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Analyzing Reasons for Business Model Change

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Abstract

The importance of changes is vital for businesses, especially concerning the business model. Apart from knowing what and how to change, it is crucial to know the reasons for the changes. Current literature provides typologies for business changes and classification of triggers. However, a typology of triggers is missing. The present research focuses on identifying the triggers for business model changes and in particular for single business model elements. This is done by analyzing seven case studies of cleantech start-ups in different stages. In total six triggers are identified which are: phase dependency, imperfect market, social component, resources, business model element and technology. Triggers mentioned most frequently are resources, imperfect market and business model element. Furthermore, the results show that the triggers more often cause a change as a set instead of single triggers. An additional insight is that the business model elements key partners, value proposition, customer segment and key activities are more often subject to change. Lastly, the analysis revealed influences between the single business model elements such as the influence of value proposition on the customer segment. The study concludes that entrepreneurs should pay attention to the influence of business model elements on other elements and be aware of the fact that in the most cases changes are caused by a set of triggers.

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I. Introduction

'According to Darwin's Origin of Species, it is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself.'

(Megginson,1963, p. 4)

Change is an important driver in the business world. The pressure of launching new products, outperforming the competition and delivering value to the customers are some possible reasons for companies to change and remain innovative. As it is in nature in business the most adapted companies sustain while less adapted companies fail.

A company can adapt to the environment by innovating products and processes but it also can adapt its business model. In fact no product or process innovation is valuable without a suitable business model. Nevertheless, an innovative product has no value without a good business model. The value will remain unclear until its successful commercialization through a valid business model (Chesbrough, 2010). Apart from the focus on what and how to change it is essential to understand why to change. The study proposes a research of investigating the reasons which lead to business model changes from the view of entrepreneurs.

There are several reasons for changes, for example businesses are facing pressure in launching new products, outperforming the competition and delivering value to the customer, to name only a few. This work investigates reasons for change from the view of entrepreneurs.

Business model change could be of help when existing solutions are too complicated or expensive; it could also be used in response to change within the competition (Johnson, Christensen & Kagermann, 2008). Another advantage of engaging in business model change is that it can prevent failures caused by stagnancy and not paying attention to the changing environment (Ucaktürk, Bekmezci & Ucaktürk, 2011). Consequently, a company has to be able to adapt to a changing environment what can be done by changing or innovating within the current business model. Hedman and Kalling (2003) included a longitudinal process into the construct in order to describe the dynamic aspect of the business model. This dynamic aspect is interrelated with the changes in the environment. That is why the business model is not just an instrument for the understanding of its internal structure, above that it is also used to comprehend its relationship with the environment by adding an external view (Chesbrough & Rosenbloom, 2002).

The present paper is structured as follows. At first, the research question of the proposed study will be presented. The literature review reveals the underlying concepts and concludes with a conceptual framework. Next, the suggested research design is described followed by a within-case analysis and a cross-case analysis. The study ends with a conclusion consisting of a discussion, practical implications, limitations of the study and suggestions for further research.

II. Research Aim and Research Question

Business models are the foundation of any organization (Margretta, 2002). That is due to the possibility of business models to operate as an effectual tool for communication, analyzing, understanding and being a basis for decision-making (Osterwalder, Pigneur & Tucci, 2005a, Pateli & Giaglis, 2004, Schafer et al., 2005). Nevertheless, the construct of the business model is still underdeveloped in research which is due to two reasons. First, the construct is very young (Osterwalder et al., 2005a). The second, the construct has developed throughout a wide range of diverse research fields such as strategy, technology or e-business (Shafer, Smith and Linder , 2005).

A. Summary of Current Body of Knowledge and Research Gap

The static approach, which sees the business model as a blueprint, was analyzed by various researchers. In contrast, only a few authors (Svejenova, Planellas & Viveson, 2010; Johnson et al. 2008; Demil & Lecocq, 2010) focused on the dynamic view of the construct. The dynamic view refers to the interactions within as well as between the business model elements (Demil & Lecocq, 2010). Since this research field is underdeveloped further insights into the dynamics of business model (Morris, Schindehutte & Allen, 2005) and especially business model changes are needed. The goal of the present study is to explore the reasons for changes of business models in start-ups. This goes hand in hand with the investigation of the elements which are subject to that change.

Throughout many disciplines a huge range of studies has been done on business models. However, all these studies focus on different research gaps such as the construct of business model portfolio (Sabatier, Mangematin & Rousselle, 2010), business model evolution (Demil & Lecocq, 2010; Yunus & Moingeon Lehmann-Ortega, 2010; Svejenova, Planellas & Viveson, 2010), business model innovation (Spector, Santos & Van der Heyden, 2009; Sosna, Trevinyo-Rodrıguez & Velamuri, 2010; Chesbrough, 2010; Desyllas & Sako, 2012), business models of e-businesses (Zott & Amit, 2001; Wilson-Jeanselme & Reynolds, 2005; Lumpkin

& Dess, 2004), explaining the difference between strategy and business models (Casadesus-Masanell & Ricart, 2010; Hedman & Kalling, 2003) and other topics.[1]

Schindehutte, Morris and Kuratko (2000) proposed a classification of triggers. The five key dimensions are source of the trigger, strategic force, market link, management hierarchy and search type. However, this classification is used to classify triggers in general but not to name triggers for business model changes.

In order to come closer to the reasons for innovations in the business model Svejenova, Planellas and Viveson (2010) identified the triggers "why" and the mechanisms "how" business model transformation takes place in the case of the chef and gastronomic innovator Ferran Adria. Furthermore, Demil and Lecocq (2010) analyzed the evolution of the business model of the English football club Arsenal FC according to the RCOV-framework (resources, competences, organization and value proposition).

Although, two studies have already been done in the context of business model change there is still need to explore the precise reasons for changes in business models in order to come closer to a theory. Consequently, factors influencing the business model design and forcing innovations are still left to be explored (Zott & Amit, 2007).

Moreover, both studies were based on one example, in particular one company and one individual subsequently there is a lack of studies with a broader sample. The available literature does not enclose the topic of business model change of technology oriented companies. Since a difference can be assumed between a football club, an individual and a technology oriented company further research is essential in order to gain more insight into this topic.

B. Research Question

In order to cover the research gap a qualitative study based on case studies is carried out. Since the majority of dynamics in the business model can be observed in start-ups, the research is focusing on this particular example. Therefore, the present research focuses on technology oriented start-ups.

[1] A table summarizing the key issues of case studies done on business models can be found in the appendix (Summary of Case Studies on Business Models).

First, the elements ("what") which are subject to changes are investigated by using the static approach of business models. Further, a closer look on the dynamic approach of business models is taken. Next, the triggers ("why") are identified.

The corresponding research question is:

"What are the reasons for changes of business model elements in technology oriented start-ups?"

The research question goes hand in hand with the following sub-questions:

- What kinds of elements of the business model are subject to innovation?
- What kind of reasons causes changes in the business model elements?
- What kinds of interconnections exist between these business model elements?

The present research is guided by the research questions, so that business model changes can be analyzed.

C. Relevance of the Study and its Impact

Apart from the novelty and interest of entrepreneurs and researchers in the emerging field of business model change, this study advances theoretical and practical knowledge. There is a need for more established literature which describes the underlying mechanisms and moves the still unstable conceptual frameworks of business model development and innovation to more solid theoretical ground. Furthermore, the present study extends the static construct view of the business model concept. The results of this study could be used for instance for further research to investigate the difference between established organizations and start-ups. Moreover, by knowing the reasons for the changes entrepreneurs will get a better understanding what kind of challeneges they have to face and which factors could influence their business model. The research might also help to get an insight into the dynamics of business models and disclose the stability of business models.

In a nutshell, to further develop and investigate the construct of business model change this paper aims to contribute to the lack of theory in that area.

D. Structure of the Thesis

The next section (**Section 3**) gives an overview of literature relevant to the topic. It starts with the theoretical substantiation and is followed by the introduction of the business model construct and the description of the business model evolution. Next, a literature review on the reasons for changes of business models is presented. The literature review concludes with the conceptual framework of this study.

Section 4 presents the methods on which this study is based. First the research design is discussed, followed by a short description of the referred unit of analysis. Next, a detailed explanation of the sampling approach is presented and the research methods used are described. Finally, the section elaborates on the data analysis and the research procedure.

Section 5 presents the analysis of the data and the results of the within-case and the cross-case studies. Subsequently, the main findings are highlighted.

Section 6 interprets the findings, draws conclusions and provides theoretical and practical implications. Finally, the section is concluded by the limitations of the research.

III. Literature Review

Building upon the existing research on business models, the present study provides an overview of the current literature and establishes linkages between the different studies according to the main problem investigated. Thereby, the overall focus is on investigating business models and analyzing the changes business models undergo.

After going back to the theoretical substantiation of business models, the business model construct is defined and its characteristics and functions are described. The business model elements ("what"), which are crucial for the research, are explained. The second part of the literature review sheds light on the dynamic view on business models. The third part of the literature review deals with reasons for changes ("why"). To conclude, a conceptual framework of the present study is presented.

A. Theoretical Substantiation

The construct of business models has its roots in the strategic management literature and in particular in the value chain construct (Porter, 1985), as well as the strategic positioning (Porter, 1996) literature. Following, a business model itself can be a strategic resource that can help to outperform competitors. Furthermore, throughout the focus on unique combinations of resources for value creation, the business model construct is in line with Schumpeter's theory of economic development (1936). The enforcement of new combinations such as new organizational structures, new processes, new suppliers and others lead to innovations and competitive advantages.

Moreover, the business model construct is consistent with the resource-based theory (Barney, Wright & Ketchen, 2001), since the business model construct concentrates on key activities and key resources in order to gain a competitive advantage. Looking at the partnerships and alliances literature, the business model construct leads to the concept of value networks (Chesbrough & Rosenbloom, 2002). This is derived from the influence on the behaviour and outcome of the company which comes from the position of a company within a network (Powell, White, Koput, & Smith-Doerr, 2005; Walker, Kogut & Shan, 1997).

In the context of change, the business model refers to the literature on dynamic capabilities (Chesbrough, 2007; Teece, Pisano & Shuen, 1997). Dynamic capabilities are rooted in the, processes and activities of a firm (Barreto, 2010; Salvato & Rerup, 2010; Zollo & Winter, 2002). These capabilities are covered by the concept of the business model throughout the infrastructure management including the element of key activities and the dynamic approach of the business model itself. The theory of effectuation underlines the dynamic perspective of business model evolution throughout experimentation (Sarasvathy, 2001).

The aforementioned theories build the basis for the business model construct, which is introduced in the following sub-section.

B. Business Model - "what"

In order to get a better understanding of the business model first a definition is provided. Second, the functions of a business models are presented. Finally, business model elements discussed in the literature are introduced and a concept is chosen for the present study.

1. Definition

The literature review on business models does not reveal a common definition. Existing definitions do not completely overlap and leave scope for interpretations (Zott, Amit & Massa, 2011).

Delineating from the described core idea and referring to Shafer et al. (2005, p. 202) the business model is defined as "a representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network". In other words, a business model refers to the logic of a company and the internal and external activity system such as the way of operating and creating value for its stakeholders (Zott, Amit & Massa 2011 based on Zott & Amit, 2008 and Seddon, Lewis, Freeman, & Shanks, 2004). The working definition this study is based on is the definition introduced by Shafer et al. (2005, p. 202).

2. Function

The research field of business models has received a lot of interest due to its importance for business practice. The significance can be derived from the variety of functions a business model is able to fulfill. For instance, the business model is used for understanding and sharing, analyzing, managing, prospecting and patenting (Osterwalder et al., 2005a). Furthermore, it has eight different purposes as identified by Osterwalder, Pigneur and Gordijn (2005b, p. 9) namely “improving communication, inter-company interoperability, intra-company interoperability, achieving reliability, enhance business model maintenance, knowledge acquisition, provide a basis for scientific research on business models and provide the fundament for enabling support tools”. The present research aims to contribute to the scientific research by using the business model function of analyzing with the purpose of understanding the reasons for changes in business models.

3. Business model elements

Many scholars in the field of business models focused on the static approach and the business model as a blueprint. Consequently, the literature review revealed many different possibilities to describe business model elements. According to Shafer et al. (2005) core elements most found in the literature are value proposition, the strategic choices and the network component. Table 1 summarizes found literature which mentions at least one of the three elements. The first element includes the financial aspects, resources and processes. Second, strategic choices contain elements such as the customer segment, value proposition, revenue in form of pricing decisions. The value network element describes the network structure with its actors and relationships which are vital for creating and delivering value (Wu, Zhang, 2009).

Table 1: Overview on literature referring to value proposition, strategic choices and the network component

Authours	Value creation and capture	Strategic Choices	Network Component
Zott & Amit 2001	x		
Andersson et al., 2006			x
Bouwman, 2002	x		
Casadesus-Masanell & Ricart 2010	x	x	
Demil & Lecocq, 2010	x		
Doz & Kosonen, 2010		x	
Gordijn, Akkermans & van Vliet, 2001	x		x
Gordijn & Tan, 2005	x		
Haaker & Bouwman., 2006	x		x
Hedman & Kalling, 2003	x		x
Janssen et al., 2008	x		
Johnson et al., 2008	x		
Kallio et al., 2006	x		
Magretta, 2002	x		
Morris et al., 2005	x	x	
Osterwalder et al., 2005a	x		x
Petrovic et al., 2001	x		
Rajala & Westerlund, 2007	x		
Shafer et al., 2005	x	x	x
Timmers, 1998	x		
Torbay et al., 2001	x		x
Venkatraman & Henderson, 1998		x	
Wirtz et al., 2010	x		
Wu & Zhang, 2009			x
Yunus et al., 2010	x		

The three core elements are included in all the following frameworks introduced by various researchers. However, the discussed frameworks go more into detail and break down the core elements observed by Shafer et al. (2005). First the business model canvas is presented which builds the basis for this research. Next, the business model canvas is compared with other frameworks introduced by researchers.

The elements summarized in the business model canvas give an answer to the question of how the value is generated and captured. This is done by paying attention to four pillars, namely product, customer interface, infrastructure management and financial aspects which are summarized in Table 2. The elements are grouped in a similar way to the balanced scorecard introduced by Kaplan and Norton (1992).

Table 2: Nine Business Model building blocks (Osterwalder et al., 2005a)

Pillar	Business Model Block	Description
Product	Value Proposition	Company's products or services
Customer interface	Customer Segment	Target group for which the value proposition is offered
	Distribution Channel	The way the value is delivered
	Customer Relationship	The links between the company and its customers
Infrastructure Management	Key Partners	Network of partners with which the company is operating
	Key Activities	The core competencies the company has to execute in order to deliver the value proposition
	Key Resources	The needed resources to create the value proposition
Financial Aspects	Revenue Stream	Revenue flows with which the company is making money
	Cost Structure	Expenses faced by the company

The first pillar is represented by the value proposition which describes the product the company delivers. The customer interface refers to the external elements such as customer segment, distribution channel and the customer relationship. In contrast the infrastructure management deals with the internal elements, namely key partners, key resources and key activities. The financial aspects are described by the revenue stream and the cost structure.

The canvas developed by Osterwalder et al. (2005a) is in accord with the V^4 ontological structure of the business model constructed by Al-Debei and Avison (2010). The ontological structure includes four dimensions namely value proposition, value architecture, value finance and value network. As shown above the value proposition is the first pillar of the business model canvas. Furthermore, the revenue stream and the cost structure describe the value finance. Moreover, the key partners, the customer relationship, customer segment and the channel illustrate parts of the value network. Finally, the value architecture is partly described by the infrastructure management through the key activities and key resources.

In addition to the V^4 ontological, the business model canvas comprises the five elements of the business model proposed by Teece (2010), namely select technologies and features, benefit to the customer, market segment, revenue streams, and mechanisms to capture value. According to Yunus, Moingeon and Lehmann-Ortega (2010), a business model consists of a product or service, the organization of delivering the value to the customer and the revenue model. The elements of both models are covered by the business model canvas.

The six business model parameters introduced by Chesbrough (2007) consists of value proposition, revenue mechanism, value chain, value network, competitive strategy and target market. Elements such as value proposition, revenue mechanisms and target market are part of the business model canvas. In contrast the value chain is covered indirect by the infrastructure management and the distribution channel. Similar to the value chain the value network is represented by the infrastructure management and customer relationship. Finally, the competitive strategy is reflected in the unique linkages within the business model.

Building upon the reviewed literature, the business model canvas is in line with the current stage of research. This is one reason the representation by Osterwalder et al. (2005a) is selected for this study. The second reason is due to the simplicity of the business model canvas and logically order which helps to start with a common understanding. Following thus, the present study is based on the nine building blocks of the business model canvas.

After having described the static view of the business model, it is important to shed light onto the dynamic view of the business model construct. The most frequently used terms referring to the dynamic view of the business model are business model change, business model innovation and business model evolution.

C. Business Model Dynamics

After having described the static view of the business model the dynamic view, which is essential for the present research, is introduced. The dynamic view includes the interactions within the business model and moreover between the single business model elements. In order to become familiar with the dynamic view the organizational life cycle is introduced first. Next, business model change, business model evolution and business model innovation are presented separately and combined in the last part of this sub-section.

The organizational life cycle and the changing business environment build the foundation of business model change. The business model is forced to changes throughout different stages. Additionaly, the influence of the environment such as technological breakthroughs can also have an impact on the business model. That is why the type of business model change is essential for this study. Business model evolution is essential for start-ups, especially in the first phase.

Nevertheless, an innovative product has no value without a good business model, the value of the innovative product will stay unrevealed until its successful commercialization throughout a valid business model (Chesbrough, 2010). Therefore, innovation is not exclusively crucial for products or processes it is also essential for business models in order to build a sustainable competitive advantage. In a nutshell, besides being a vehicle for innovation, business models can be a subject of innovation (Zott, Amit & Massa, 2011). Consequently, different stakeholders such as investors, strategic partners and entrepreneurs are excited about developing new innovative business models and bring them to market.

1. Organizational Life Cycle

Comparable to other living organisms, a company passes through different development stages (Miller & Friesen, 1984). In contrast, Greiner (1972) referred to the different stages as growth phases which imply a special kind of growth such as growth through creativity, direction, delegation, coordination and collaboration. The life cycle approach emphasizes the systematic individual changes (Kezar, 2001) and states that each organization proceeds through different development stages. Between all the models of organizational change the life cycle model has found more support in research (Kezar, 2001).

Miller and Friesen (1984) introduced the five phase model based on a longitudinal study which showed consistent patterns of development in organizations. The present study makes use of the five phases defined by Miller and Friesen (1984) illustrated in

Figure 1. The five phase model is used to classify the participating companies and simplify the comparison within the cross case analysis.

Figure 1: Organizational life cycle by Miller and Friesen (1984)

According to Lippitt and Schmidt (1967), the birth phase, also known as the entrepreneurial stage, is represented a new company which aims to become a viable entity (Quinn & Cameron, 1983). A company in this stage is usually dominated by the founders, is very simple and has an informal structure (Greiner, 1972).

After establishing the key competences and gaining some product-market success the company moves to the growth phase, also known as the rapid growth stage (Down, 1967) or second stage (Lyden, 1975). Companies in this phase can be distinguished by their emphasis on achieving rapid sales and scaling up. Moreover, the phase is dominated by companies with a functionality-based- structure and a formalized procedure (Greiner, 1972).

The maturity phase is achieved when sales levels stabilize, innovative activities decrease and bureaucracy dominates the organizational structure (Greiner, 1972). Efficiency is one of the main goals during this phase. This phase is also known as stable organization stage (Katz & Kahn, 1978) and maturity stage (Adizes, 1979).

During the phase of revival the companies usually try to diversify their products and expand their product-market scope (Greiner, 1972). The complexity leads to structure governed by divisions with more control systems. The phase is also called coordination stage (Greiner, 1972) or elaboration of structure stage (Scott, 1971).

The death stage is characterized by the stagnation of the market which leads to profitability loss due to reasons of external challenges or lack of innovation (Greiner, 1972). The deceleration Stage (Down, 1967) is another term used for this phase.

2. Business Model Change

Teece (2010) argues that the perfect business model is rarely designed in the early phase of an emerging business. That is why the business model is subject to change throughout the start-up phase. Demil and Lecocq (2010) analyzed the evolution of the business model of the English football club Arsenal FC according to the RCOV-framework (resources, competences, organization, value proposition). According to the authors, the course of an organization is accompanied by continuous and emergent business model changes. According to Shirky (2008) companies are more likely to succeed if they have a flexible business model which allows changes and justification.

Not all changes in the company lead to business model changes (Cavalcante, Kesting & Ulhøi, 2011). Changes which affect the core business model elements are referred to as business model change.

In the following typologies introduced in the literature are discussed. However, the typologies are used to classify business changes in general. After an introduction of the two typologies by Beddowes and Wille (1990) and Peters and Waterman (1982) a typology for business model change is developed.

Beddowes and Wille (1990) summarized different types of changes as shown in Table 3. The authours distinguish between six groups of changes. According to the authours changes can be organizational; concern market led or people issues; technological; entrepreneurial-creative and of economical nature.

Table 3: Typology by Beddowes and Wille (1990)

	Type of change by Beddows and Wille
A.	Organizational - Culture - Structure
B.	Market led issues - Customer market orientation - New products - Reduction to core - Internationalize - Quality emphasis
C.	People issues - Communication/participation - People matters - Reward development - Emphasis on training and development - New work practices - Teams/groups/task forces
D.	Technology - Technology
E.	Entrepreneurial-creative - Innovation - Entrepreneurship
F.	Economics - Cost cutting - Staff reduction - Productivity

Waterman and Peters made use of the McKinsey S7 model introduced by Waterman, Peters and Phillips (1980) and applied it to changes. The typology distinguishes between seven types of changes as shown in Table 4. According to the McKinsey S7 model changes can occur on the level of business strategy. Comparable to the typology of Beddowes and Wille (1990) changes can be of organizational nature namely organizational structure and organizational system. Two more typologies deal with the human resources namely staffing within the organization and skill requirements. In addition, changes can appear in the managerial style and in the shared values.

