mr. Ola Ekman, trained customer's human resources could partially solve this problem.

Empirical data also show AI to be still approaching the first stage of the prototype building and partnership research, so marketing activities are not still

considered as a critical action. Nevertheless, as the theory suggests, communication with potential customers is very important to raise awareness about the brand and the value proposition. Not much is said by the literature about how to develop a strong awareness of a value proposition in a developing country: customer jobs, as explained, is still lacking informations and this could make it difficult to understand how to structure a marketing campaign. However, AI has the intention to develop partnerships with local organizations which can exploit their network, as to find potential customers while at the same time minimize marketing costs and match the stakeholder's interest creation.

Another aspect that should catch the attention is the absence of a practical side from the theory about how to exploit the local touchpoint and partners to enhance the potential of local market. As a matter of fact, theoretical framework as regards the communication to the customers say something about "what" to do to to reach potential customers but there is not a satisfying explanation on "how" to do it in a developing country. In other words, most of what found about these blocks is referred to a generalization of the steps to reach the customers in a good way but, on the other hand, it lacks information about the application to the different contexts and the identification of key actors that can help in this sense. In particular, theory misses the importance of local potential in order to to deliver the Value Proposition to the Customer Segment. As an example, empirical data show AI's intention to exploit local transportation from the harbor to the installation site. It could be socially valuable, for this reason, to state the possibility to rely on local parallel services since, according to the Sustainable approach, this is a good practice to enhance growth and development of local industry. Also, as explained by Mr. Ekman, in a first moment it could be good to create a local office to manage the operations in the area more efficiently, in order to give a fast response whenever a problem arises.

Both the findings demonstrate the positive benefits of creating a channel structure that exploits local services to bring the value proposition to customer, and how AI should focus on local potential to guarantee a fast response to customer's needs.

5.4 Infrastructure - Key partners, Key activities and Key resources

The area of infrastructure gives insights on what the company has or needs in order to attract customers through the Value Proposition.

In the literature and the empirical findings there is a main common concept: in energy industry, the presence and influence of key partners can be extended to any Model. From the comparison it emerged the necessity to establish partnership under three dimensions: financing, expertise/know how and network.

Partnerships research in developing countries have a different approach, so companies need to identify and rely on many collaborations with local actors, for at least two reasons. First, many times it is not possible to find informations about the market through normal ways and, for this, companies need to hardly work to get the knowledge they need. In the case of Rwanda, according to Mr. Ola Ekman, the Government is still working on collecting the informations that may be used to attract foreign investments but, at the moment, it is not certain or easy the possibility for a foreign company to have access to them. Second, the risks of insolvency by customers in developing countries are still high, and ventures may decelerate and restrain the process of investments. As a consequence, there is the need to identify the best financing models that fits the particular context on which a company is interested, which includes a wide knowledge about customers needs and economical possibilities. So, companies need to know as much as they can about customers, in order to identify the right ones. For this, key partners in developing countries are an important success factor: most of them have government and non-governmental Organizations seeking for private investments through partnership and new financing schemes (Kolk and Van Der Buusen 2012), with the purpose to attract new investments while not influencing customers with higher prices. In this case, although no partnerships were subscribed in Rwanda yet, the empirical findings show AI awareness of the importance of network creation and knowledge transferring when entering the new market. In doing so, there are many international organizations that may help in this direction but, as for the

local potential, two main organizations have been identified: EPD, which purpose on network creation and knowledge sharing can help to connect the company to new possible partners and RIG, more focused on investments on the energy sector for the socio-economical development of the country.

Another aspect that has to be considered when entering a new market is the regulation structure. Basing on the secondary data, the most common ways for a company to enter the market is through Public-Private Partnerships or Independent Power Producer. For the early stage of AI development, the empirical findings showed interest towards private enterprises rather than public mutual collaborations for the initial step. According to Mr. Ekman, this solution is the most economically viable at this stage but it could be possible, when the company will be more structured, to find agreements with the Public sector for the implementation of the technology in hospitals or offices. For this reason, at the moment there are two possibilities: establish IPP partnership with Organizations mentioned above and/or with local private partners. According to the literature, especially referring to the Customer relationship and the Customer-Side approach, it was shown the social-benefit of instituting partnerships with customers (Richter 2012), which would challenge AI by understanding the most profitable and feasible ways to realize this kind of relationship.