Table 4: Typology of changes by Waterman, Peters and Phillips (1980)

	Types of change by McKinsey
1.	Business strategy - Core business - Target markets - Shifts in technology
2.	Organizational structure - Restructuring - Relocating - Reorganizing
3.	Organizational system - Bureaucracy - Information technology
4.	Staffing within the organization - Headcount - Individual and group redundancies - Career paths
5.	Skills requirements - Skill demands - Standards of performance - Performance criteria
6.	Managerial style - Work approach - Relationship to employees
7.	Shared values - Organizational culture

The introduced typologies by Beddowes and Wille (1990) and Waterman, Peters and Phillips (1980) are combined in the following and a connection to the elements of the business model canvas is tried to be established. Details are discussed in the following (for a summary see table in appendix section F).

First, the organizational structure includes the infrastructure management (key partners, key resources and key activities) as well as the customer interface (customer segment, customer relationship and distribution channel). In contrast, the organizational system supports the whole business model (Osterwalder et al. 2005) but has no direct connection to single business model elements. Similar to the organizational system the organizational culture has no direct relation to single business model elements.

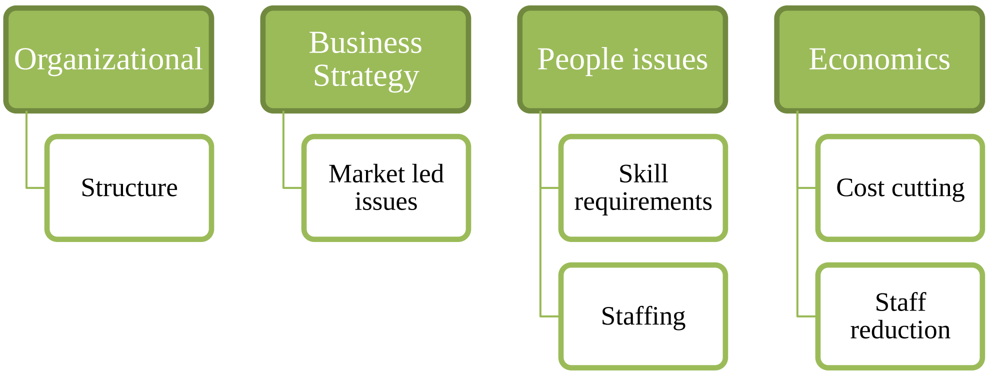
Second, changes within the business strategy have only a direct connection to the business model in terms of market led issues which focus on the value proposition and customer segment. The technology has an indirect link in the case if a change in the technology leads to a change in the value proposition or other elements of the business model. The entrepreneurial-creative type refers more to the outcome of a change in the form of business model innovation.

Third, the economics of the company cover the financial aspects of the business model (revenue stream and cost structure) but have also a connection to the key resources in the case of staff reduction. Last element in this category namely productivity has no direct connection to the business model.

Fourth, people issues deal with staffing within the organization and skill requirements which are linked to key resources. Finally, the managerial style is not expressed in the business model.

According to the change typologies and their relationship to the business model elements only four categories of changes remain for business model change as illustrated in Figure 2. The first category refers to changes in the organizational structure. Next category deals with changes in the business strategy consisting of market led changes such as customer market orientation, new products, internationalize and quality emphasis. The third category deals with people issues involving skill requirements and staffing within the organization. Last category focuses on economics and the associated changes as cost cutting and staff reduction.

Figure 2: Typology for Business Model Change



Terms often used related to business model change are business model innovation and business model evolution. No study could be found which clarifies the difference and clearly defines the terms. In order to understand business model change, business model evolution and business model innovation have to be discussed. In the following, the constructs of business model evolution and business model innovation are introduced. After having understood the underlying logic, both constructs are combined into a framework of business model change.

3. Business Model Evolution

Like the organization itself, the business model goes through changes which are explained below. According to Demil and Lecocq (2010, p. 240), business model evolution “has to be thought of as sequences” which means that the business model “is permanently in a state of transitory disequilibrium”.

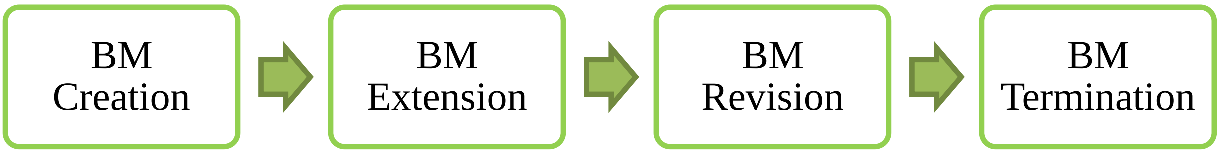
Some start-ups design their business model in the first start-up phase by planning each step beforehand and start running the business afterwards. On the other hand, some companies have no clearly formulated business model and start with their operations without planning. The described approaches are also known as causation and effectuation (Sarasvathy, 2001). Causation focuses on planning, in contrast effectuation is driven by discovery, trial and error, adaptation, adjustment and experimentation.

Irrespective of wether the business model was planned or achieved by experimentation, the business model undergoes changes during its lifetime (Chesbrough & Rosenbloom, 2002). According to Morris, Schindehutte and Allen (2005), a business model life cycle undergoes different periods namely: specification, refinement, adaptation, revision and reformulation illustrated in Figure 3. The transformational aspect is also in line with the concept of continuous morphing introduced by Rindova and Kotha (2001) which says that the changes are profound transformations.

Figure 3: Business model life cycle (Morris et al., 2005)

Next, the concept of business model change developed by Cavalcante, Kesting and Ulhøi (2011) is presented. Although, Cavalcante et al. (2011) refer to the concept in Figure 4 as business model change it is more suitable for businesss model evolution since it starts with a processs of creation and ends with the termination. According to Cavalcante et al. (2011) business model change can be distinguished between business model creation, extension, revision and termination as shown in Figure 4. Within the process of business model creation new processes are created; while during business model extension new process are added without changing the existing business model. In contrast, business model revision focuses on the change of existing processes while business model termination is based on terminating existing processes.

Figure 4: Business model change (Cavalcante et al., 2011)



During the business model evolution a business model can be innovated which is described in detail in the following.

4. Business Model Innovation

According to the Organization for Economic Co-operation and Development (OECD) “innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organization or external relations”[2]. West and Farr (1990) describe innovation in a similar way as an idea, a process, a procedure or a product which is introduced and applied within an organization. This innovation should be at least new to the organizational unit and has to deliver a valid benefit to the organization or to the society. Roper and Love (2004) consider innovation as a process, which is everlasting and evolutionary, based on application and reapplication of already existent and new knowledge. Referring to these descriptions Shipton, West, Dawson, Birdi, and Patterson (2006) divided innovation into two processes. The first stage consists of idea generation and the second of its implementation. Correspondingly, the first phase is focused on exploratory activities and the second phase on exploitative activities. Both kinds of activities are critical for this research.

As described by Schumpeter (1942) innovation is understood as enforcement of new combinations namely production of a new product or a new quality, new processes, opening a new market, new suppliers or new organizational structures. Similar Francis and Bessant (2005) argue that innovation can be targeted in four different ways. Innovation can be

[2] http://www.oecd-ilibrary.org/sites/sti_scoreboard-2009-en/03/08/index.html?contentType=&itemId=/content/chapter/sti_scoreboard-2009-40-en&containerItemId=/content/serial/20725345&accessItemIds=/content/book/sti_scoreboard-2009-en&mimeType=text/html (last visit: 05.02.2012).

achieved by improving or introducing products or processes as well as by defining or re-defining the position of company or its products or paradigms of the firm.

According to Teece (2010) business model innovation is a form of organizational innovation which is characterized by identifying and adopting portfolios with new opportunities. Subsequently, business models can be a vehicle for corporate transformation (Demil & Lecocq, 2010) as well as a subject of innovation (Zott, Amit, & Massa, 2011,). Companies also have the possibility to compete through their business models (Casadesus-Masanell & Ricart 2010; Anthony, 2012).

Yunus, Moingeon and Lehmann-Ortega (2010, p. 310) state that three essential strategic moves assist the progress of business model innovation namely “challenging conventional wisdom, setting up appropriate partnerships and undertaking experimentation”. Throughout the process of experimentation, learning from trial and error is a crucial component for business model innovation (Giovanni & Daniel, 2000; Itami & Nishino 2010; Teece, 2010).

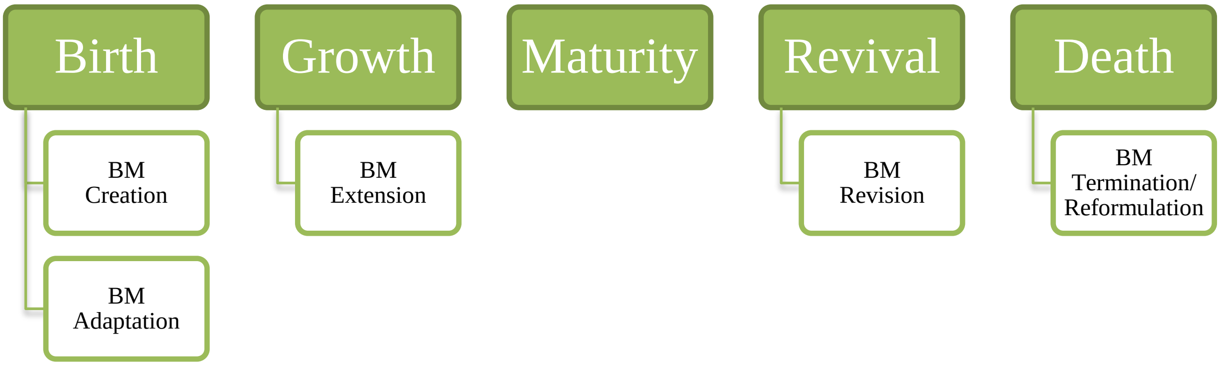
After introducing the concepts of business model change, business model evolution and business model innovation, all concepts are combined into one framework.

5. Combining Business Model Change, Evolution and Innovation

In the following the discussed concepts are combined. First, the business model lifecycle and the organizational life cycle are combined. Second, the three types of dynamics namely business model change, business model evolution and business model innovation are brought together in one framework.

Referring to Andries and Debackere (2007), entrepreneurs should adjust their business model according to the organizational life cycle. Figure 5 combines the organizational life cycle with the business model life cycles and business model change introduced earlier by assigning the business model change types to the associated organizational life cycle stages. As shown in the figure, business model creation and adaptation is associated with the first birth stage. After the business model has been adapted the business starts to growth and is mainly dominated by business model extension. Next, the business arrives at the maturity stage which usually has no significant changes within the business model. The stage of revival is strongly connected to business model revision. Finally, the death stage relates to business model termination or reformulation.

Figure 5: Combining organizational life cycle and business model evolution



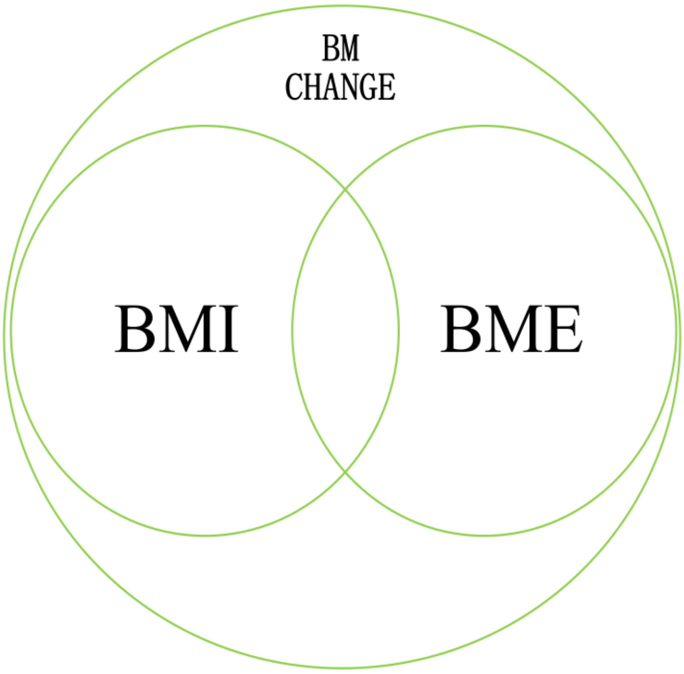
In the following, the business model life cycle introduced by Morris, Schindehutte and Allen (2005) and the business model change approach by Cavalcante, Kesting and Ulhøi (2011) are combined. Specification and refinement are part of the business model creation process. After a successful adaptation of the created business model the business model is extended. Next, the business model is revised and at the end of the business model life cycle the business model is reformulated or terminated. The present research focuses on the first two stages namely the birth stage including business model creation and adaptation and the second stage of growth with business model extension.

Not all changes in the company lead to business model changes (Cavalcante, Kesting & Ulhøi, 2011). Moreover, changes which affect the core business model elements are referred to business model change. However, not all business model changes can be called business model innovations and not all changes belong to business model evolution. To clarify the difference, first the terms are defined followed by an explanation of how the terms are separated.

Business model change (BMC) refers to changes which affect the core business model elements. Business model evolution (BME) is a gradual, progressive change or development of the business model. Consequently, business model evolution is more of a process whereas business model change represents the difference between two states of a business model. Business model innovation (BMI) is an organizational innovation which is based on an element which is new to a particular business model. Therefore, changes in the business model can belong to simple business model changes, to business model innovations or to subjects of business model evolution.

Figure 6[3] shows the interdependence between business model innovation, business model change and business model evolution. As presented in the figure BMI and BME are part of BMC. Besides simple changes a business model change can be also a business model innovation or business model evolution. The portion between BMI and BME includes changes which are subject to business model evolution but represent an innovation for the business model.

Figure 6: Framework for business model dynamics



Although, the dynamic view of business models is noticed by researchers, there is still no clear theoretical grounding. To gain a deeper understanding of the dynamics it is essential to investigate the reasons for changes in the business model. Therefore, the next sub-section sheds light on the reasons for changes which were identified by the current literature.

D. Reasons for the Change - “why”

Apart from the focus on what and how to change it is essential to understand why to change. According to Bedowers and Wille (2007), companies experience a variety of triggers and implement different changes.

[3] The figure is an illustration of the relationships and is not used to present the ratio.

In order to come closer to the reasons for changes in the business model, Svejenova, Planellas and Viveson (2010) identified the triggers “why” and the mechanisms “how” business model transformation takes place in an individual business model. The main trigger of dynamics recognized is the quest for creative freedom. Above that, three other specific triggers drove the innovation forward namely “the quests for authenticity, recognition and influence” (Svejenova et al. 2010, p. 408). These triggers are connected to an individual business model and therefore they cannot be applied for general business models.

Based on a literature review on triggers Schindehutte, Morris and Kuratko (2000, p. 23) grouped the found elements into five key dimensions as shown in Figure 7.

Figure 7: Key dimensions of triggers by Schindehutte et al. (2000)

Changes within a business model can be of intended and emergent nature as a response of internal and external factors comparable to strategy (Mintzberg, 1978; Mintzberg & Waters, 1985). According to Demil and Lecocq (2010, p. 1), a firm’s sustainability depends on “anticipating and reacting to sequences of voluntary and emerging change”. Similarly, Al-Debei and Avison (2010) argue that not only do internal variables shape the design of the business model, it is also influenced by external factors. The external variables include elements such as the political and economical situation, social issues, the technological advances, the environment and legal situation also known as the PESTEL analysis of the macro-environment (Gillespie, 2007). In a similar way Romanelli and Tushman (1985) argue that changes within companies are triggered by technology, substitute products, dominant design or by events in the legal or social environment. Concluding, the source dimension fiends a great support in the literature.

The dimension of strategic force can also be found in the arguments of Johnson et al. (2008) as well as Zahra (1991). As mentioned in the paragraph about reasons for engaging in business model innovation, existing solutions can be too complicated or too expensive (Johnson et al., 2008). Consequently, this could be a reason to rethink a business model. More influencing factors were identified by Zahra (1991) differentiating between hostility (threats through competition), dynamism (instability of the market the company is in) and heterogeneity (market development which leads to new demands).

A market link is established by Phillips and Brice (1988) throughout the argument that an entrepreneurial action can come from being pushed to act entrepreneurial because of job dissatisfaction or being pulled into entrepreneurship because of a discovered opportunity.

In the dimension of management hierarchy Schindehutte et al. (2000) differentiate between entrepreneurial activities based on a management decision (top-down) or activities brought up from the employees (bottom-up).

Finally, Schinduhutte et al. (2003) distinguish between deliberate searches and searches by chance. This typology is closely linked to the effectuation and causational approach introduced by Sarasvathy (2001). Hereby, the deliberate search is associated with the causation and in contrast the search by chance is connected to the effectuation approach.

However, the typology developed by Schindehutte et al. (2000) helps in classifying the triggers but not in naming the reasons for business model changes.

Referring to Beddowes and Wille (1990), issues that trigger change are financial loses, increased competition, industry in recession, new chief executive officer, proactivity (opportunities or threats), technological development and staff utilization. All these reasons can be classified at least into one type introduced by Schindehutte et al. (2000). Financial loses, staff utilization and a new chief executive officer are internal triggers. Apart from that, an increased competition is also a push factor in the market link dimension. Competition, technological development and industry dynamics represent external reasons.

Since the typology introduced by Schindehutte et al. (2000) derived from changes in general, the typology has to be investigated for business model elements separately. However, little is known regarding the types of triggering events that result in business model change.

As shown in this sub-section, there is still need for more research in order to come closer to a theory. Consequently this research is conducted to bring more insights into this research field. The next sub-section introduces the conceptual framework of the present research.

E. Conceptual Framework

This study contributes to the current research by shedding light on the triggers of business model change in start-ups. Building upon the literature review and the cases summarized in figure 6, a theoretical framework has been developed. According to Whetten (1989), the structure of the conceptual framework is best described by selecting the relevant constructs and their relations, which can be simple or very complex.

Figure 8: Conceptual framework

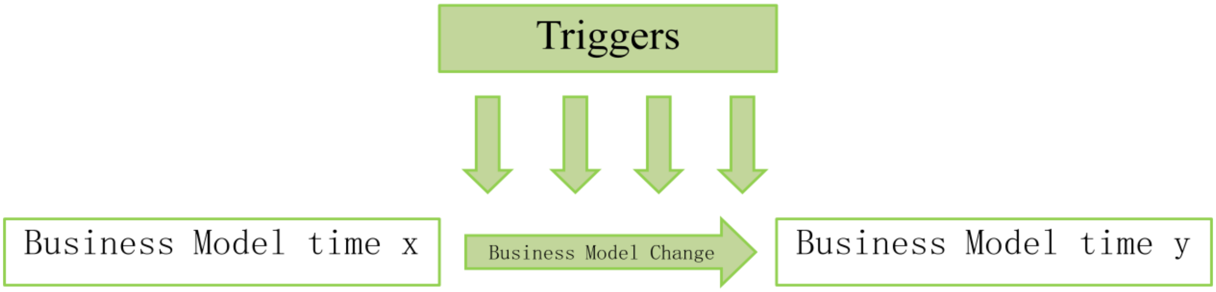


Figure 9: Conceptual framework

As shown in Figure 9, the study observes the triggers which cause changes in the business model at time x and lead to a new version of the business model in time y. The endogenous construct in this study is the business model at time y which is the dependent variable. The independent variable is represented by the business model at time x. Following, the conceptual framework assumes that business model change including business model evolution and business model innovation is caused by triggers. The present research observes the exact reasons and sheds light on the conceptually important question of the structure of the relationships. In accordance with that, the study could also make predictions about the most significant factors which cause business model change.

After the literature has been reviewed and the conceptual framework presented, the next section introduces the methods which form the basis of the study.

IV. Methodology

In order to answer the research question an explanatory study, using a qualitative research design, is carried out. The main purpose of the present research is to gather detailed information about the phenomena of business model change and the reasons for the upcoming changes.

After the description of the research design, the sampling approach is introduced. Next, the research methodology and the research procedure are presented. Subsequently, data coding and analysis are delineated.

A. Instrumentation

The research is qualitative and based on a case study design which is best suited for exploring new research areas (Eisenhardt, 1989), to answer "how" and "why" questions (Yin, 2003) and explain causal relationships (De Vans, 2001). According to Siggelkow (2007) a case study is a persuasive way to describe causal relationships in order to come closer to a construct. Furthermore, a case study considers the context by which a phenomenon is influenced (Baxter & Jack, 2008). As described by Freagin, Orum and Sjoberg (1991) case studies are suited for research aiming to gain deep insights leading beyond statistical results. In contrast to theory testing, case studies explore unknown phenomena in order to build a basis for future research (Saunders, Lewis & Thornhill, 2009).

According to Handfield and Melnyk (1998) territory exploration by asking questions about key issues, what is there and what is happening can be conducted by in-depth case studies and unfocused, longitudinal case studies. The data is collected throughout observation interviews and documents to get an insight and categorize. According to Voss, Tsikriktsis and Frohlich (2002) case study research design is best suited for in-depth field studies as well as focused, multi-side and best-in-case studies when asking similar questions mentioned above and extend by the identification of linkages and "why" behind the relationships. However, case studies are also very important for theory building and testing.

Following Yin (2003) a case study is suited when (a) why and how questions guide the study; (b) the behavior of participants cannot be manipulated; (c) contextual conditions are important to cover; (d) there are no clear boundaries between the phenomenon and the context. The present research is in line with the requirements by fulfilling all the conditions stated by Yin (2003).

In order to be able to explain differences and similarities within and between cases a multiple-case study is carried out. Consequently the case study is instrumental to understand a particular situation (Stake, 1995), namely business model change and the associated changes. Following, this research design allows the analysis of individual settings as well as across settings. However, the research design has its own weaknesses and strengths which are described below.

The complexity and the value of rich data allowed the researcher to theory building by capturing everything (Eisenhardt, 1989). Consequently, there is a risk of data overload (Baxter & Jack, 2008), which could lead to a lack of simplicity. In line with the mentioned arguments it can be said that case study research is very time consuming (Handfield & Melnyk, 1998).

Another weakness can be seen in construct validity and the potential subjectivity. Both can be overcome by using multiple sources of data collection, reviewing by key informants of the case study report and originating a chain of evidence (Yin, 2003).