The last aspect to consider for AI is what kind of partnerships Sweden can offer in order to set the production and increase the success degree of the exportation of the technology. Again, this is mainly based on the one hand on expertise and know how and, on the other, the possible ways of financing the problem and lower the risk of failure. As for the knowledge, the close relationship with Samster AB and its suppliers network seems to have positive implications when it will come to collect materials, as well as for the expertise to install the technology and make the demonstrations. Instead, as for the financial risk, Swedish Export Credit Board (EKN) seems to provide a good service of warranties and its involvement will be valuable for new investors.

For this reason, matching the research on Partnership in entering a developing country implies for AI to run on two levels. As for the social point of view, local

partnership are a good solution to increase the network and get informations, as well as if possible get financed by local partners whereas, for the economical viability, developing countries may not provide the technical knowledge and more specific services of risk coverage, which are easier to find in the origin country.

Moving to the Activities, Richter (2012) states that small companies should focus more on distribution and retail, whereas the elements of the Value Proposition identified during the interview simply a vertical integration along the value chain, which means a much wider activities from the ones identified by the theoretical framework. Richter (2012) then classifies the activities basing on the size and competences of companies. In this case, then, there is a mismatch in the comparison between the two Business Models. AI value proposition includes first of all the generation of energy and the delivery to the customers through a flexible configuration. Being an Off-Grid solution, though the connection to the Grid is still a possibility that can be implemented any time if required from the customer, the passages of transmission and distribution are minimized since the technology is supposed to operate in the same place of where it will be used. This underlines and suggests the necessity to include more details in the literature of Business Modeling especially as regards Off-Grid solutions. As a matter of fact, the small dimension and the affordability of these technologies, together with their elasticity on use and applicability, make them a huge resource for developing countries, where the majority of the population has not access to electricity and where the collection of the investments and the installation time for build the infrastructure would require years. Sustainable Business Model therefore have to take in consideration the speed at which the provide to the society an important resource, fundamental when talking about electricity. Moving back to the specific activities in the empirical findings, there is a light mismatch with the theory as concerns the stages of activity. Osterwalder and Pigneur (2015) only suggests an organization and the structure of the activities but, in contrast, does not take in consideration the tactics through which it wants to organize its development towards entering the market (Casadedus-Masanell and Ricart 2010). Tactics, as

well as strategy, have a very strong identity and importance in business, however they are not independent from the Business Model, and vice versa (Zott, Amit and Massa 2010). Their recognition when structuring a Model can be helpful to delimitate the activities that each step requires. Moreover, it allows to revise some activities whenever needed in a clearer way, enhancing the concept of flexibility required by the definition of Business Model.

Key Resources in the theory are defined as all the necessary components, human and financial resources and intellectual properties that companies need to deliver the value proposition. With particular regard to the Customer-Side approach by Richter (2012), small companies that want to enter developing countries could face big efforts if their product was used for energy auto-production. The adoption of AI from many decentralized customers therefore has to include a dedicated configuration of resources. One of the most feasible and elastic resource here is provided by local expertise, which has to be trained by AI and could be a solution to this problem. As a matter of fact, there is correspondence between theory and empirical findings as regards the importance of local expertise. On the one hand, they can turn useful in the decentralized situation while, on the other, it is in line with what required by the TBL and the sustainable concept of Business Model while, which is a very useful leverage for a start-up. However, there is no evidence in the empirical findings that link their implementation for the second purpose, so the comparison between these elements of the block appears incomplete. Corresponding to the description, AI should implement tactics to balance this problem. One way in facing this could be suggested by the strengths of local partners, as already explained in the relative section but, by its side, also research should try to go deeper in what kind of resources are needed when facing decentralized customers and focus on the dynamics that interest small enterprises when entering a new developing market.