One strength of case study research is that throughout juxtaposition of paradoxical and contradictory evidence it is more likely that creative insights arise (Cameron & Quinn, 1988). Moreover, case study research enriches the researcher herself throughout gaining insights from practicing entrepreneurs and conducting research based on a real problem.

In short, the study is more theory generating rather than theory testing, thus it is more conceptual than empirical. The next sub-section introduces the unit of analysis which is used for the present research.

B. Unit of Analysis

As already indicated by the interoperability function, a business model can be used at different levels such as inter-company or intra-company. The literature presents three levels of analysis. The first level is a business network consisting of many organizations (Gordijn et al., 2001; Torbay et al., 2001). The second unit of analysis is the individual organization (Venkatraman & Henderson, 1998; Linder & Cantrell, 2000). Finally, the business model construct can be used to analyze single organizational units (Timmers, 1998).

The present paper aims to contribute to the scientific research using the business models function of analyzing with the purpose of understanding the reasons for changes in business models. Using the business model canvas the study looks at the individual organization as the unit of analysis by studying multiple cases.

The analysis on the individual level of the organization is performed based on two characteristics of the business model. As stated by Demil and Lecocq (2010), a business model can be seen as a blueprint (Haaker & Bouwman, 2006) in the static approach and as a conceptual tool (Campanovo & Pigneur, 2003; Morgan & Baden-Fuller, 2010) in the transformational approach. The static approach provides a picture of components and their arrangement. In contrast, the dynamic view also referred to as the transformational approach deals with changes and the dynamics of a business model as well as with its relationships. The present study makes use of both approaches by taking the business model as a blueprint and analyzing the changes and their reasons from the dynamic point of view.

After defining the unit of analysis, the sampling approach is addressed.

C. Sampling Approach

The sampling of interview partners is done in a qualitative non-probability style. Through purposive sampling (Patton, 1990), companies are identified and approached. These companies are selected according to pre-defined characteristics.

Business model changes are mostly observed in new companies because of the flexibility and the associated dynamics in the business model, which is why this group is approached for the present research. In order to control environmental variation one specific market is selected in order to observe companies with similar characteristics and comparable conditions. Many studies on business models focus on e-businesses, but the emerging field of clean technology is not yet observed. This evolving industry is taken as a sample for this study due to the large number of start-up activities in the recent time. Furthermore, the chosen industry is well suited for the topic of business model change since the companies have to introduce very expensive technologies throughout innovative business models. In this way business model change holds opportunities for unlocking the potential of clean energy and technology.

According to the Cleantech Group clean tech is not a single industry; rather it stretches across different industries defined by thirteen segments (Cleantech Group)[4] such as agriculture, smart grid, materials and others. The Cleantech Group offers a definition, namely "Cleantech represents a diverse range of products, services, and processes, all intended to:

- Provide superior performance at lower costs, while
- Greatly reducing or eliminating negative ecological impact, at the same time as
- Improving the productive and responsible use of natural resources"[5]

Another definition provided by Pernick and Wilder (2007) describes clean tech as consisting of different products and services from a wide range of industries, which have to fulfill five criteria. The requirements defined by the Cleantech Group are extended by the criterion of creation of quality jobs. Finally, clean tech is guided by its diversity, but it is also unified by its idea of climate mitigation and adaptation and especially by being beneficial for the environment (Lane, 2011). Since the requirements of both definitions are overlapping, the three elements defined by the Cleantech Group are used for this study.

The focus on start-ups sets a limit on size and age of the companies. The companies should not exceed a size of 100 employees and not extend the age of ten years. However, companies from different stages are selected in order to have some comparable elements.

Finally, the following criteria are defined for the purposive sampling approach:

- Technology oriented
- Belonging to one of the 13 categories defined by Cleantech Group
- Superior performance at lower costs
- Greatly reducing or eliminating negative ecological impact
- Improving the productive and responsible use of natural resources
- Fewer than 100 employees

[4] http://www.cleantech.com/about-cleantech-group/what-is-cleantech/ (last visit: 15.09.2012).
[5] http://www.cleantech.com/about-cleantech-group/what-is-cleantech/ (last visit: 15.09.2012).

- Not older than ten years

Companies fulfilling the defined requirements were approached by attending the EcoSummit 2012, a clean tech start up conference in Berlin. Additionally, the attendance at the Journey 2012 of Climate Kic helped to identify further research participants. Moreover, the listed companies in the Cleantech Atlas and the 100 top companies of 2010, 2011 and 2012 listed by the Clean Tech World were analyzed and addressed.

The final sample consists of seven clean tech start-ups as defined in the sampling approach, excluding the pilot. The last one is used to discuss the relevance of the study and to conduct a follow-up interview in order to analyze the results. Table 5 shows the overview of the participating companies.

Table 5: Participating companies

Case	Name	Industry	Foundation	Interview Partners
1.	A	Sensoring	2010	
2.	B	Hydropower	2010	
3.	C	Automotive	2007	
4.	D	Mobile Metering	2008	
5.	E	Wastewater	2008	
6.	F	Solar Energy	2003	
7.	G	Electricity	2009	

D. Methods of Data Collection

In order to achieve triangulation and validation of the theoretical constructs various sources of data collection are of essential interest for qualitative research (Saunders et al., 2009). The proposed research aims to build upon different data sources in order to achieve credibility. In consideration of achieving a better understanding of the company, its products, the stage in the organizational life cycle and in particular the changes in the business model, the publicly available material is analyzed first. Starting point for data collection is the webpage of the company. Next, the publicly available material is collected through an online search with the help of a search engine machine (see Appendix section F). In addition, the press links on the webpages of the companies are viewed. The information is used to evaluate the stage in the organizational life cycle and to gain a deep understanding of the business model and the associated changes.

Second, semi-standardized interviews are conducted with entrepreneurs. The interviews serve to gain more detailed insights into the specific fields, capture subjective impressions, personal interpretations and clarify information previously collected and adopted from literature. Subsequently, a close collaboration between the researcher and the participant is needed. The questions for the interview are developed beforehand and encompass different types of questions, such as introducing questions, direct questions and specifying questions (Kvale, 1996). The interview starts with finding out what an entrepreneur understands under a business model, followed by a description of the research with its specific goals (see appendix section F). Mainly open questions are used throughout the interviews. Direct questions are used to gain information about particular changes. Specifying questions are used spontaneously according to the information provided and in order to talk more detail about specific examples. The aim is to conduct interviews of high quality with spontaneous and relevant answers by the interviewees (Kvale, 1996).

After the introducing question the interviewee is asked to provide information about every block of the business model canvas shown in Figure 10. In doing so, the first question aims to get information about the state of every single element at the beginning of the start-up. Next, the interviewee is asked to explain how and why every single element changed over time. This is interesting to gain information about the reasons for the change and how the company dealt with it. Finally, the interviewee is asked if the change influenced some of the other blocks presented in the business model canvas.

Figure 10: Business model canvas (Osterwalder et al., 2005a)

<table>
<tr><td rowspan="2">Key Partners</td><td>Key Activities</td><td rowspan="2" colspan="2">Value Proposition</td><td>Customer Relationship</td><td rowspan="2">Customer Segments</td></tr>
<tr><td>Key Resources</td><td>Distribution Channel</td></tr>
<tr><td colspan="3">Cost Structure</td><td colspan="3">Revenue Stream</td></tr>
</table>

Figure 11: Legend for figure 10

	Product		Infrastructure Management		Customer Interface		Financial Aspects

Before the large scale investigation, an exploratory study based on an interview (pilot) is conducted. The pilot study is undertaken in order to get first insights on the investigated topic from a practical point of view, gain experience on case study research, test the developed interview guideline and improve the personal interviewing skills. Regarding the structure the pilot has pointed out that many questions are to general and not focused enough to bring the research forward and answer the research question. Following this, the general questions were replaced by more focused questions asking for details and examples. The pilot revealed that the interviewee is interested in clear definitions for setting up a common understanding of the issues discussed.

Referring to the content, the pilot has shown that there are many changes within the business model caused by feedback from customers. Furthermore, the pilot disclosed the fact that financial scarcity led to creative ideas for generating new revenue streams. The pilot study helped to improve the structure of the interview guideline. Moreover, the pilot assisted in providing first insights by testing the relevance and fit of the theoretical model.

In a nutshell, the interviews are opened with a short introduction, explaining the background and purpose of the interview and research report. The series of questions address the following issues: (1) “what” was subject to change and (2) “why” was it subject to change (reasons). Data gained throughout the interview is analyzed according to the methods described in the next sub-section.

E. Data Analysis

To aggregate the information gathered throughout the interviews the interviews are transcribed and the data is coded according to the coding procedure proposed by Cobin and Strauss (2008). The transcription of interviews is done in parallel with conducting subsequent interviews; and insights gained on the quality are incorporated into the interview guideline for the following interviews. In order to conduct within case analysis a simple description of the cases is prepared. These descriptions are used to cope with the massive volume of data (Gersick, 1988) and to become closely familiar with each case (Eisenhardt, 1989). Before starting the coding abbreviations for code categories are introduced: “R” is used for reasons and “E1” is used for the changing element in the beginning and “E2” for the element at the end.

First, open coding is used in order to identify important words or groups of words in the data. Afterwards, the important words or groups are consequently labeled (Birks & Mills, 2011). Referring to Corbin and Strauss (1990, p. 423) the procedure is described as “the interpretive process by which data are broken down analytically”. In this way the meaning is directly derived from the data. Subsequently, the resulting multitude of code labels is compared and merged to broader, related categories (Saunders, Lewis & Thornhill, 2009). By pushing aside standard ways of thinking about phenomena reflected in the data, the researcher gains new insights.

Second, axial coding is used in consideration of finding relationships and identifying patterns, themes and processes that would account for the frequency, strength, and presence or absence of any category. According to Corbin and Strauss (1990, p. 96) axial coding is defined as “a set of procedures whereby data are put together in new ways after open coding, by making connections between categories”.

Third, selective coding is used to integrate categories and produce consequential theory. One or many central core categories are identified to which the other categories are related (Saunders et al., 2009).

All steps of the process include the constant comparative method, which is on-going throughout the whole project. Coding is not a successive process but more an irregular circular flow, where the collected data is constantly compared with the already categorized data with parts of the theory fully developed and saturated and others still fragmented and incomplete. The within case analysis includes exclusively the information from each single case. In contrast, the cross case analysis contains information from all the cases. A detailed description of the procedure is presented in the following sub-section.

F. Procedure

After the research question is defined, the participants are selected and the publicly available material is analyzed. Next, interviews are scheduled with the interviewees. Participation is voluntary and the confidentiality of responses is assured. In total seven qualitative interviews are conducted. The data collection overlaps the data analysis. In doing so, field notes are taken to remember important impressions. The data obtained is analyzed in two ways. Alongside the individual within-case analysis by identifying patterns in each case, a cross-case analysis is conducted by identifying generalized patterns across cases (Eisenhardt & Graebner, 2007). Next, the data found is compared with existent literature. In this way the validity is increased.

Finally, the interviewees are asked to add or comment on issues which have not been addressed yet. Thereafter, the interviews will be transcribed. The second step includes the data analysis through coding and searching for cross-case patterns. Furthermore, the results are compared to existing literature. In the third step, the research is concluded by providing practical implications for propositions.

The methodology presented is used in the next section in order to analyze the case studies. After the within case analysis a cross case analysis is used to identify patterns across cases.

V. Results

Section 5 presents the examination of the data and illustrates the results of the within-case analysis in the first part. The second part deals with the results of the cross-case analysis. Subsequently, the main findings are highlighted in both parts.

A. Within Case Analysis

Every within-case analysis starts by summarizing the main facts about the discussed company, followed by a case description. Descriptions are used to cope with the massive volume of data (Gersick, 1988) and to become closely familiar with each case (Eisenhardt, 1989). The within case analysis includes exclusively the information from each single case.

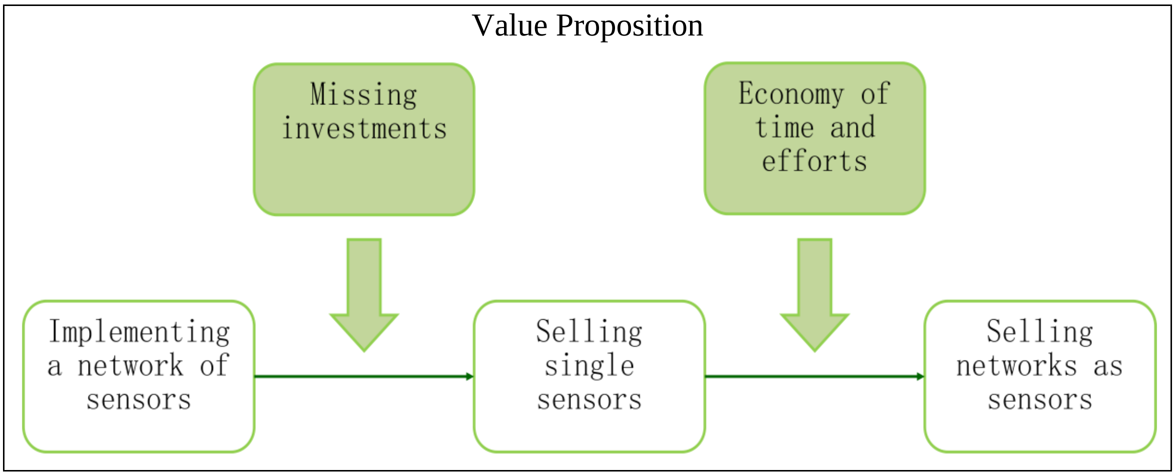
1. A Systems

	A
Short description	A is a start-up firm from Israel which develops low-cost air pollution monitoring units and a proprietary information analyzing on-line platform. This multi-sensory monitoring unit incorporates the most advanced Nano-Tech sensors technology and is used to measure levels of, noise, relative humidity, temperature and levels pollution caused by transportation. In contrast to its competitors A offers a full service package, providing the sensor itself, the on-line platform and the immediate alerts, for a competitive price. The mission of A is to turn air quality information into a commodity. Certified partners help to fulfill this mission. The Global Certified Partners Program supports the local presence of A, harnessing air quality information for the broader public, affecting public discussions, and influencing industrial and government policies regarding air pollution.
Year of establishment	2010
Founders	
Management	
Contact	
Phase	Birth

A introduced an innovation within the civilian enforcement by following the social change and answering it by technological innovation. In this way the company used the possibilities of internet for environmental monitoring.

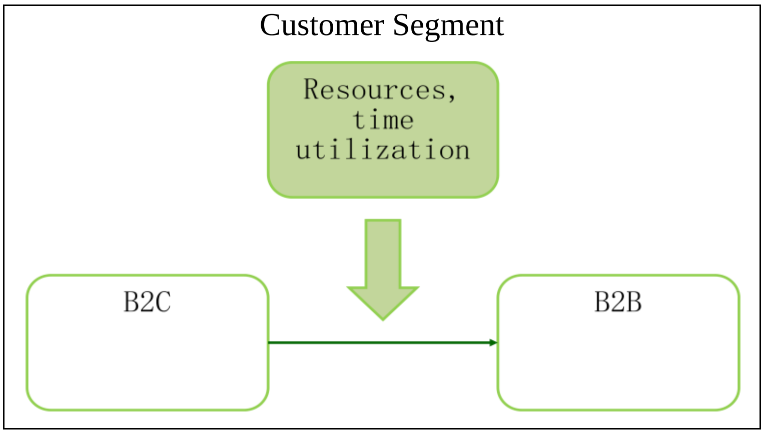
A was able to reduce the production costs and gain a competitive advantage by price reduction. Based on this competitive advantage A started with the idea of implementing their own network of sensors. Due to missing funding and following a lack of investments the company had to take one step back and move to another approach by selling single sensors. However, since selling single sensors is a highly time consuming process and demands great efforts, a further switch was undertaken by moving to selling networks of sensors with an on-line platform and immediate alerts. According to the new approach A is looking for organizations that are able to raise money and buy the networks from A. This shift in the value proposition is justified in the reaction to the investors and the market itself. Figure 12 summarizes the switches in the value proposition the company undertook.

Figure 12: Change in value proposition (A)



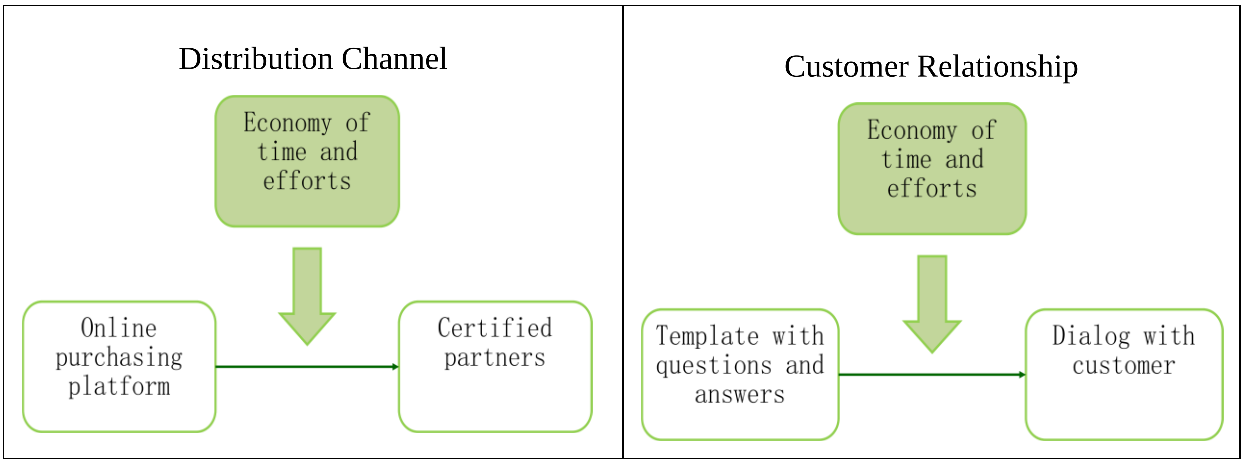
In accordance with the switch to selling networks a different customer segment was addressed. Following this, another change was essential - namely the shift from a business to customers (B2C) market to a business to business (B2B) market. The same reasons such as availability of resources and funding caused the switch in the customer segment and forced the company to move to an effective time utilization procedure. The B2B market was approached by setting up a global network of certified partners in order to "recruit resources without having to increase expenses" (Interview A, p. XXXIII). The shift in the customer segment is summarized in Figure 13.

Figure 13: Change in customer segment (A)



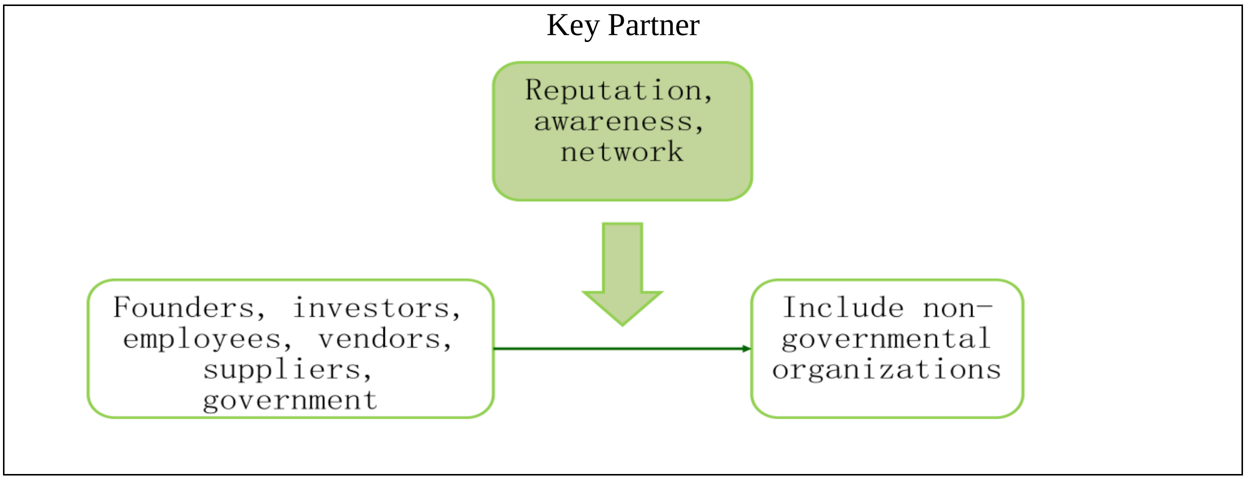
Correspondingly, the distribution channel was swapped from an online purchasing platform to a more direct approach with certified partners in order to save time and effort as shown on the left hand side of Figure 14. The same reasons are associated with the switch in the customer relationship as illustrated on the right hand side of Figure 14. The initial idea had to be redrafted from a template with questions and answers without deep conversations to a more complicated relationship based on a dialog with customers who are specialists in this particular area. The changes in the distribution channel as well as in the customer relationship are presented in the next figure.

Figure 14: Change in distribution channel and customer relationship (A)



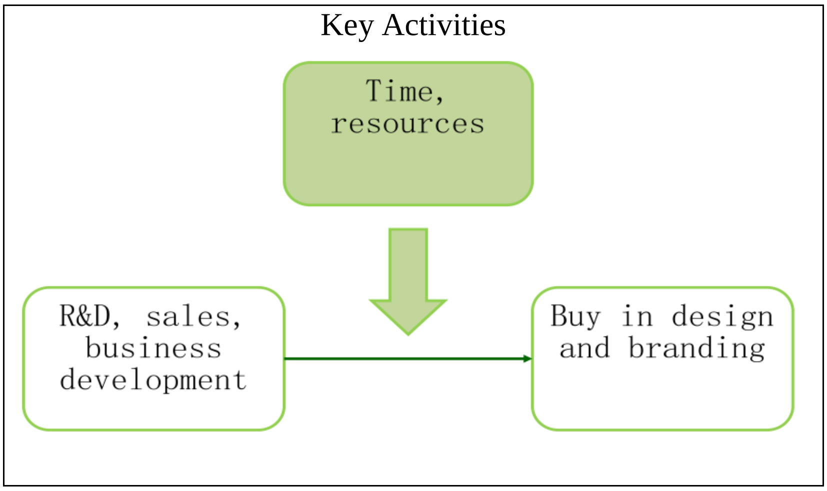
Concerning the infrastructure management A enlarged its network of partners from investors, government, founders, employees, vendors and suppliers to include partners such as non-governmental organizations in order to get more reputation and create awareness in conjunction with raising funds and enlarging its network. A representation of the development in the key partner block can be found in the following figure (Figure 15).

Figure 15: Change in key partner (A)



In contrast, key activities remained the same, focusing mostly on scientific and technology oriented tasks and activities like marketing, putting up sales, organizational build up and raising investments. Other activities such as design and branding were bought into the company as the business was progressing and the resources became available. The company was mainly focusing on activities which were essential in order to survive. In doing so, activities were prioritized and some of them were postponed if possible. The enlargement of activities the company had to buy in is shown in Figure 16.

Figure 16: Change in key activities (A)



An additional switch which the company made in refers to the financial aspects and in particular the revenue stream as shown in Figure 17. Due to missing investments A was forced to increase the initial price of the product from 500 USD to 800 USD in order to compensate the lack of financial resources. The following figure illustrates the switch in the revenue stream.

Figure 17: Change in revenue stream (A)

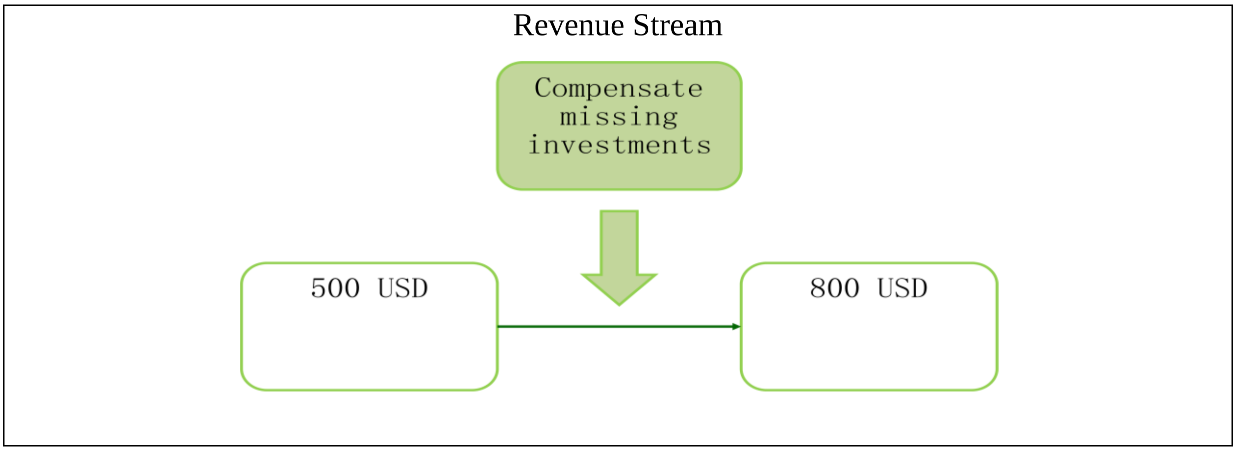
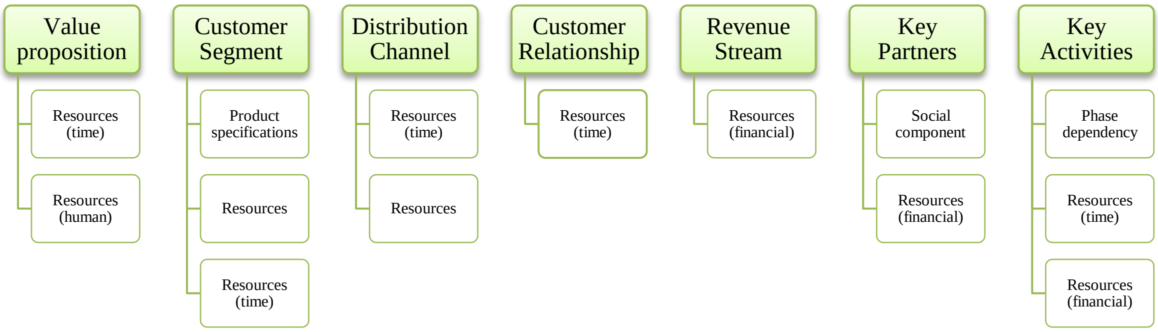


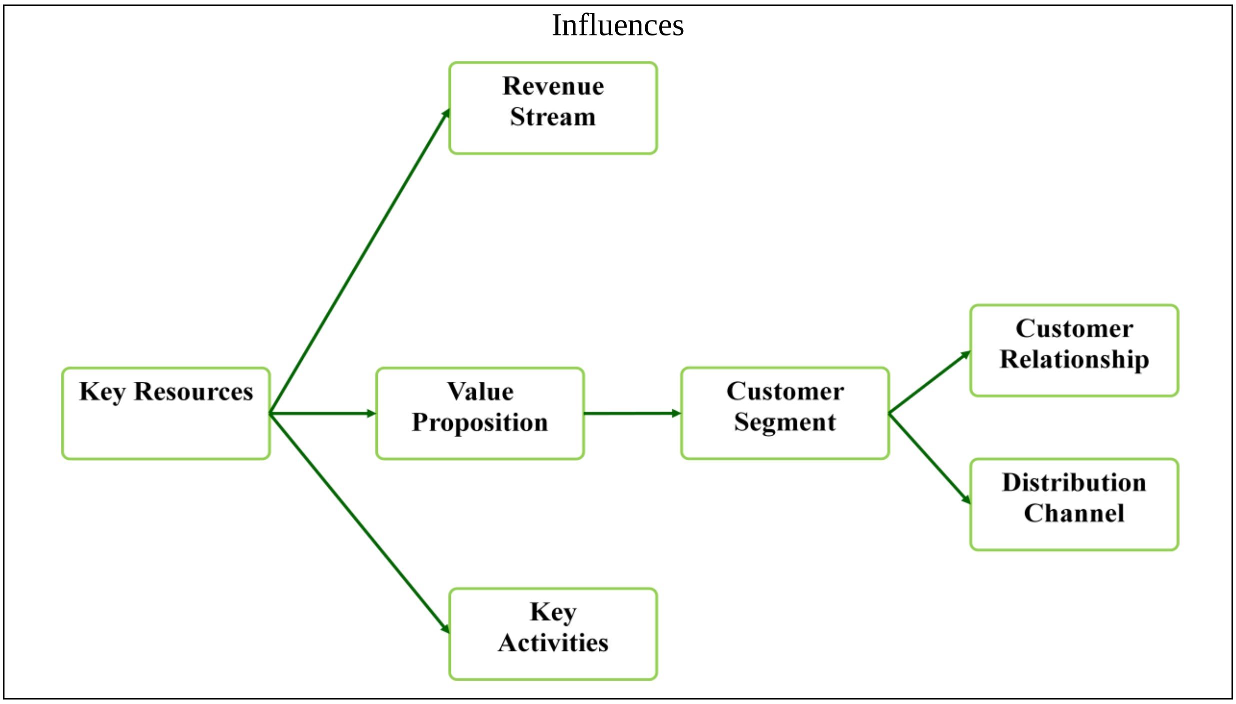
Figure 18 summarizes all the coded reasons for the switch in each block which were mentioned by the entrepreneur. As illustrated in the figure resources are responsible for the changes in all business model elements which were subject to change. Nevertheless, there are three other reasons reported namely product specifications, phase dependency and the social component which also played an important role for changes in customer segment, key partners and key activities.

Figure 18: Reasons in the case of A



The analysis of the case shows that some business model elements have an impact on other business model elements. As illustrated by Figure 19 key resources played a vital role and herby influenced the revenue stream, key activities and value proposition. As mentioned by the entrepreneur "you make decisions that are based on the resources that are available to you" (Interview A, p. XXXIV). As reported the company had to change their value proposition and to increase the selling price because of not available resources. After resources were available to the company, A bought in some activities. The new value proposition had itself an impact on the customer segment. Thus the switch from selling single sensors to selling networks addressed totally new customers. Subsequently, the customer segment influenced the customer relationship and distribution channel since both had to be adjusted to the new target group.

Figure 19: Influences of business model elements amongst each other (A)



In the case of A seven out of nine elements of the business model were subject to change. To conclude, the present case highlights the importance of key resources. Key resources in this particular example have an influence on value proposition, customer relationship, distribution channel, customer segment and revenue stream.

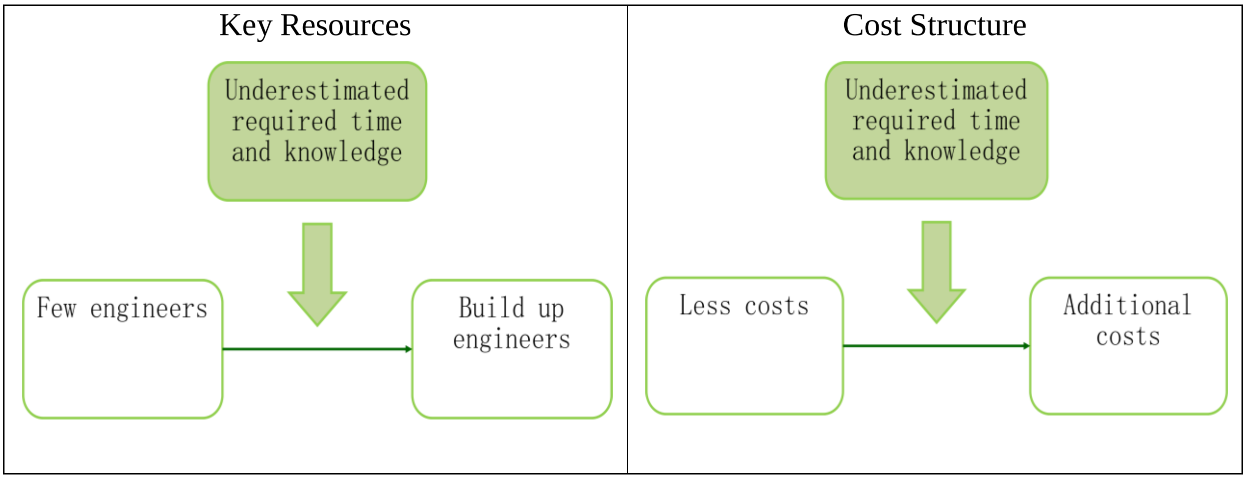
2. B

	B
Short description	B is a company located in Germany and is run by an international team. The main focus of this company lies in affordable and sustainable energy solutions by developing and implementing hydro electric power generation using kinetic power only. Therefore, the company is focusing on generation and all associated requirements such as battery banks or additional demand systems for instance water purification units. The heart of the generation system is the 5KW water turbine which is designed to match the environment. The turbine does not block any flows of the river and can be installed in many different ways to adjust for varying flow conditions. The targeted customer segments of B are: Decentralized Electrification, single users and agricultural users.
Year of establishment	2010
Founders	
Management	
Contact	
Phase	Birth

With its hydro electric power generation system B (B) offers an innovative solution for sustainable energy.

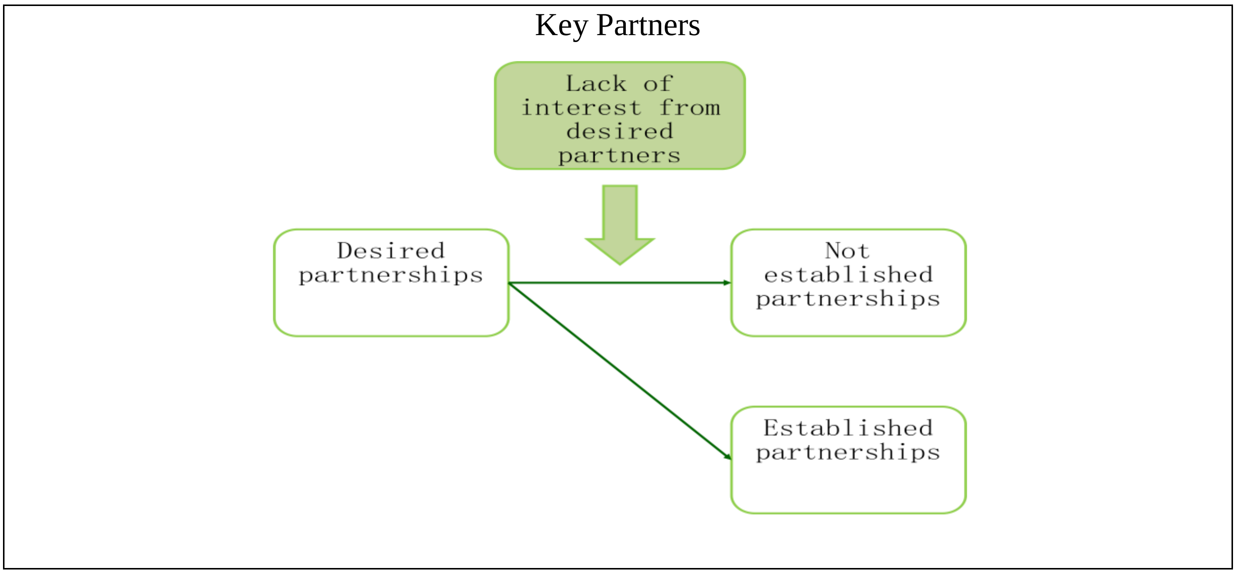
One of the main challenges B had to face was the need to build up more engineering staff. This was necessary because the time an engineer needs to complete a task was underestimated. Furthermore, the level of general knowledge required about the electrical system was underestimated. This is closely linked to the adoption of the cost structure since the company had to pay more for engineering services; this is why B was forced to adapt the budget for personal expenses. The changes in key resources and cost structure are illustrated in Figure 20.

Figure 20: Change in key resources and cost structure (B)



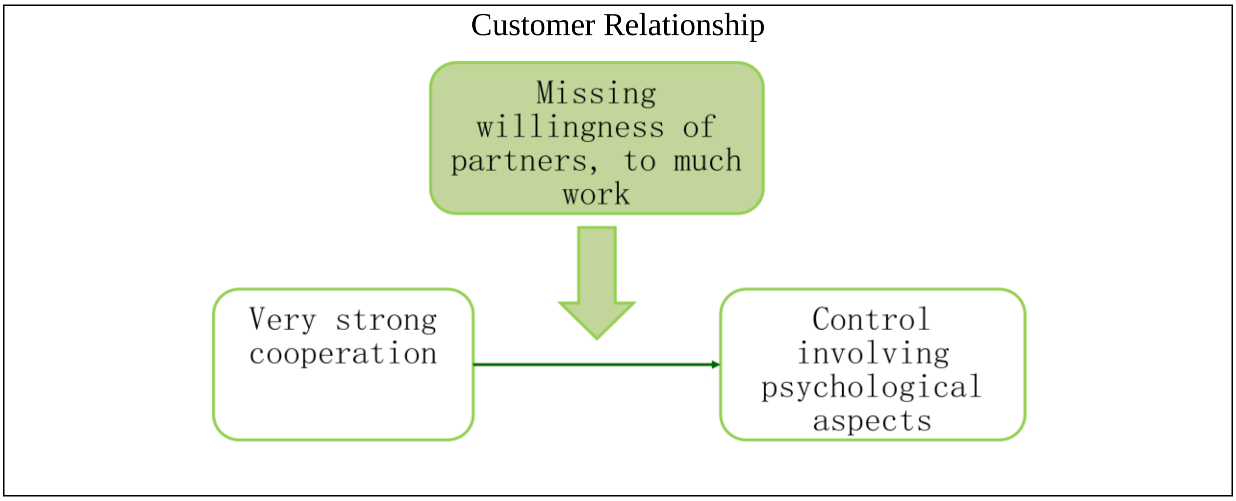
As all other start-ups B had no key partners at the beginning. In the time of enlarging the network, specific potential key partners were identified in order to get better reputation. However, not all desired partnerships could be established due to a lack of interest in future relationships from the other side. The following figure (Figure 21) presents the development with key partners.

Figure 21: Change in key partners (B)



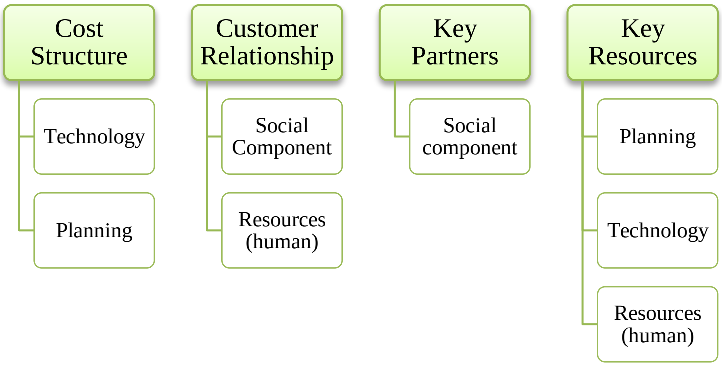
A further element which was subject to modification is the customer relationship (see Figure 22). B first envisioned some kind of a supervisory board with their customers. Following this, a share in the company or at least a very strong cooperation was the aim. After a certain time the company found that there was too much work for its six employees and switched to an approach with more control involving psychological aspects of the cooperation. Another reason for the shift to a different approach was that the entrepreneur overestimated the willingness of potential partners to receive help and information in their product.

Figure 22: Change in customer relationship (B)



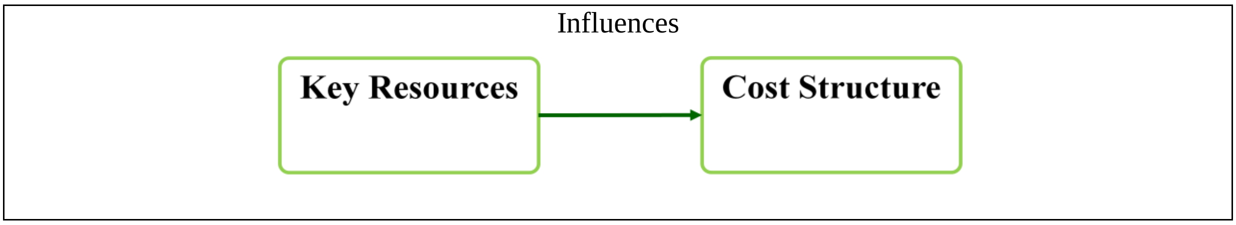
According to the entrepreneur, blocks such as the value proposition, distribution channel, customer segment, key activities and the revenue stream did not change because all these issues were carefully planned at the beginning. Since the company is still in the birth phase further changes might be faced in the future.Figure 23 illustrates the coded reasons responsible for the switch in each block. As reported by the entrepreneur technology and the component of planning caused changes in the cost structure. In combination with the social component human resources triggered a shift in the customer relationship. In addition, the social component played a vital role in the change of key partners. Lastly, the shift of key resources has its origins in planning, technology and human resources.

Figure 23: Reasons in the case of B



Furthermore, an analysis of the influences behind the changes of the business model shows that the key resources had an impact of the cost structure presented in Figure 24. As mentioned by the entrepreneur the company is "paying more today for engineering services" since the costs were underestimated (Interview B, XLIII). Following a change in the key resources led to changes in the cost structure.

Figure 24: Influences of business model elements amongst each other (B)



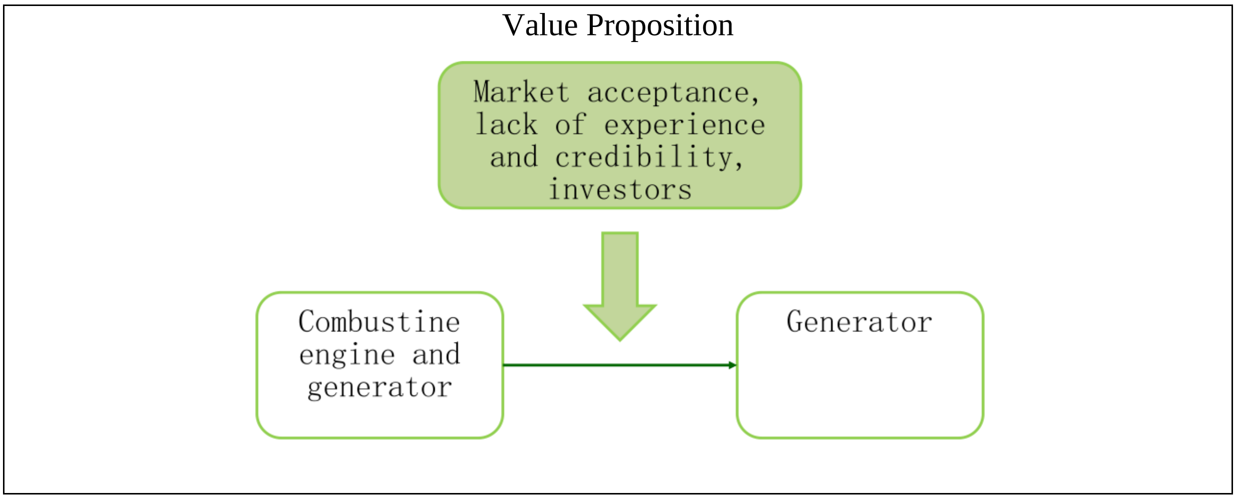
To conclude, four elements of the business model were subject to change in the case of the analyzed company. B represents one of the companies who plan in advance and hereby follow the causation approach.