5.5 Revenue Model - Revenue Streams and Cost Structure

The theoretical Revenue Model as proposed by Richter (2012) presents some difficulties for new companies, especially for those adopting the Customer-Side approach and an Off-Grid solution. This approach requires efforts that small businesses could not easily face. Moreover, as Kolk and Van Der Buusen (2012) stated, these difficulties are also enhanced by the lack of investments from partners due to insolvency risks. As a matter of fact, empirical findings show most of the uncertainty on these two blocks. However, Richter (2012) suggests new methods of contracts that may fit the get between company and customers and ensure a more stable revenue stream.

As for the cost structure, the division of costs of the theoretical framework matches the one of the empirical findings but the latter does not show clear numbers. At this early stage, the easiest calculations for AI could be for components but, for the moment, it is not possible to find accurate data about the costs of shipping, the fees to pay to the regulatory agency in Rwanda and the cost-opportunity paid to insurance companies like EKN, so there is a complex structure that AI has to assess as a first step for starting the production. However, much of the components can be found easily in Gothenburg's market, especially the ones related to the partnership with Samster. The shipping costs have to be decided through the identification of the company but, once arrived to the closest harbor, it could be valuable to exploit local transportation companies which, according to Mr. Knutsson, are already organized in the area and it should not be difficult to select one.

The cost structure becomes more complex when related to the Customer-Side Business Model. As for Rwanda, cost should be considered along the whole value chain. In this case, the generation costs will refer to the costs of construction and installation, since the investment in its basic form is in one solution and does not require future expenditures on fuels. Moreover, since the the system can be used Off-Grid and store the energy, costs of transmission and distribution are minimized. In contrast, retail and service provision could be source of high costs for the company. As already mentioned, it can be difficult

for a small company to provide a wide range of services to decentralized customers and, looking at the costs, since AI has not yet identified the specific services that it wants to provide from the possible choices, it is not easy to determine which kind of costs the company will face. Moreover, this approach implies that expenditures will raise for each new customer in the system (Richter 2012). This means that a large service providing might mean lower profits for the company or higher costs for the customers. Therefore, Empirical Findings show a very superficial way of considering the cost, so the company should consider the nature of its services as soon as possible as to understand which are the expenditures associated to their services and how to minimize them, which will be part of the tactics of the company. About that, as suggested by theory, a good way to face the problem could be the standardization of the projects, which might show their potential through the economies of scale once a certain number of systems have been installed but, at the same time, AI has to compensate the drawbacks of the costs with a good choice of pricing in the Revenue Stream.

The Revenue Stream as proposed by the Interviews does not match the one found in the theory. Basically, as mentioned, there is still too much uncertainty in AI as regards the type of the pricing contract and the relationship between customers and company. Nevertheless, some ideas have emerged, from the pure selling of the product to the ownership of the technology and the supply of energy and services to the end customer. For the nature of the technology, both the ideas have an impact on environment but, according to the literature on sustainability and the particular role of the company on the social impact, the second option seems to be the one that allows more flexibility when considering economical and social purposes. As a matter of fact, Mr. Ola Ekman suggested the possibility to be energy provider and owners of the technology, while Mr. Kent Samuelson remarked the role of local human resources in the whole process which, together, would create a value proposition that could be easier to implement in a solution that does not include the pure-selling.

However, Kolk and Van Der Buusen (2012) state the difficulties encountered by companies that want to increment the electrification of rural areas of developing

countries through Off-Grid solutions. Moreover, Richter (2012) shows perplexity in the revenue models shown in the Customer-Side approach. The case studies and literature have not yet succeeded in finding a pricing model that allows the shift from the Utility-Side criteria of price per kW towards a more comprehensive price for services provided. AI in this case should consider the pricing models identified by literature so far (decoupling, flat rates, dynamic pricing) adapting the most feasible to its own condition. However, these models refers to general Customer-Side businesses and are not, therefore, centered on developing markets dynamics. For this reason, by its side, theory should involve the informations about customers of new markets and create new revenue models.

5.6 Sustainable business Model for Autonome Infrastructure International AB

The following framework (figure 5.1) shows the result of the comparison between Theoretical Framework and Empirical Findings, in order to create a final version of the Sustainable Business Model that collects the characteristics of both. This represents the Model that AI should start with when deciding to enter the Rwandan Market.

Key Partners

Definition on geographical base (Sweden and Rwanda) and scope level (Network, know how, finance) and nature of partners (private or public):

Sweden:
- Collection of components from identified Suppliers (Samster and its network)
- know how and expertise from Samster
- Insurance risk: EKN

Rwanda:
- Independent Power Producer agreement with local partner/investor
- Network and knowledge of market: EPD
- Local financing on energy investments: RIG
- Possibility to create IPP directly with customer

Key Activities

1) Prototype construction and demonstration in Sweden

2) Local partnership and authority agreements; pilot trial; identification of customer

3) Network enlargement, new private customers; governments contracts for energy supply

Key Resources

Local human resources

Expertise and know how from partners

Components by Samster

Value Proposition

Products and services:
- Flexibility in the system configuration for each context (Off-Grid, On-Grid or combination of them)
- Easy configuration and installation
- Tailored energy provision solution based on customer needs
- Maintenance
- Vertical integration on value chain

Gain Creators:
- Diversification of energy (heat, cold, hot water and electricity)
- Stability and quality of energy delivered

Pain Relievers:
- Cost saving compared to traditional solutions
- Possibility of independence from Grid infrastructure

Customer Relationships

Bundled services:
- Workshops for creating expertise among local human resources
- Pre/post delivery personal assistance through local resources
- Communication with customer to understand the best configuration of the product

Channels

Involvement of stakeholders:
- Customer partnerships
- Local transportation
- Organization for network

Office establishment for managing the operations in the area and restrict the decentralization issue

Customer Segments

1) Separation of segments based on characteristics customers' needs and socio-political context:

- Jobs: reliable high use of energy; increase of production; diversified use of energy
- Pains: no access to sources of renewable energy; high costs of energy
- Gains: increase of production; efficiency of production; low cost of energy

2) Definition of stages: private enterprises identified as most feasible segment in the first moment.Government agreements and rural areas will be considered after the demonstration of the pilot

Cost Structure

Minimization of costs of distribution and transmission due to Off-Grid characteristics, but high transaction costs for decentralization

- Sweden: costs of supply, construction, prototype installation, cost-opportunity for EKN
- Rwanda: local transportation, installation, education (workshops) and bundled services implied by Customer-Side approach

Revenue Streams

Price of the electricity fixed on RURA tariffs, which are already settled on Dynamic pricing and price of components when maintenance issues arise

Price of electricity includes the provision of all the forms of energy

Possibility to sell the product to the local partner after breakeven point

Figure 5.1 Sustinable Business Model for AI. Source: compiled by author

Chapter 6

CONCLUSIONS

This chapter is conceived to expound the conclusions of this Master Thesis to Autonome Infrastructure, for its sake to exploit the development of Energy Market in Rwanda. The conclusions are designed around the Sustainable Business Model emerged from the combination of Theoretical Framework and Empirical findings. The aim of this chapter to recollect the informations useful to answer the research question:

“Which is the Sustainable Business Model for AI to enter Rwandan Energy Market?”

In doing so, this chapter includes the discussion of the composition of the Business Model and some recommendations that might be useful for AI to step towards the next stages of development.

Furthermore, as the topic of Sustainable Business Model for renewable energy in developing countries have not been deeply discussed yet, this section aims to give new ideas for future research based on the findings of the analysis.