3. C

	C
Short description	C's main goal is to develop and manufacture advanced electric motors, electric generators and integrated systems for any type of transportation and other mobile power applications. The differentiation from other companies is based in the offer of efficient and light weight alternative machines based on an innovative Axial Flux technology. Hereby, C promises to deliver durability, efficiency and high performance. The products offered by C are electric motors, electric generators, engineering services and custom products.
Year of establishment	2007
Founders	
Management	
Contact	
Phase	Growth

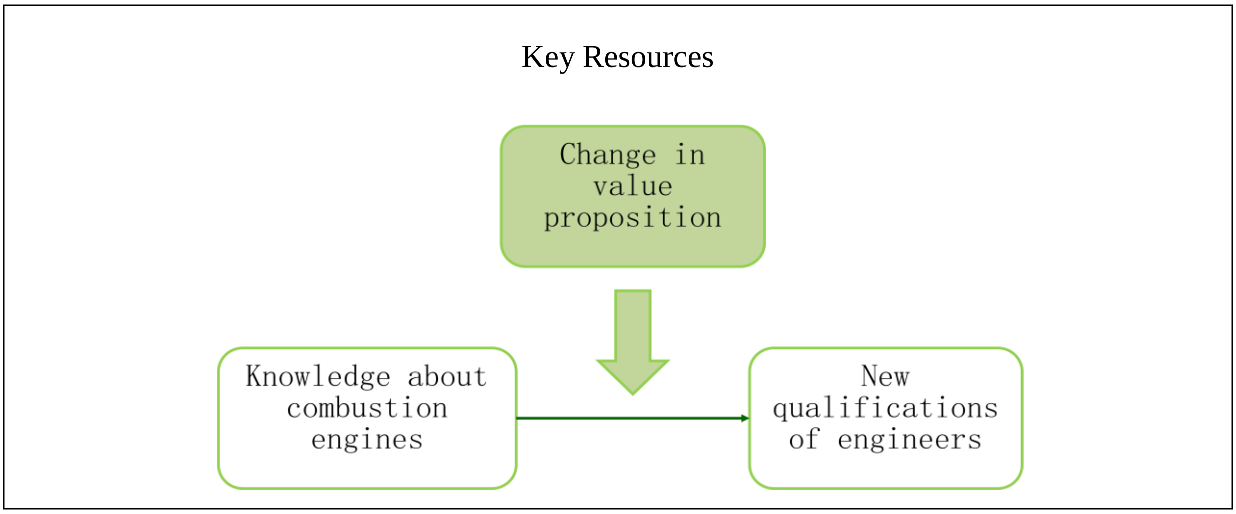
C started its business with the idea of offering a very light weight generator set based on an innovative architecture which should be more efficient and less costly. The generator set consists of a combustion engine and the generator. The company made a shift in their value proposition by offering only the generator, in particular powerful electric motors with a light weight and small size as shown in Figure 25. The company was forced to make a shift because the product was not accepted in the market due to its complexity. Furthermore, with a lack of expertise and credibility the market entry was very difficult for C. The naivety of the entrepreneurs gave no opportunity to create a convincing proposition which would attract investors and make it more tangible. "The offer wasn't right", so the company switched to a more suitable option (Interview C, p. XLVIII). This shift had an influence on other blocks, namely customer segment, key resources (technology and people) and the financial elements. Basically the whole business model was subject to change and was totally different at the end of the process.

Figure 25: Changes in value proposition (C)



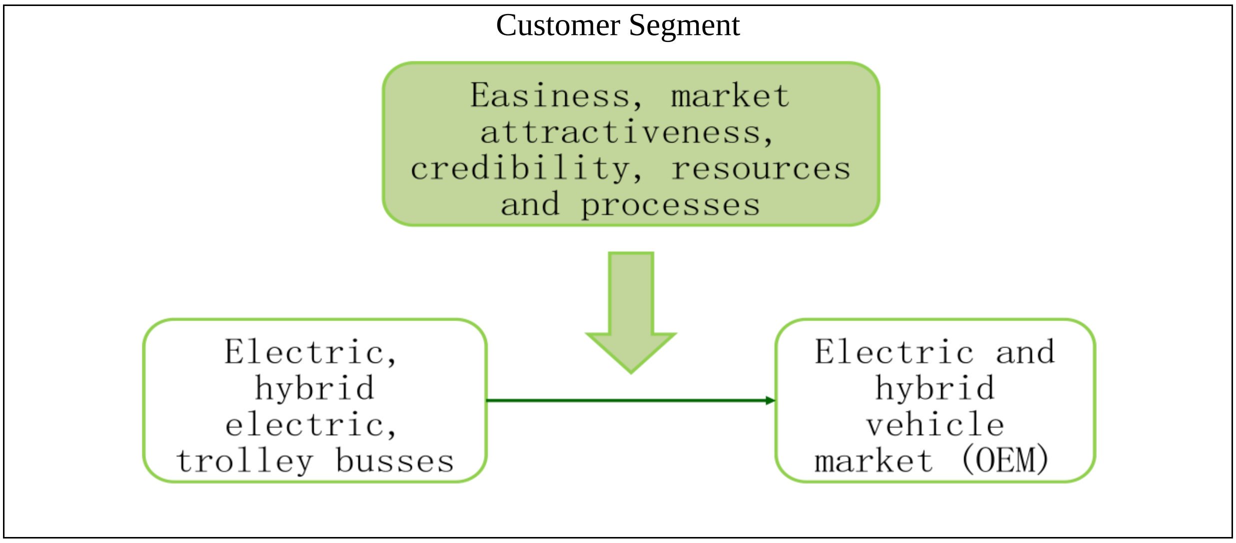
The change within the value proposition led to a shift in the key resources. No special knowledge was needed about combustine engines. Subsequently other skills were required and the company was looking for engineers with different qualifications.

Figure 26: Changes in value key resources (C)



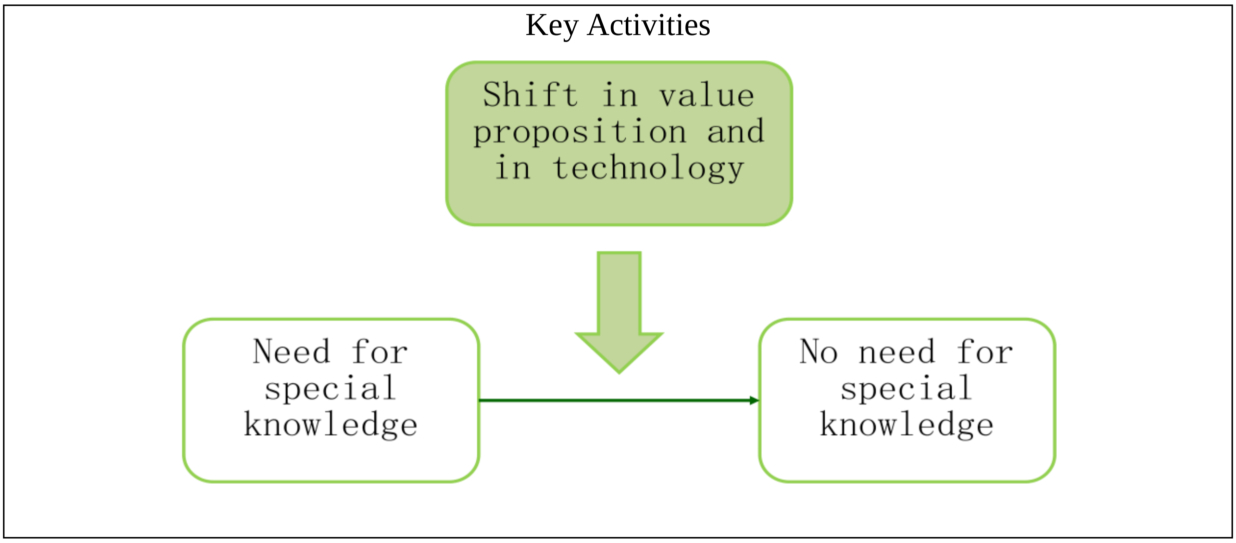
At the beginning the company aimed to get into the market of electric buses, hybrid electric buses and trolley buses. After the shift in the value proposition the customer segment was slightly different as well as illustrated in Figure 27. Nowadays, C delivers its product to the electric and hybrid vehicle market and especially to original equipment manufacturers. This market was more attractive because it was less developed, which is why the market entry was easier. In contrast, the market originally aimed for was more developed and was asking for credible suppliers with a lot of experience, resources and established processes.

Figure 27: Changes in customer segment (C)



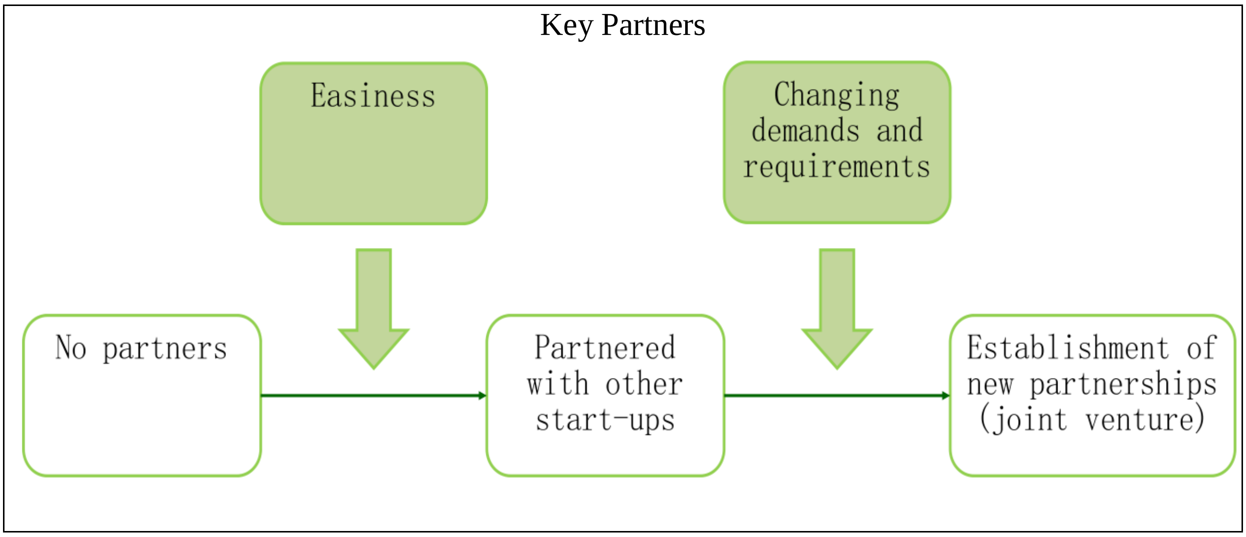
Furthermore, the shift in the value proposition caused a shift in the technology which led to some changes in the key activities (see Figure 28). A business with combustion engines requires a buying process and integrating processes into the greater system. Because of the shift in the technology these activities are no longer needed. Subsequently, special knowledge and additional skills are not longer of interest. Following this, the qualification of the engineers had to be different.

Figure 28: Changes in key activities (C)



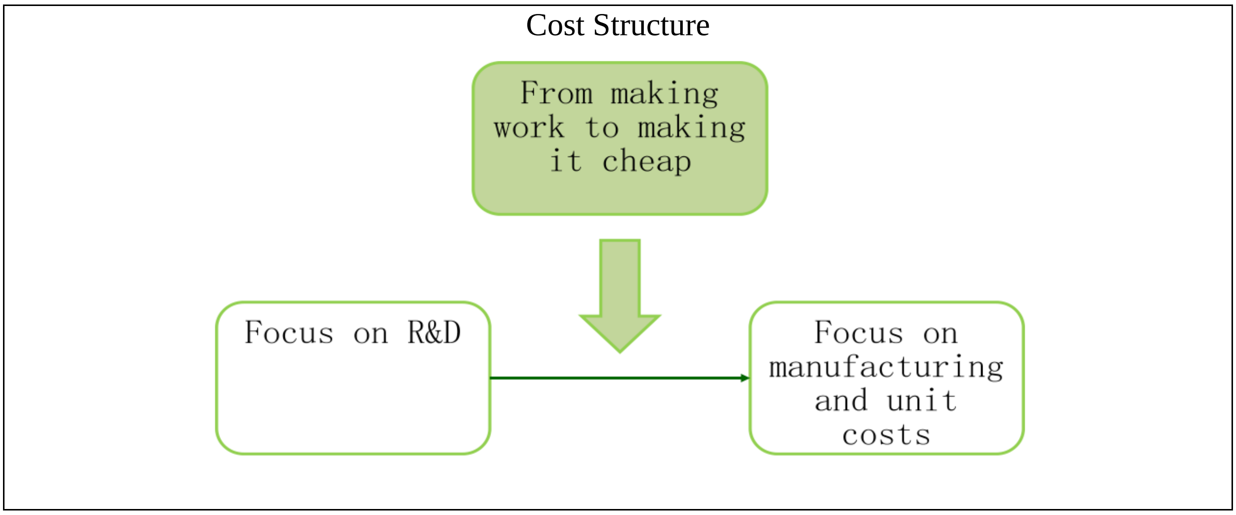
One of the main changes faced by C is the establishment of a new partnership. At the beginning C had no partners at all. Then, the company partnered with other start-ups because it is much easier to deal with start-ups and was considered too difficult to establish a partnership with a large company. With changing demands such as the production of a high volume the requirements for a supplier are rising. Consequently, C needed a partner with experience, knowledge, resources and credibility in order to assure that a high volume can be delivered and the quality standards can be hold. To industrialize their product C partnered with a very large and influential company after a certain time. This partnership influenced a huge variety of other elements such as the distribution channel, the processes and the customer value proposition. However, this partnership had also an influence on the brand, the values and norms of the company. The changes in key partners are presented in Figure 29. Additionally, the new partnership unfolded new opportunities within the distribution channel.

Figure 29: Changes in key partners (C)



The changes in the cost structure are phase dependent. At the beginning, C focused on research and development without looking to close to the costs of the prototype but concentrating on a workable product. After the product has been designed the focus switched to the manufacturing element and to the costs of each unit (sees Figure 30). In a nutshell, it was a development from “making it work to making it cheap” (Interview C, p. LVI).

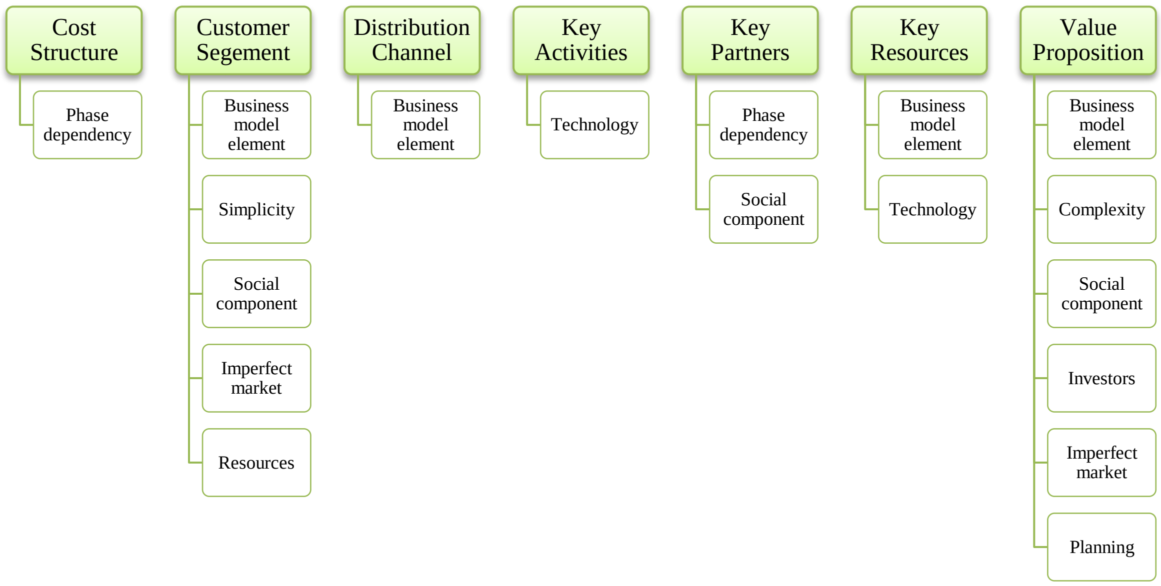
Figure 30: Changes in cost structure (C)



Cost structure, distribution channel and key activities were triggered by only one reason namely phase dependency, business model element and technology. In contrast, the customer segment and the value proposition were shaped by a huge variety of triggers with three triggers in common: business model element, social component and imperfect market. In addition, simplicity and resources contributed to the shift in the customer segment. Apart from the three mentioned components the value proposition was triggered by complexity, investors and planning. The changes of key partners and key resources happened because of two triggers each. The shift in key partners was caused by phase dependency and social component. Lastly, business model element and technology produced a switch within key resources. The mostly mentioned trigger in the case of C is the business model element itself.

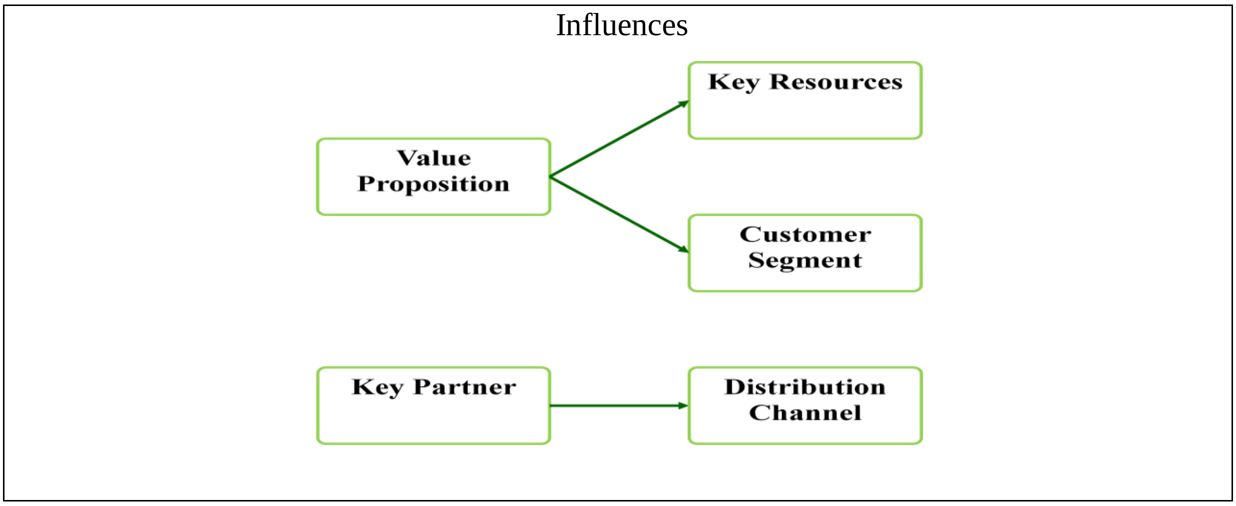
Figure 31 presents all the reasons which were responsible for the business model changes. As shown in the table the changes in the business model of C were caused by a huge variety of reasons. Cost structure, distribution channel and key activities were triggered by only one reason namely phase dependency, business model element and technology. In contrast, the customer segment and the value proposition were shaped by a huge variety of triggers with three triggers in common: business model element, social component and imperfect market. In addition, simplicity and resources contributed to the shift in the customer segment. Apart from the three mentioned components the value proposition was triggered by complexity, investors and planning. The changes of key partners and key resources happened because of two triggers each. The shift in key partners was caused by phase dependency and social component. Lastly, business model element and technology produced a switch within key resources. The mostly mentioned trigger in the case of C is the business model element itself.

Figure 31: Reasons in the case of C



A further interesting result of the analysis is the influence of the partnership (key partners) on the distribution channel as illustrated in Figure 32. Throughout the joint venture C was able to use the distribution channels of the partner. Moreover, the case shows how the value proposition can have an impact on the customer segment and key resources. After deciding to go only for the generator C also looked into the market segment of original equipment manufacturer. In addition to that, the switch to the generator was followed by a change in the key activities since many activities dealing with the integration of the engine and the generator could be ignored.

Figure 32: Influences of business model elements amongst each other (C)



C is a very good example for the development of a product going through exploration activities followed by exploitation activities. The case on C furthermore shows the influence of a joint venture on the business model. In total seven business model elements changed caused by different reasons and in the end “it’s basically a different business. A different business model” (Interview C, p. L).

4. D

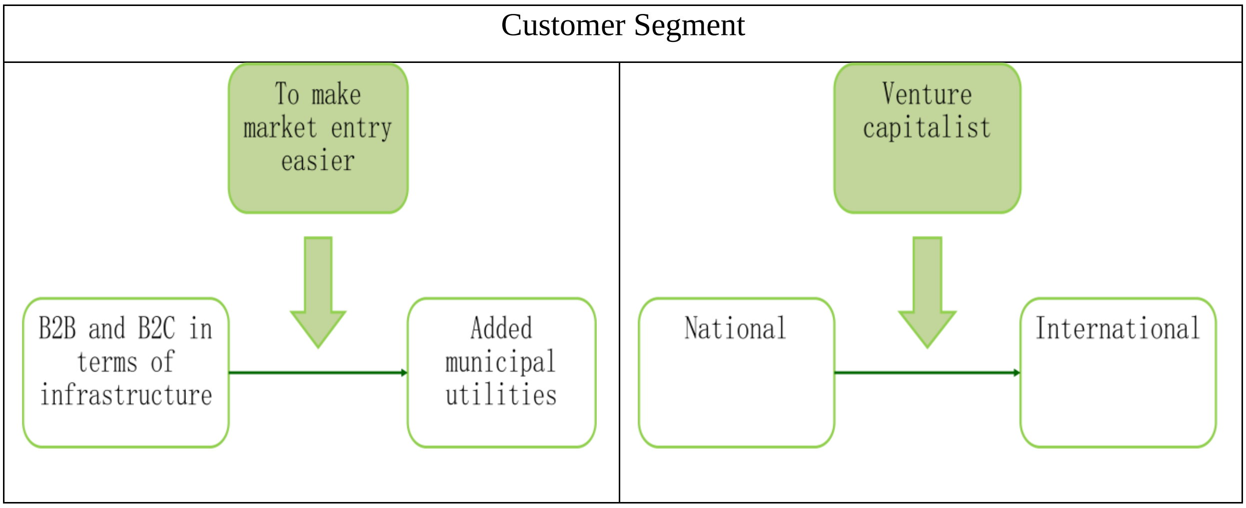
	D
Short description	D develops services for households with electrical vehicles. Their goal is to offer the possibility to charge electrical vehicles everywhere with the convinience of one single simple bill. This is reached by breaking down the costs for system sockets which can be installed in the places the driver needs to charge his car and providing the electrical vehicle driver with a mobile meter which is a charging cable with an integrated smart metering technology. Beside the main focus of the company, D entered the market of energy providers and delivers renewable electricity to households in Germany.
Year of establishment	2008
Founders	
Management	
Contact	
Phase	Existence

An interesting point to mention about D is that the founders first thought about the business model and only after that about the technology. The focus on the business model was guided by the idea of making the charging points as cheap as possible in order to make e-mobility affordable and attractive.