6.1 Conclusions

The substantial boost that Rwandan Energy Market is experiencing has started attracting foreign entrepreneurs attention, driven by the growing interest from local institutions to predispose the necessary regulations and socio-political conditions to facilitate the process. As a consequence, today Rwanda appears to be much more committed in implementing sustainable innovative solutions then other African countries and, therefore, a good environment to start a geographical diversification. The country already allows different financing solutions and governmental participation on the development of several industries, among which the propelling role of Energy Sector has a key function. Furthermore, the stability of the Government and the safe situation of the

country have contributed in the process of attraction of foreign knowledge and solutions.

In particular, the Government has shown interests on new, sustainable energy technologies, with a particular captivation towards Off-Grid solution, since the Grid Infrastructure coverage of the whole territory would require long times and large amounts of investments. In this context, Autonome Infrastructure technology has shown the characteristics to solve the pains that population faces in energy provision. In the results of this Master Thesis, AI appears to have a very strong Value Proposition that fits the needs of the customers, identified through documents on Rwanda Energy Market and interviews with entrepreneurs and students. Using the Value Proposition Canvas framework, it has been possible to notice how the pains and gains of the identified customer segment matched the pain relievers and the gain creators of AI technology, making the Value Proposition the greatest strength of the company. However Rwanda is still showing the issues related to developing countries and, for the company, it is hard to understand how to deal with its dynamics: for this reason, the available literature on renewable energy technology in developing countries turned to be essential in order to structure the Business Model for AI.

Literature on Business Model has reached good results in defining the frameworks and the approaches to how companies should exploit their Value Proposition to create value, while introducing social and environmental purposes in their business. These informations allow to understand what is and how to develop a Business Model based on the principles of Sustainability, in order to identify the right framework and what the company needs to step into the target market. Despite this, the lack of information on developing countries make it difficult for enterprises to apply the general knowledge on Sustainable Business Model in those markets. For facing this problem, as suggested by theory, the first step has been to identify the right strategy fitting the particular scenario of the country and the possibilities that AI might find in entering the Energy Market. Starting from the strong relationship between Value Proposition and Sustainability that the company plans to deliver, the strategy identified refers to Customer-Side Business Model. This approach is conceived to capture

the value in a different way from traditional Utility-Side systems, especially for autonomous photovoltaic and solar water heating technologies for energy production, potentially available to smaller customers, in line with what identified for AI. Customer-Side Model is able to exploit a vast range of services that AI could exploit, in contrast to the traditional stand-alone supply of energy of Utility-Side system, allowing the company to vertically integrate in the value chain. Moreover, this method shows benefits for companies that want to enter developing markets, as well as some drawback related to the raise of transaction costs that decentralized customers imply when bundling a number services to the main product.

The Customer-Side approach has been implied both in the Infrastructure and Customer Interface sides of the business Model.

As already mentioned, Customer Interface presented a very strong relationship between Value Proposition and Customer Segment but, analyzing the Empirical Findings, there were not many informations about how to deliver the first to the latter. In particular, the Customer Relationship and the Channels indicated many different aspects in the comparison between Literature and Empirical Findings. As a matter of fact, although AI was aware of the importance of local human resources, Empirical findings missed some important notions about the strategic approach that would have enhanced the role of local expertise creation for reducing the gap between transaction costs and services provided.

Moreover, the particular nature of AI's technology increases the social and environmental role of the business, in line with the TBL concept, something which according to empirical data seems to be clear to the company: local expertise can be created in order to help the company to deliver the pre and post delivery services and, maybe most important, communicate with the customer. However, it has been shown in the theory how TBL alone is not a precondition to achieve results, which makes it important for a company using Customer-Side approach to have a tailored price scheme.