According to the entrepreneur the value proposition did not change, since it is “still completely the way we are going, but the stages, the stages we have foreseen in our first business plan take much longer than we thought” (Interview, D, p. LX). Subsequently, the value proposition remained the same.

In the process of business model evolution a customer segment was added which was not considered at the beginning (see Figure 33). First, D focused on B2C and B2B in terms of infrastructure. After a certain time the company enlarged their customer segment to include municipal utilities (see figure 33). The main reason for this shift was to make market entry easier and to avoid competing against them. Thus, D makes sure that the municipal utilities can keep their customer relationships and send further bills to the customers with their own label and name. Apart from that change the company made a shift from a national focus to an international focus after a new venture capitalist entered the company.

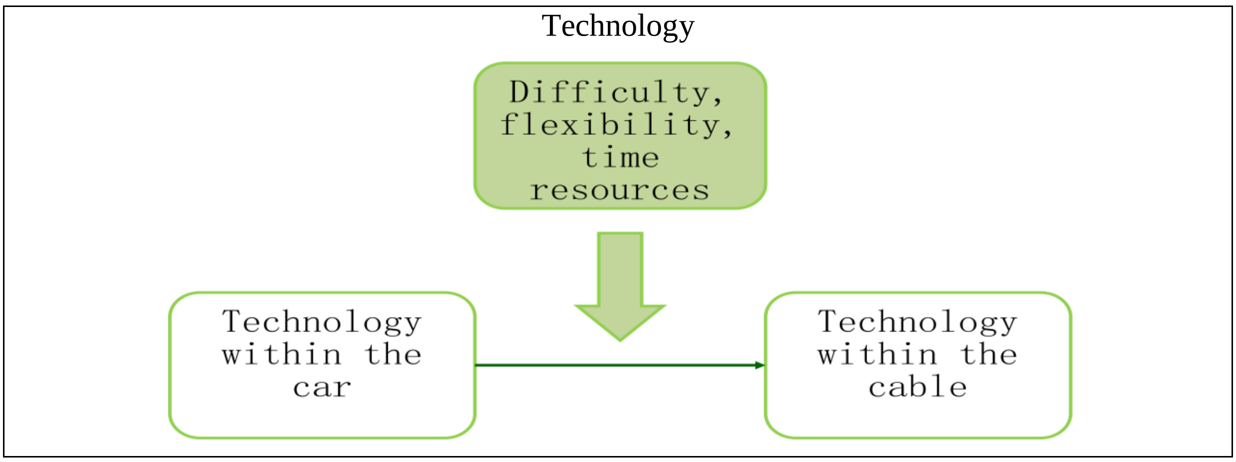
Figure 33: Changes in customer segment part 1 (D)



Neither the distribution channel nor the customer relationship blocks changed. However, in order to become familiar with the processes in the energy market D founded its own utility.

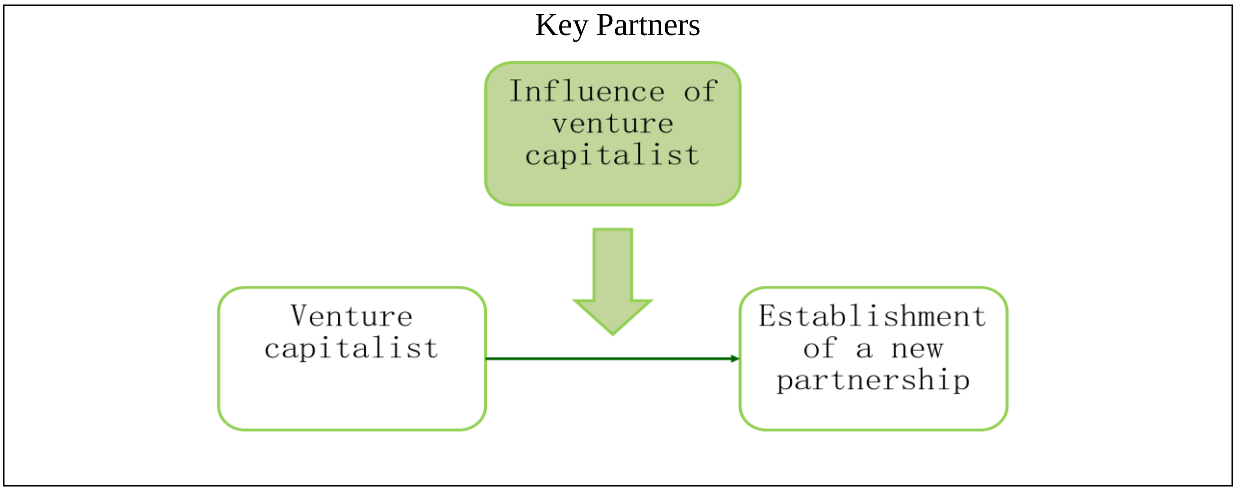
Initially the aim was to build the technology for mobile metering within the car by finding an original equipment manufacturer (OEM) and using him as distribution channel. The founders discovered that it was too difficult to install new components within the car and to convince the OEM would take too long. For this reason, the company moved to install the technology within the cable instead of having built it within the car as shown in Figure 34. Besides saving the time the company could assure its flexibility and avoid the dependence on the OEM. This change influenced the cost structure.

Figure 34: Change in technology (D)



Like other start-ups D had no key partners at the beginning. Later, trust was gained by establishing a relationship with a partner with a good reputation, so new partners would be able to trust in the existing partnership (see Figure 35). After a certain time, the founders managed to get a venture capitalist on board. Influenced by the venture capitalist and his international focus D established a new partnership with a very large international tier. With every step of growth the partners of D are growing as well.

Figure 35: Change in key partners (D)



After having a venture capitalist on board, the revenue stream shifted from one based on a national market to an international one as shown in Figure 36. This change was initiated by venture capitalists, since “once you have VC on board, you can forget about thinking small, you have to think big” (Interview D, p. LXIII). To be able to act internationally D thinks of cooperating and building joint ventures. Furthermore, the shift had an influence on costs.

Figure 36: Change in revenue stream (D)

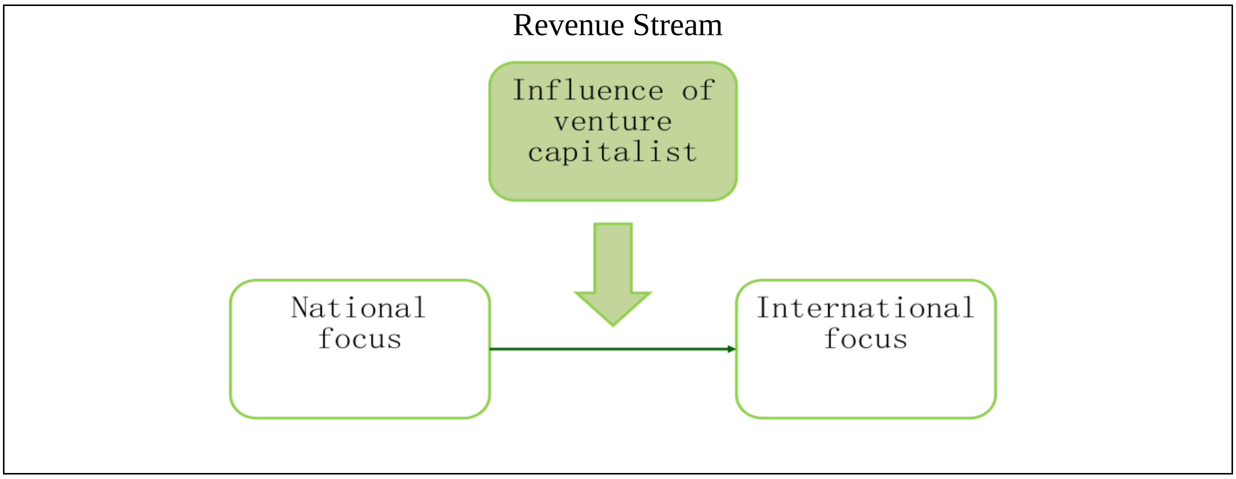
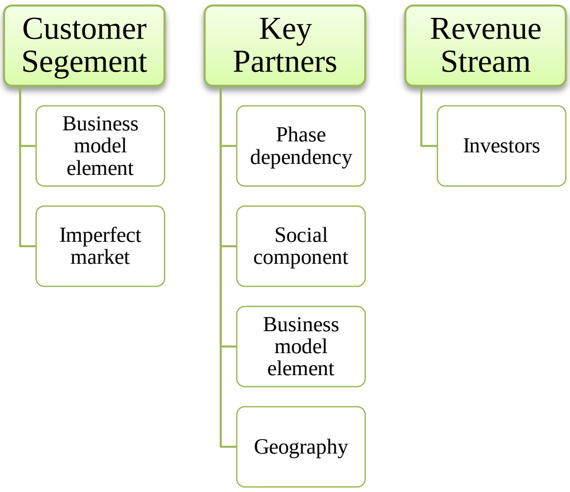


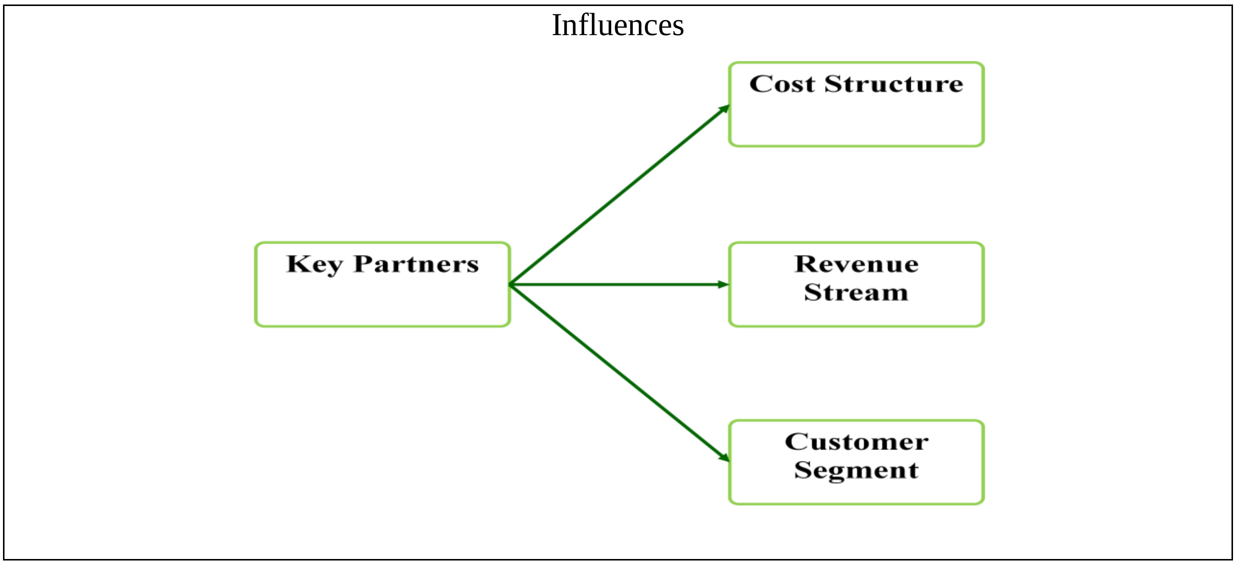
Figure 37 presents all the reasons for the changes. The change within the customer segment was caused by another business model element in combination with the component of market imperfection. Next, phase dependency, social component, business model element and geography gave rise to a shift within the key partners. Investors are mentioned as a reason causing a switch in the revenue stream.

Figure 37: Reasons in the case of D



After bringing a venture capitalist on board D had to go for an international market which led to changes in cost structure, revenue stream and customer segment. The case analysis shows that in this particular example key partners have an influence on cost structure, revenue stream and customer segment as illustrated in Figure 38.

Figure 38: Influences of business model elements amongst each other (D)



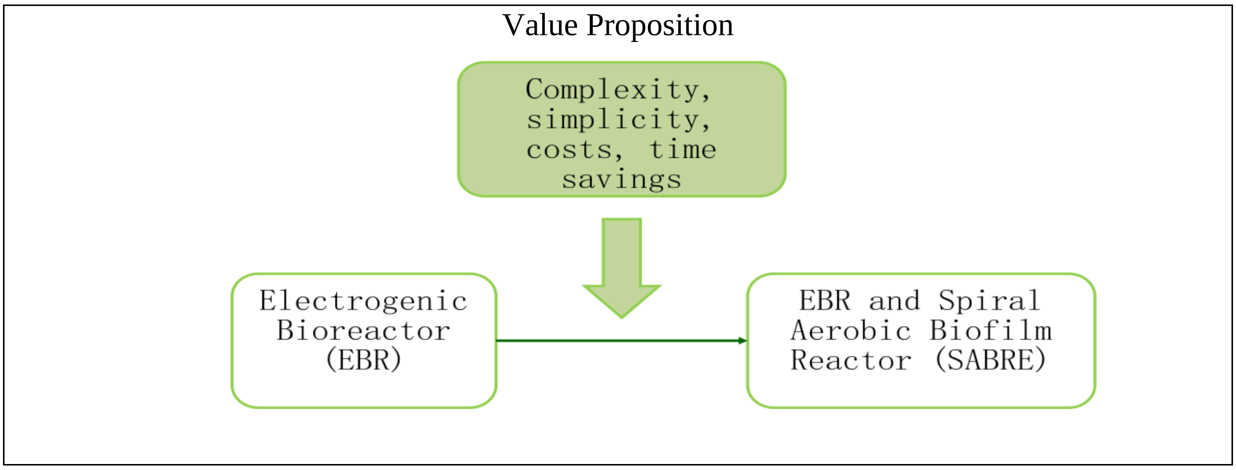
In total changes within three business model elements and within the technology have been reported. An interesting point is that although the founders thought about the business model and not about the technology first, the business model still underwent several changes. Finally, D started with a very complex business and broke it down in order to be able to shorten the time to market. Furthermore, what is special about D is that the company is operating between two large industries, namely automotive and energy, with very strong players.

5. E

	E
Short description	The vision of E is to change the energy economics of wastewater treatment. This change is achieved by offering advanced energy efficient technology. The state of the art machinery provides a practical and cost-efficient solution for municipal and industrial plants. The first product developed by E is the Electrogenic Bioreactor (EBR) which is used for wastewater treatment as well as producing renewable electricity as a byproduct. Their second product Spiral Aerobic Reactor (SABRE) changes the economics of wastewater treatment at the same time as radically reducing energy consumption and reducing the amount of excess sludge.
Year of establishment	2008
Founders	
Management	
Contact	
Phase	Existence

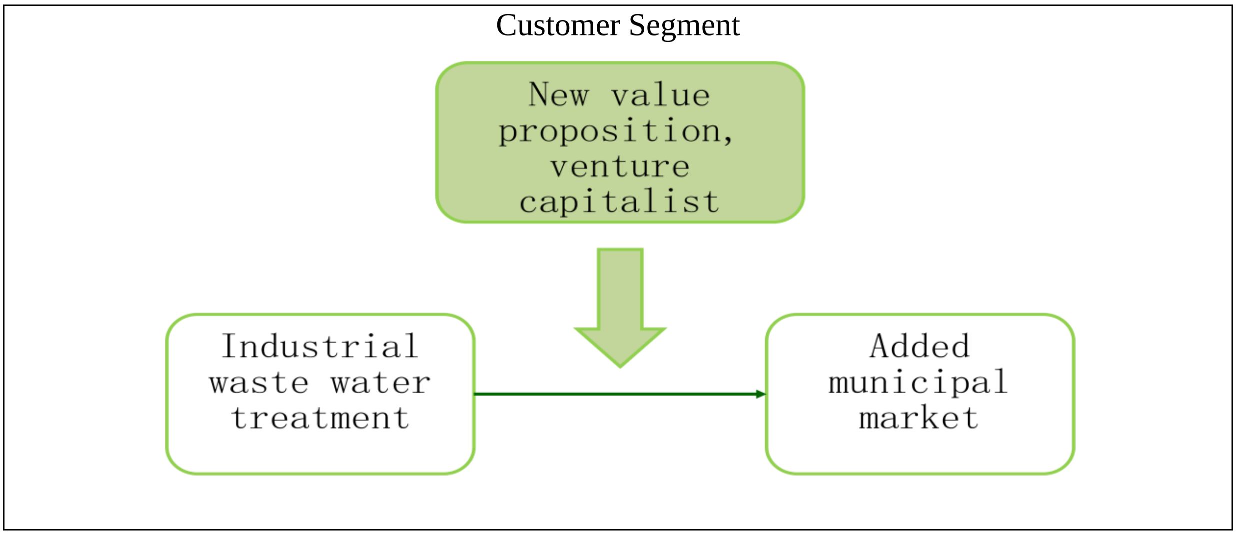
E was founded with the goal of providing a product named Electrogenic Bioreactor (EBR) which produces electricity while treating wastewater. Throughout the research and development process the company realized that the reduction of energy consumption by 80 % alone delivers a great benefit for the vast market. Subsequently, a new product namely Spiral Aerobic Biofilm Reactor (SABRE) was developed which had the advantage of shorter time to market than the EBR (see Figure 39). While EBR remains in the portfolio of Emfecy the focus of the company moves to SABRE. This is due to reasons such as the complexity of EBR and in contrast the simplicity of constructing and operating of SABRE. Moreover, SABRE is cheaper to produce and includes several benefits for the target market. Finally, the change in the value proposition had an influence on the customer segment, the distribution channel, customer relationship and others.

Figure 39: Change in value proposition (E)



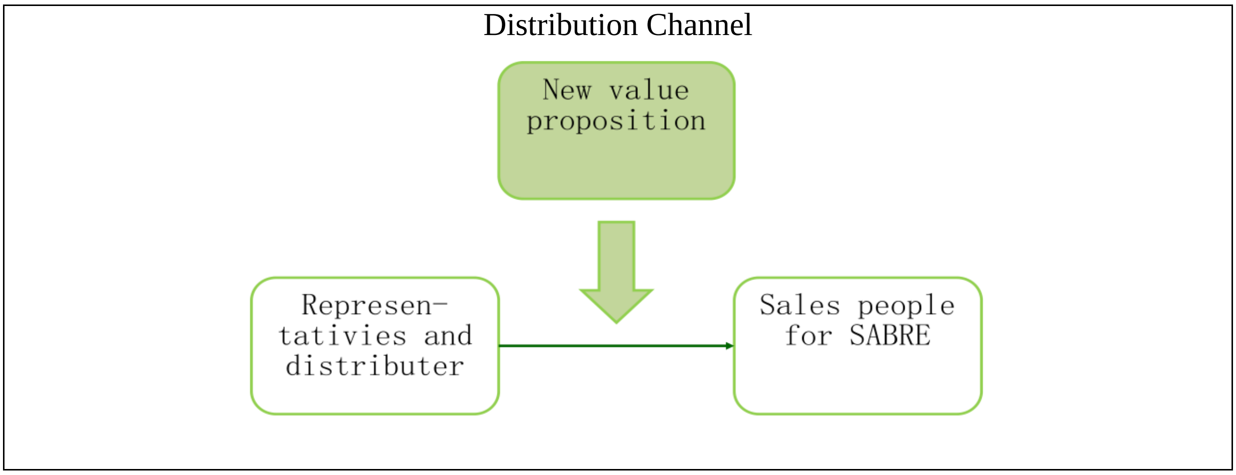
First, E focused on the industrial waste water treatment market but with the appearance of SABRE E added new customer segments to its business model as illustrated in Figure 40. The additional segments aimed for the municipal (and municipal-type) market such as “remote sites with a need to treat their wastewater” for instance casinos or hotels (Interview E, p. LXIX). E offers a wide range of value propositions tailored for segments with different needs. The change in the customer segment was caused by the new value proposition and the influence of a venture capitalist who applied a cohesive methodology and influenced the targeted market. Moreover, the experience of the venture capitalist led to the approach of shortening time-to-market and aim for market dominance in specific markets.

Figure 40: Change in customer segment (E)



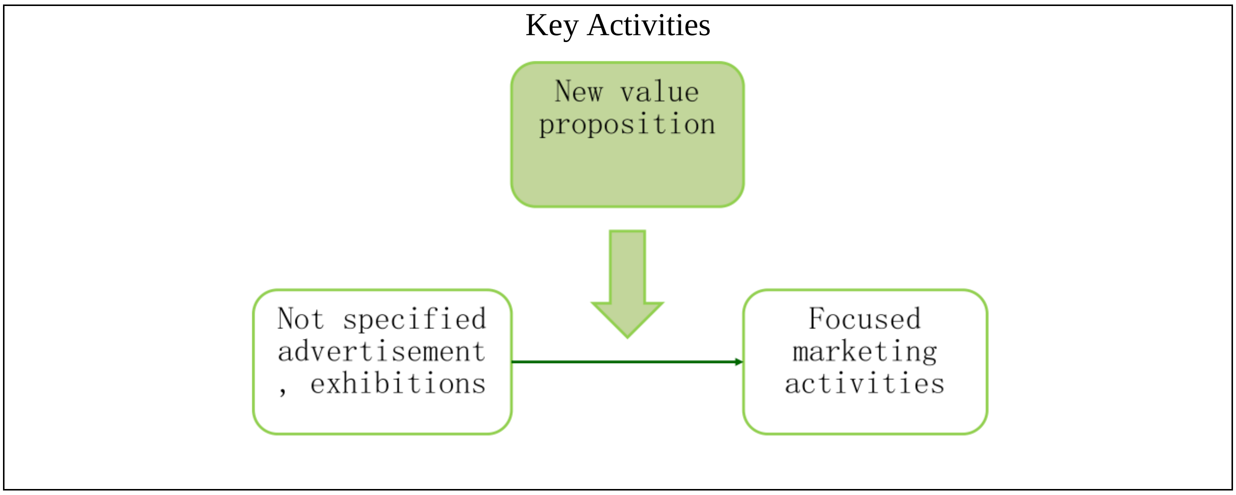
Next, the initial distribution channel whose representatives and distributors sold EBR to industrial clients had to be modified for SABRE (see Figure 41). As a result, E will employ salespeople in order to market SABRE to certain segments and other segments will be marketed using representatives and original equipment manufacturers (OEM).

Figure 41: Change in distribution channel (E)



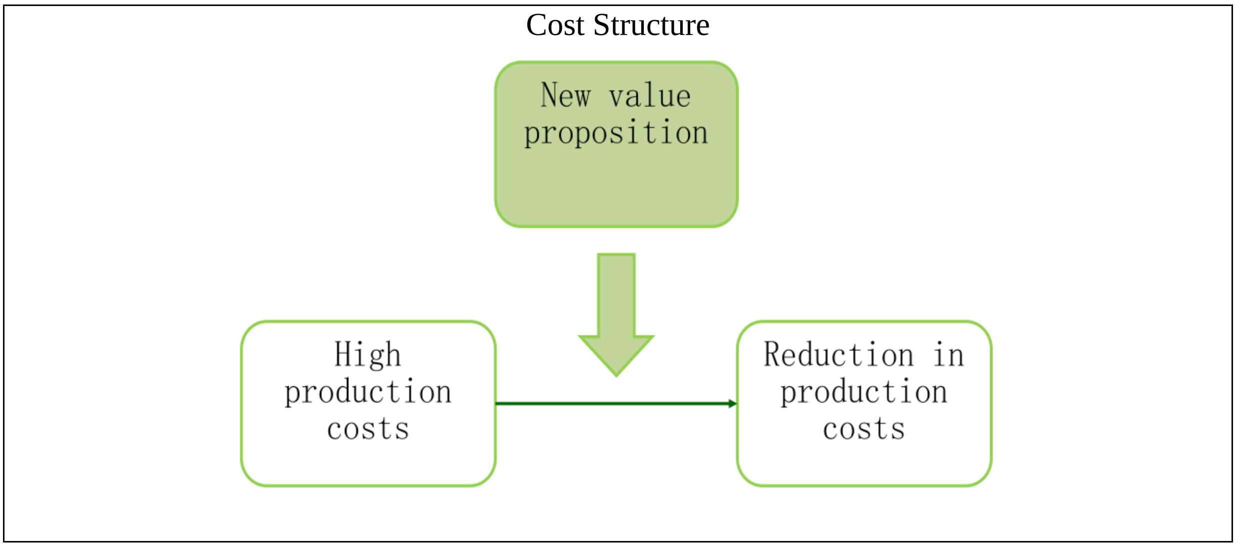
After devising a new value proposition and customer segments the key activities did not remain the same since marketing activities needed to focus on market segmentation and validation of sub-segments (see Figure 42). The advertising strategy switched from general to more specific advertisement for particular markets. Different exhibitions were targeted as they had to focus on more specific segments and on certain territories.

Figure 42: Change in key activities (E)



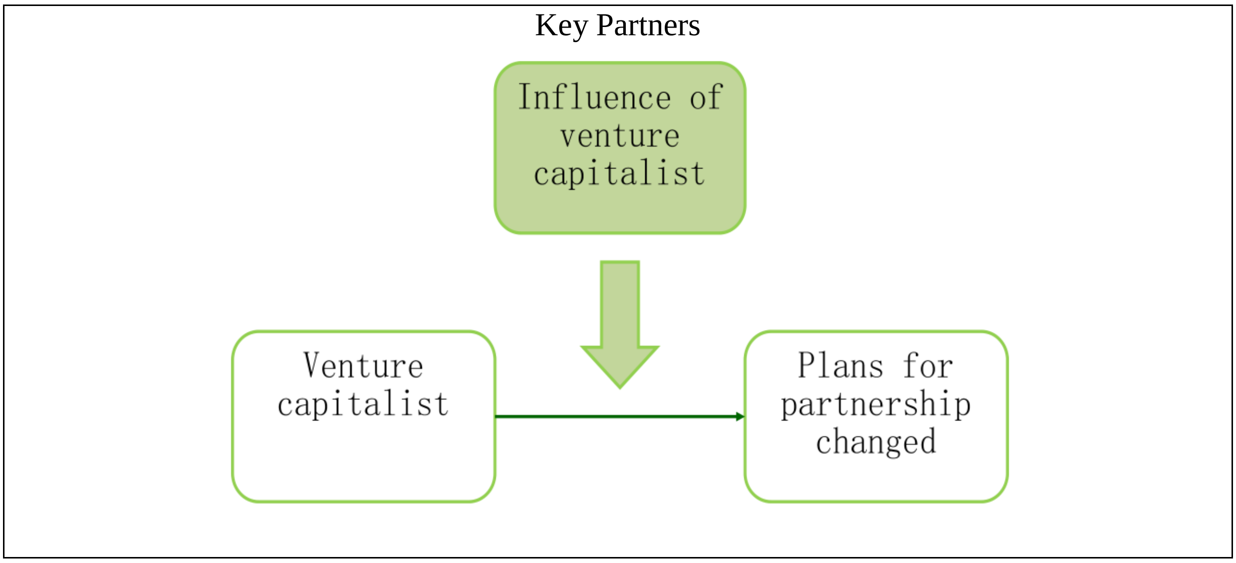
With the introduction of SABRE into the business model the cost changed. The structure production cost were the greatest part of the cost structure; however by introducing SABRE the production costs decreased and now represent a small part of the overall costs (see Figure 43). This in turn changed the value proposition in terms of a more cost-competitive product. Furthermore, the product can be offered to larger and less wealthy markets.

Figure 43: Change in cost structure (E)



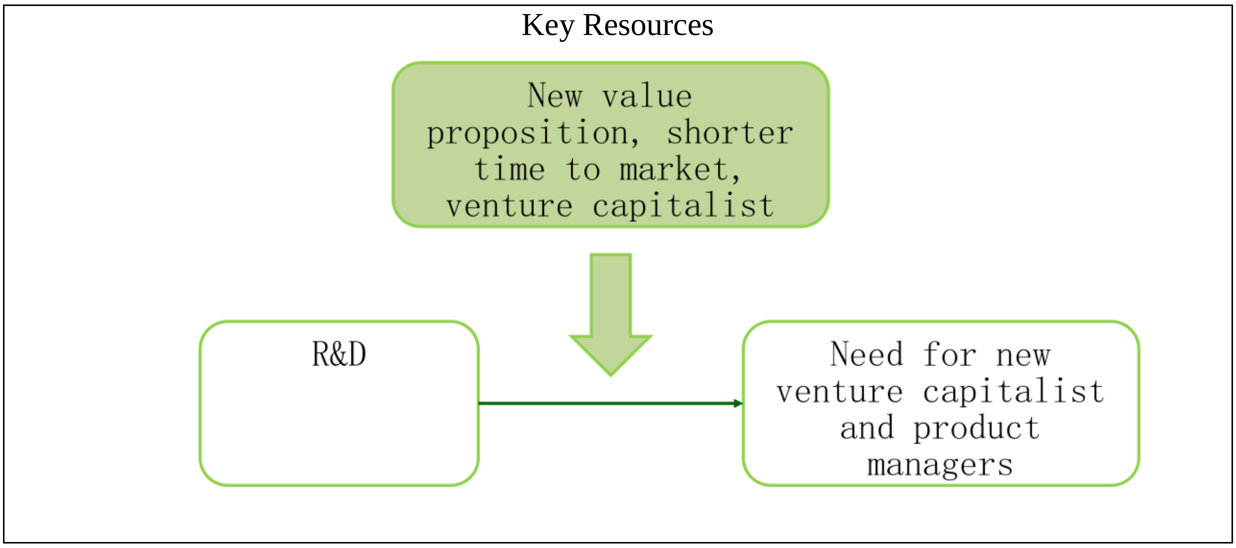
Like other start-ups Emfecy had no partners at the beginning. Later, Emfecy was able to win a venture capitalist as presented in Figure 44. Plans for partnerships have changed due to the changes in the value proposition and the influence of the venture capitalist entering the company.

Figure 44: Change in key partners (E)



With SABRE and the shorter time to market, key resources which were planned much later became essential earlier as illustrated in Figure 45. Not only is the change in the value proposition responsible for the added key resources but also the new venture capital partner who enabled the company to move quickly following his investment.

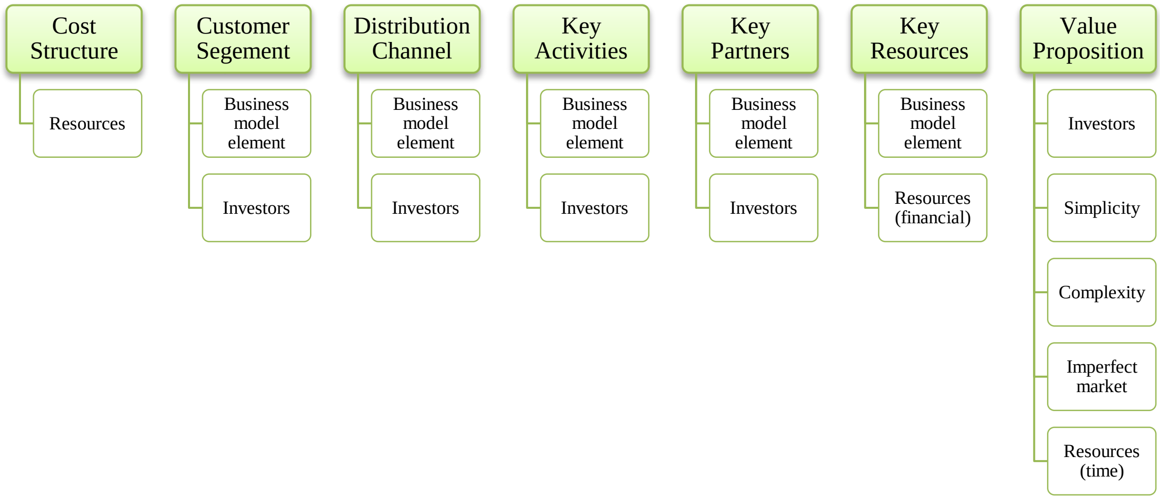
Figure 45: Change in key resources (E)



As illustrated in

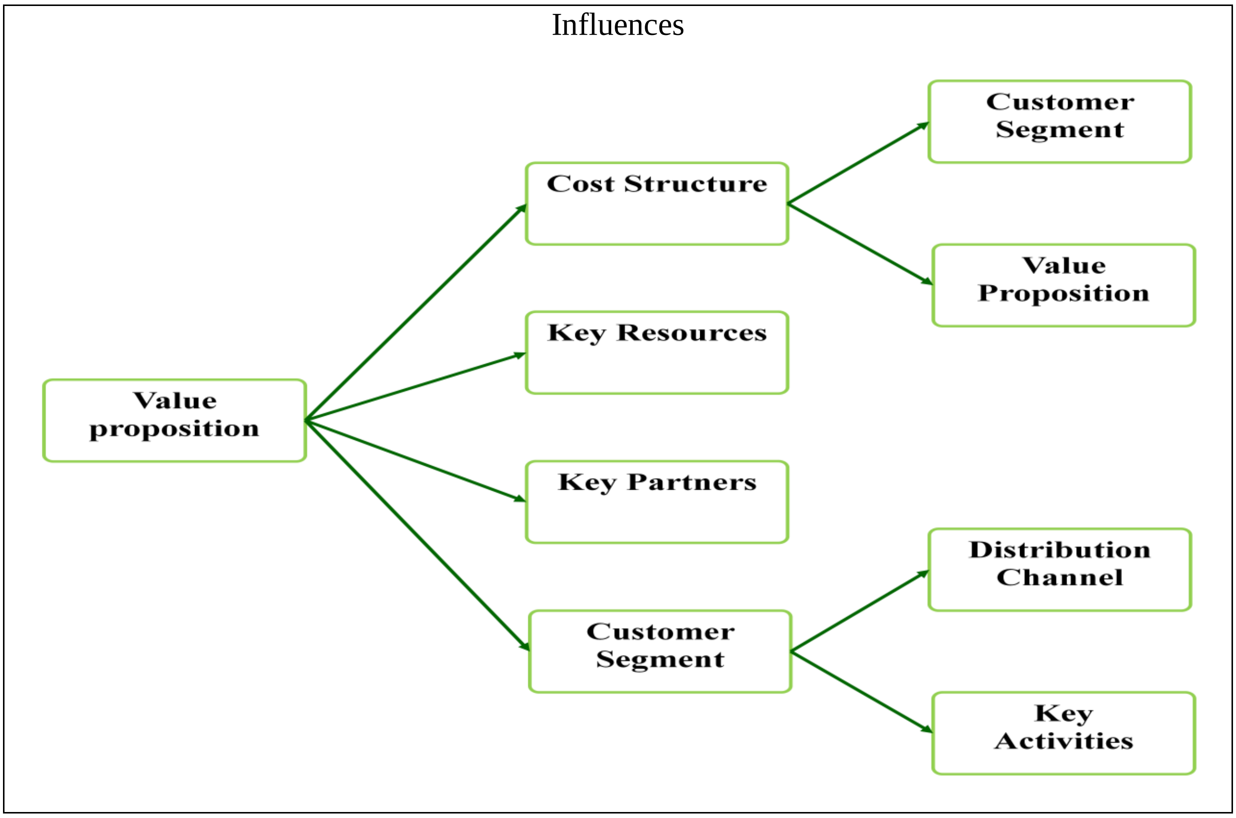
Figure 46 business model element combined with the component of investors caused changes in customer segment, distribution channel, key activities and key partners. The combination of investors, simplicity, complexity, imperfect market and time resources generated a shift in the value proposition. The cost structure was triggered by one component namely resources. Another business model element and financial resources led to a change in key resources.

Figure 46: Reasons in the case of E



As shown in Figure 47 the change in the value proposition had a deep impact on the whole business model. First, throughout the new product the costs changed in terms of lower production costs. The decreased costs enabled the company to offer a more cost-competetive product which in turn allow to sell the product to larger and poorer market segments. Second, SABRE called for a new engeneering professionals and product managers which were planned later. Third, the new product required to look for different partners namely integrators for all the different segments. Finally, the added product led to changes in the customer segment, since SABRE is marketed to certain segments and not industrial clients which is the case for EBR. The additional customer segments require new distribution channel which is covered by employing salespeople. Furthermore, the shift in the customer segment calls for new key activities such as marketing focusing on segmentation and validation.

Figure 47: Influences of business model elements amongst each other (E)



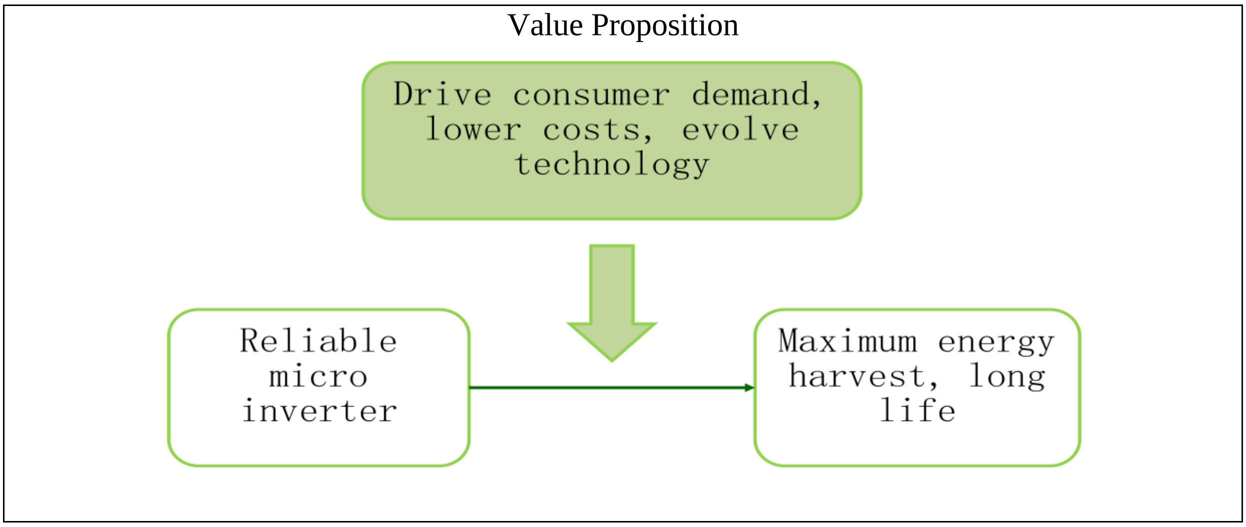
In a nutshell, seven business model elements changed due to various reasons but especially because of a new investor and a shift in the value proposition. The case of E shows the potential impact of changing just one element of the business model.

6. F

	F
Short description	F introduced a grid-connected micro inverter and monitoring system. The breakthrough technology maximizes energy harvest, improves safety, is highly reliable, matches the lifetime of the solar module, and makes photovoltaic array design and installation easier. The patented micro inverters convert direct current power produced by the solar module to alternating current power. In this way the power can be supplied to the electricity grid and provided to homes and businesses.
Year of establishment	2003
Founders	
Management	
Contact	
Phase	Growth

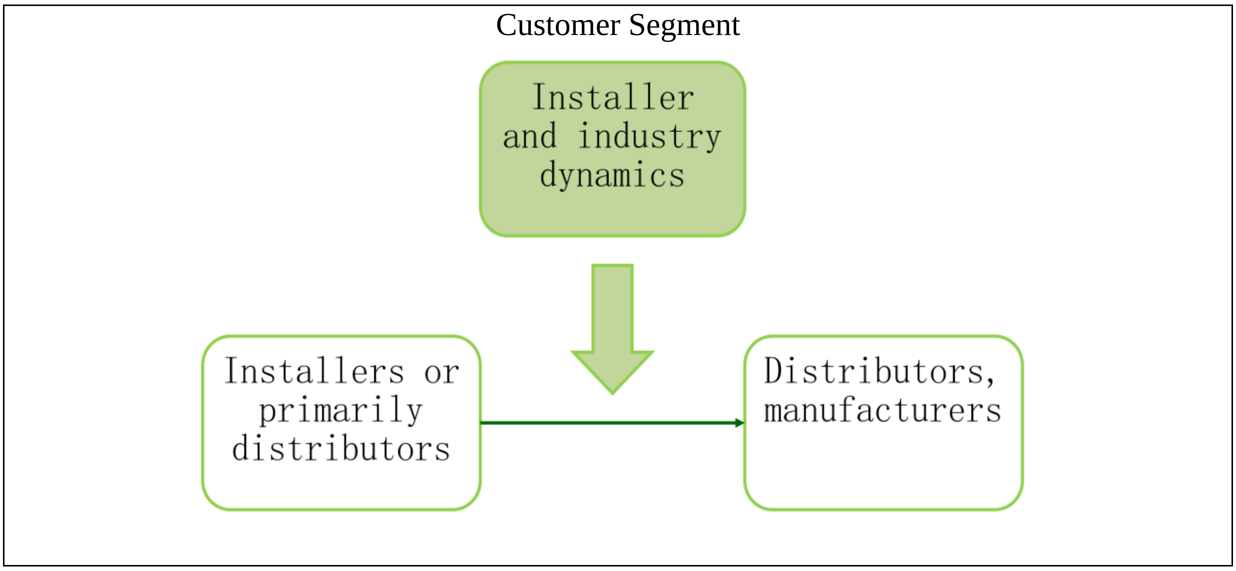
F was founded by one professor and three PhD students from Cambridge, who wanted to offer a reliable micro inverter. After reaching this goal of the value proposition the company aimed to ensure that the micro inverter would have the maximum energy harvest (see Figure 48). The next step was to improve the micro inverter and ensure a long life functionality and reliability compatible with that of a solar module. There are several reasons for the changes; one of which is being able to follow the market in particular the technological development. Another reason is to drive more customer demand by minimizing the cost of installation and components.

Figure 48: change in value proposition (F)



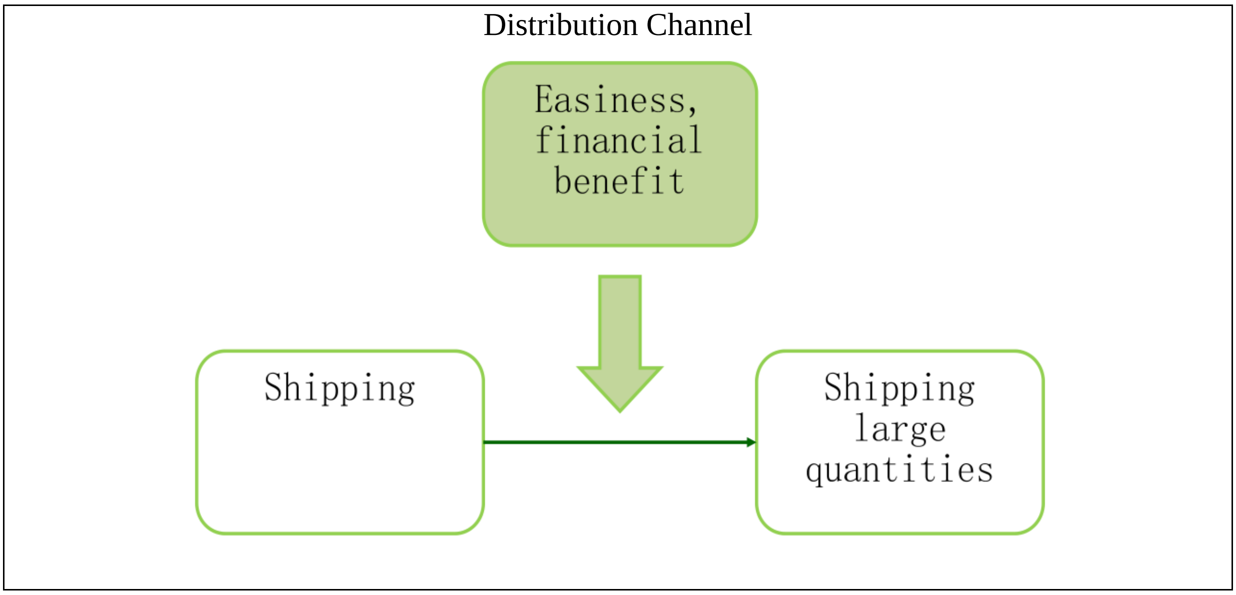
The initial customer segments targeted by F included the installers or primarily distributors. The ability to reach and influence to market and sell to installers is very difficult to accomplish, especially since the dynamics are different all over the world. Having learnt this lesson the company made a shift towards selling to distributors and manufacturers and drifted apart from the idea of selling to installersas illustrated in Figure 49. Furthermore, the customer segment was influenced by industry dynamics.