On the other side of the Model, the Infrastructure explains what the Business needs in order to deliver the Value Proposition. The Customer-Side System indicates how partnerships can turn to be fundamental for small businesses

aiming to enter emerging markets, in particular for Energy Sector. Therefore, partnerships have been organized basing on geographical position, scope and nature of partners. As for Sweden, at this early stage, the main Supplier of components and and know how would be Samster AB while, as for risk insurance, EKN can be a valuable source of risk avoidance, since it could protect AI against customer's insolvency in a country where this eventuality is largely present. As for Rwanda, the regulatory framework indicates to find a partner under Independent Power Producer Agreements, since the Public-Private Partnership could be difficult to establish in a first moment. Customer-Side approach suggests to involve customers as partners since, according to Ludeke-Freund (2010) customer value is also composed by the equity of the company owned by the customer. Other local partnerships may help AI in network creation (EPD) and financing the project (RIG). Finally, stage division of activities facilitates the process of value delivering, allowing enough flexibility to make correction of the Model when required.

The Customer-Side literature was also able to identify some informations about the Revenue Model. The Cost Structure of the model contains an idea of the expenditures that AI should face throughout the value chain. However, it has been stated that although having the characteristics of small companies, which typically avoid vertical integration and operate on the distribution and retail of energy, the Off-Grid nature of the technology allows to minimize the costs of transmission and distribution. Moreover, as for the regulatory framework, the Regulation Authority gives more freedom to this technology compared to Grid based ones. Even in the case of a combination between On-Grid and Off-Grid, which conversion is possible anytime for the features of the product, it could be possible to reduce the time and avoid the costs for the application for the licenses. This is verified through RURA Grid-Code and Solar-Water Heating Code study: the first allows the exemption from licenses and fees for generators under 50 kW, while the second allows the same exemption for the water heating systems working on renewable sources of energy.

The revenue model, instead, presents more complexities, both from the theory and the empirical findings. Revenue Streams block has to consider the

transaction costs of services to decentralized customers. A bad designed price scheme could increase the cost for customers, nullifying the Gains identified in the Customer Interface, or lower the revenues of the company, making the entrance in the market less economically viable. Theory suggests three types of pricing, such as decoupling, dynamic prices and flat rates, however it is difficult to state a good solution, due to the perplexities found in the theory about pricing models for Off-Grid solutions. Also, Rwanda should decide in the next few months the new tariffs framework both for On-Grid for Off-Grid solutions. For this moment, therefore, the actual revenue model is based on the electricity tariffs provided by RURA, which already appear under the Dynamic pricing scheme. The price will include the provision of the other forms of energy. Also, it is contemplated the possibility to sell the product once the breakeven point target is reached. However, the decoupling of energy provision price and services price appears to be risky, since if something would not work and the customer could not repair it, he/she would be not consequently able to pay the tariff.

For this reason, any suggestion on the pricing scheme and any perplexity in general will be discussed in the next paragraph, dedicated to the recommendations. Moreover, it is important to remember that business models need to be flexible, so since the configuration of the product could be changed from Off-Grid to On-Grid anytime, it is necessary to consider also a different Revenue Model and make the appropriate changes in the Business Model.

6.2 Recommendations for Autonome Infrastructure AB

This paragraph presents some recommendations that may help to fill the gap between what the literature lacks and what AI can search for in the next stages of its activity, which might imply some changes in the Sustainable Business Model proposed.

The first point on which AI should work is the establishment of the partnerships identified in the Sustainable Business Model. This figure has a huge impact on

the good results of the business and has to be exploited both in Sweden and Rwanda. In particular, it has to be considered that interests rate for bank loans arrive to 17%, therefore AI could be forced to find other forms of financing. Also local investors are not easy to find, so the most feasible options are two. On the one hand, RIG is an example of ideal local partner, since its mission is to increase social wealth through investments in energy sector: deeper insight on the possible local organizations that may help through financing could be therefore recommended. However, the social purpose of using local partners does not necessarily mean to exploit local investors, since it could turn to be a bad tactic with a negative impact on revenues and, for this reason, it is necessary to verify the possibility to find Swedish or International investors. On the other hand, one of the main purposes of the theory of Business Model is the involvement of the stakeholder, which could imply also a financial participation from customers. Theory suggests how customer's value is represented by the equity she/he has on the company and, most important, seeking an IPP with customers might help to identify the most willing to pay, minimizing the risk of insolvency.

Another recommendation is referred to the communication with customers by two point of view. First, in a early stage it could be hard for AI to understand how to communicate the value proposition to decentralized customers. Marketing campaign could be a solution but it would require high investments for covering different areas, which may turn to be impossible in a first approach to the market. Network creation is a good alternative to this problem: partnerships with EPD imply a wide field of entrepreneurs, investors and public organizations in which it could be easier for AI to find the possible targets. Second, it could emerge a problem in communication whenever decentralized customers require services. This problem could be faced through the creation of an office in which a Key Account Manager takes care of the Customer Relationship, while the use of trained local human resources for the maintenance would contribute on the social side of the TBL. Although the dimension of the country, which are a strength point in this case, the problem of the decentralization, however, would be still present. The recommendation is therefore the subdivision of the

countries in areas and the identification of the one in which the density of potential customers are higher as a target of the first stage. This way, it will be easier in a first moment to establish the office and manage the requests from customers. This way, on the next periods it could be possible to enlarge the business towards other areas, positioning a key account management office for each of them.

Furthermore, there is still not enough knowledge about the competitive situation in the Solar Energy Market in Rwanda. Critics to business models are also referred to their inability to show the competitive situation of a certain market but, in this case, it is not also easy to find informations about it. What can be said with the available data is that, according to empirical findings, hydroelectric power investments and companies are very present in the country, whereas there is still a low contribution of solar energy technology to the requirements of the country. AI should state the nature of the lack of competition, if this was not due to the non exploitation of the opportunity.

Finally, the revenue model still appears to be the weakest area of the Sustainable Business Model. According to theory, Business Model Fit is reached when there is the evidence that value proposition can produce profits by matching what customers want. The identified segment could be attracted by the possibility to get more forms of energy at the same price of the stand-alone electricity but, on the other hand, this could not imply enough revenues for the company. AI should understand with a deeper insight if a flat rate could be a more valuable option to the dynamic pricing of energy and decoupling of energy price and service price as shown at the current state of the Model.

6.3 Future Research

This Master Thesis aims to study the Business Model for AI to enter Energy Market in Rwanda. However, the gaps encountered in the comparison of informations from the literature and the empirical findings can help in giving a direction to future research.

First of all, literature shows a very weak position on pricing models for renewable energy solutions in developing countries. In particular, the Customer-Side approach gives some advices on pricing schemes, but nothing is said as regards their implications in the Business Model for Off-Grid solutions, since there is not enough evidence coming from case studies. Therefore, scholars should try to focus on pricing models already adopted and understand if there is a scheme that better fits the entrance in developing energy markets, or the possibility elaborate different solutions.

Moreover, the literature about Sustainable Business models in developing countries lack the application of Value Proposition Canvas, especially referring to jobs and pains that customers face in energy provision. Since Business Models present possible ways to get in touch with new potential customers, and since value proposition communication is the first step to do it, jobs description is a necessary as well as difficult information to find. Since this situation could contribute in giving a too superficial and simplified insight, scholars should try to go deeper in describing the Interface of customers in developing countries.

Also, theory suggests how social principles of sustainable business model can be reached through partnerships with customers. Nevertheless, it is not clear in the literature on developing countries which should be the nature of these partnerships, therefore it could be valuable if authors defined some schemes for understanding the possibilities and the consequences of partnership with customers.

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Appendix 1

Demand and Tariffs

Demand is characterized by the consumption of biomass for the 85% of the total energy consumption, which means bad consequences for the environment, mostly for the destruction of forests. Moreover, the demand for this source of energy exceeds the supply, causing a deficit of 4.5 million cubic meters per year.[4]

The main sources of energy are biomass, peat, methane gas, solar and hydropower. The table below shows the potential of the resources present in the market and the already installed capacity. Many of them are still missing, since the government have not finished to map them yet.

	Installed	Total Potential
Hydro	98.5 MW	400 MW
Peat	0.0MW	700 MW
Methane	25MW	350MW
Biomass	N/A	-
Solar	N/A	tbd
Wind	-	tbd
Geothermal	-	340 MW

Source: Energy Sector Strategic Plan

Although the absence of data about solar energy supply, it can be said that a growing number of private actors are already operating in the sector, with a many PV alternatives from 5W household systems to Solar Power plant on-grid. As regards PV, the need is to have a regulation that guarantees quality in products, connections, provision and customer relationship after sale.

The economic ratio beyond the definition of tariffs relates to two variables: the long-run marginal cost (LMRC) of power supply that states the efficiency of the

[4] https://energypedia.info/wiki/Rwanda_Energy_Situation#Introduction

resource supplied, and the average revenue requirements indicating the financial performance of the utility. Tor commercial and residential consumers the flat rate is at 134 RwF/kWh (22 US cents/kWh), whereas for industrial consumers are paying a time-of-use tariff of 126 RwF/kWh (21 US cents/kWh) from 7 AM to 5 PM, 168 RwF/kWh (28 US cents/kWh) from 5 PM to 11 PM, and 96 RwF/kWh (16 US cents/kWh) from 11 PM to 7 PM, with an average revenue requirement of 90-100 RwF/kWh for high-voltage customers and150-200 RwF/ kWh for low-voltage consumers.

The time-of-day tariff is conceived for inducing industrial and commercial consumers to shift their electricity use to off-peak periods. Moreover, all consumers pay a fixed monthly payment of 500 RwF and 18% VAT.

These prices are aligned as to reach the cost recovery principles, so in other words they represent the basic parameters on which conduct the sector's revenue statement and the financial viability. The huge investments that will characterize the country in the next period however will also see a shortfall in revenues and cashflow.

It is clear how, the two variables are not far to match and result appropriate for commercial and industrial consumers, as well as for residential ones. However, the actual unbalanced condition is unaffordable for most of the population.

Appendix 2

Interview Guide

Business model

(1) **Customer Segment**

- For which customers are we creating value?
- How can we divide the customers segments?
- Who is AI going to serve first?

(2) **Value Proposition:**

Product and services

- What value do we deliver to the customer?
- How does AI can contribute in creating social wealth?
- Which problems are we helping to solve?
- Which customer needs are we satisfying?
- What bundles of products and services are we offering to each customer segment?

Pain relievers

- Could AI products and services contribute to give lower energy price?
- What are the main risks about energy providing in Rwanda that this technology could face?

Gain creators

- Could your product or services produce benefits beyond customers' expectations?
- Could they make their life easier?
- Can this have an impact on their jobs?
- Can AI make adoption easier? Who are the key partners to do it?

(3) **Channels**:

- How do AI raise awareness about our company's products or services? How does AI Communicate the Value Proposition?
- How do we allow customers to purchaseAI technology and bundled services?
- How do we deliver Value proposition to customers?
- How do we provide post-purchase customer support due to high transaction costs?

- Through which channels do our customer segments want to be reached?

(4) **Customer Relationships**:
- What type of relationship does each of our customer segment expect us to establish and maintain with them?
- How costly are they?
- How are they integrated with the rest of our business model and the Value Proposition?

(5) **Revenue stream**:
- For what value are our customers really willing to pay? What is the impact of service bundling in this?
- For what energetic alternatives do they currently pay ?
- How are they currently paying?
- How would they prefer to pay?
- How/what they will pay?

(6) **Key resources**:
- What key resources do AI value propositions require?
- Our distribution channels?
- Customer relationships?
- Revenue streams?

(7) **Key activities**:

- What key activities do AI Value proposition require?
- Which are the necessary steps to achieve the results?

(8) **Key partners**:
- Who are AI Key Partners?
- Who are AI Key Suppliers?
- Which Key Resources is AI acquiring from partners?
- Which Key Activities do partners perform?

(9) **Cost structure**:
- What are the most important cost inherent in AI business model?
- Which key resources are most expensive?
- Which key activities are most expensive?