Figure 49: Change in customer segment (F)



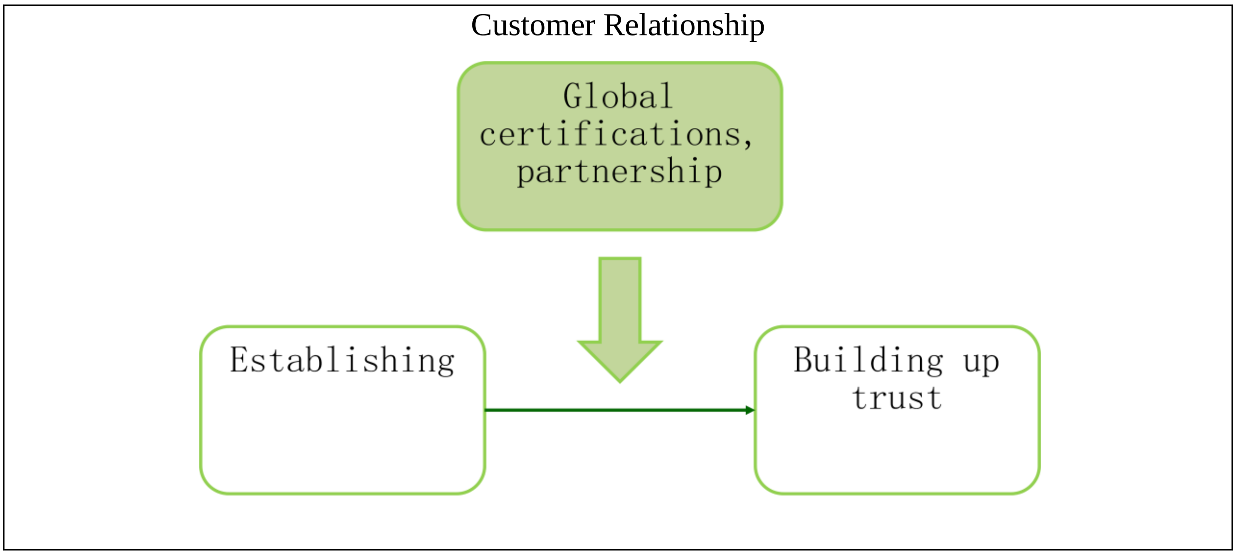
Due to the changes in the customer segment the distribution channel underwent some changes too. Although shipping was used from the beginning, F is nowadays more interested in selling large quantities (see Figure 50). Direct shipment to the module manufacturer is the company's preference. One of the main reasons for this is efficiency and lowering the costs for marketing, advertising, sales, logistics and the supply chain dynamics. Transaction costs are lowered as well since there are only few large distributors or OEM's which have to be convinced.

Figure 50: Changes in distribution channel (F)



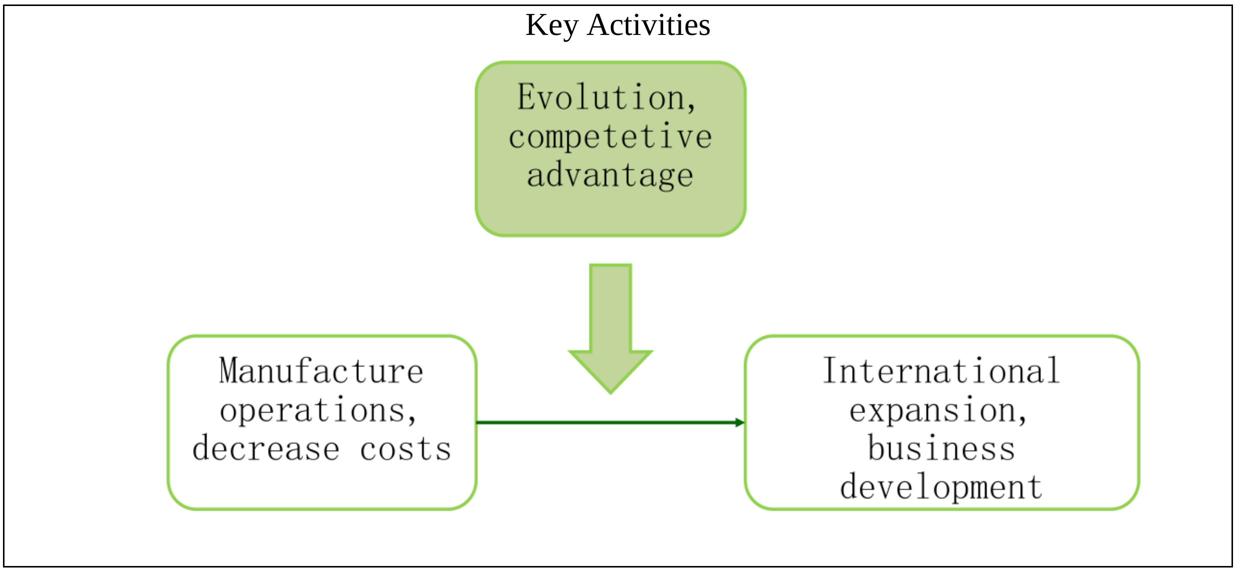
F improved their customer relationship by working with a large and well-known brand (see Figure 51). The company built up trust by getting certifications in different countries and reached a high level of global certifications. The advantage of being the only company to have passed the high level certification in Germany helps to contact and convince new customers.

Figure 51: Change in customer relationships (F)



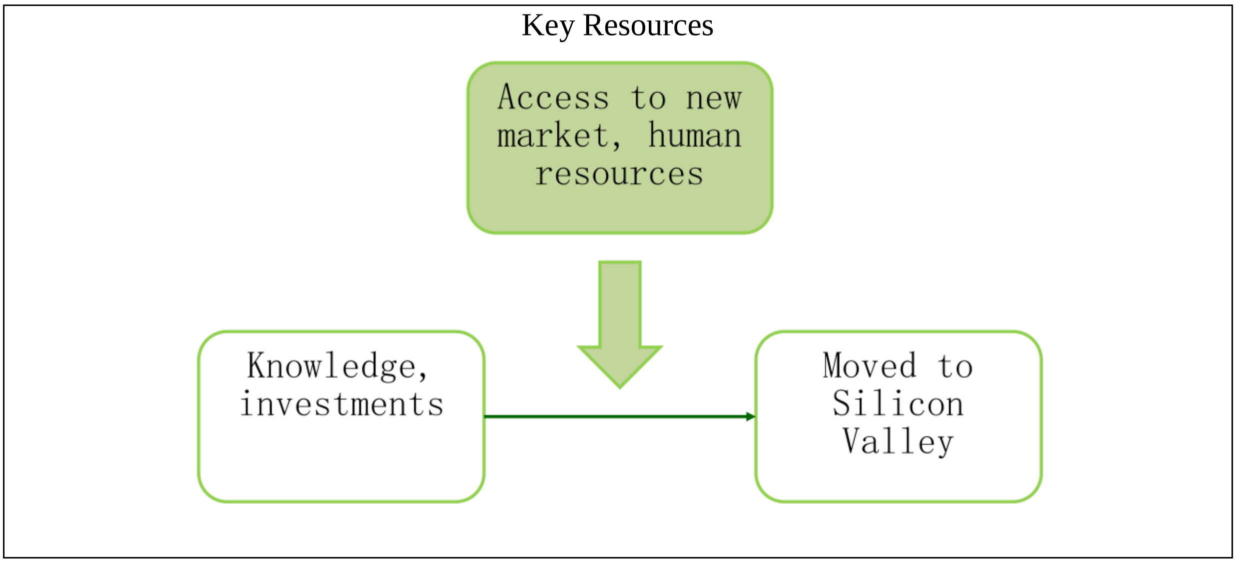
After bringing the product to the market F made sure that the product can be manufactured in high volume and high quality as shown in Figure 52. Afterwards, the key activities focused more on international expansion and on new customer acquisition but continue to improve manufacture operations and decrease the costs. According to the entrepreneur it is "[…] the normal evolution. First, you get the product, you make the product perfect. You make sure it can be manufactured in high volume. You start out in one local market. As you gain experience, you look for other growth markets" (Interview F, p. LXXXIII). In addition to that, the global certifications and the benefit the customers have accelerated the growth.

Figure 52: Change in key activities (F)



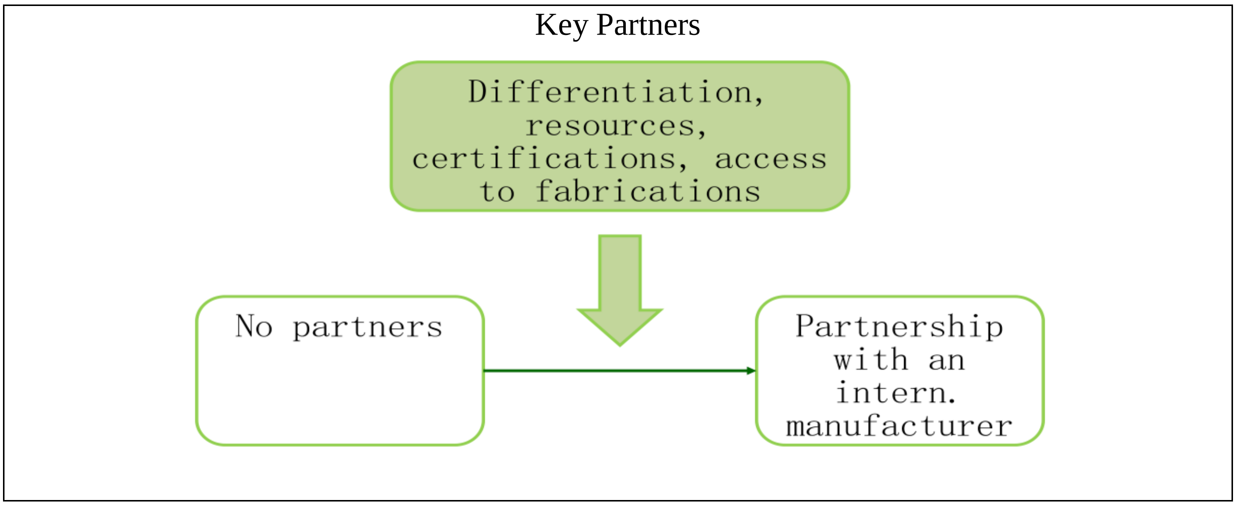
As all other start ups the company was founded with limited resources. After a certain time F was able to convince investors from the German Cleantech Funds. The funding enabled the growth of the company in personnel and to broaden the management ranks. In order to get access to high qualified engineering talents the company moved to Silicon Valley (see Figure 53). This move was made not only to access new human resources but especially to enter the North American market.

Figure 53: Change in key resources (F)



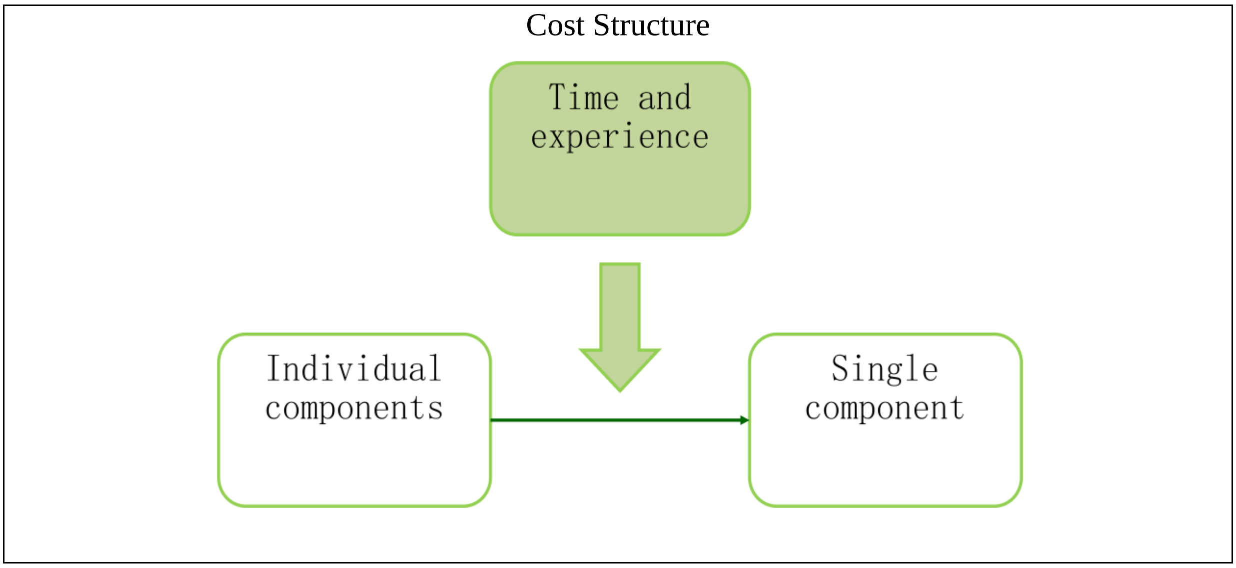
F partnered with a well-known international module manufacturer because the company had no capabilities or ambition to build their own factory as shown in Figure 54. Another reason is the differentiation possibility F and the manufacturer got from this partnership. The partnership with an international module manufacturer was established because of the global certification of F' product and its good logistics in manufacturing.

Figure 54: Change in key partners (F)



The cost structure changed the design of the first product from discrete components which consist of individual components to the second generation, which combined all the components of the first one into a single component called ASIC. The change enabled not only increased reliability but a dramatic decrease in costs (see Figure 55). The change was only possible after validating and verifying the functionality of the components which made it possible to reduce the component count.

Figure 55: Changes in cost structure (F)



The changes in the revenue stream came from adding new markets as shown in Figure 56. First, F had revenue stream from the markets in the United Kingdom and Continental Europe, but after entering the market in the United States F now has a greater percentage from this market.

Figure 56: Changes in revenue stream (F)

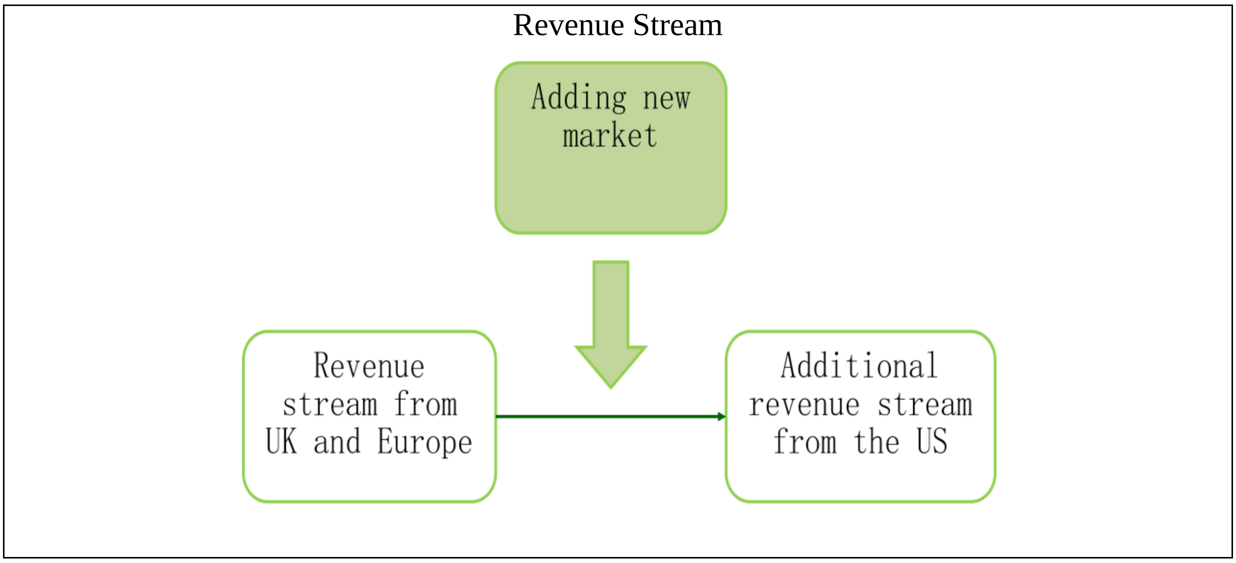


Figure 57 and Figure 58 summarize the reasons responsible for the changes in every single business model element. The most commonly mentioned reasons are imperfect market, resources in general and financial resources. Further reasons reported are business model element, geography, simplicity, social component and phase dependency. Key resources and the revenue stream were triggered by only one reason. In contrast, three triggers were responsible for the change in key activities and four in key partners.

Figure 57: Reasons in the case of Eencsys part 1

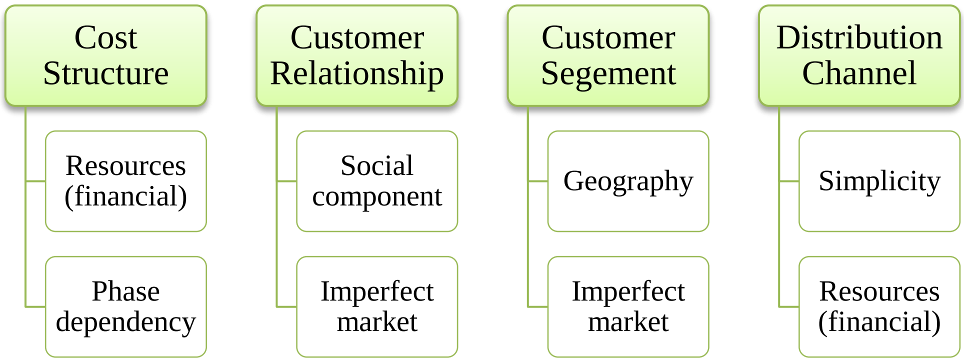
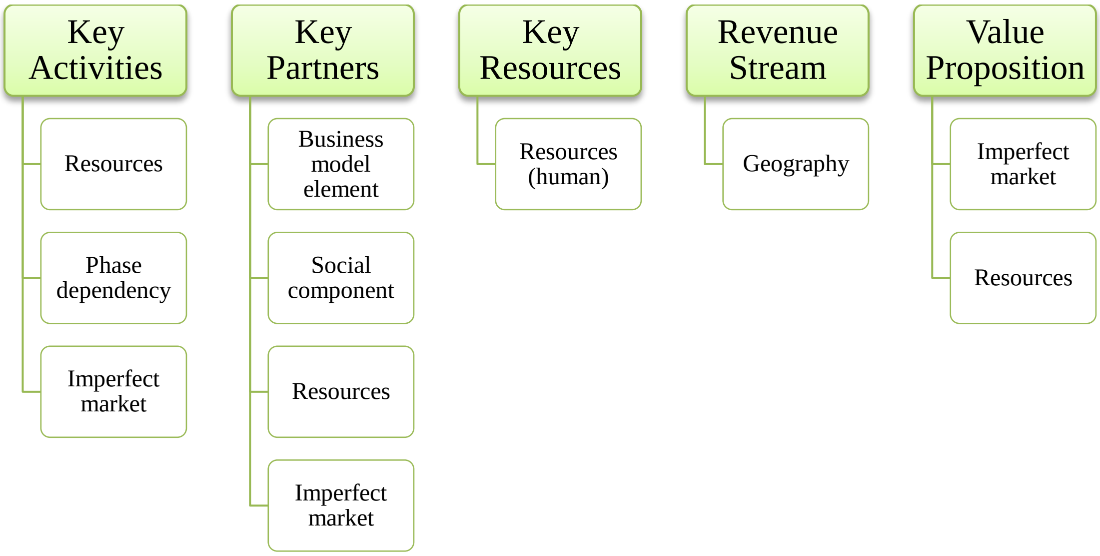
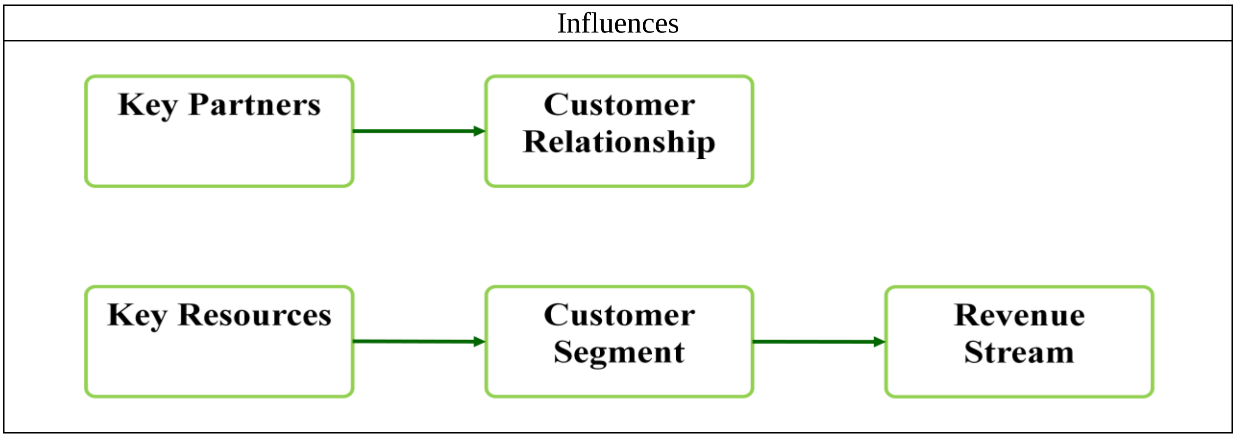


Figure 58: Reasons in the case of Eencsys part 2



The analysis showed that in the case of F key partners influenced the customer relationship. This influence is grounded in the established partnership with a strong international original equipment manufacturer, which contributed to the reputation and builded up more trust in F. Apart from that, funding (key resources) enabled the company to go for the US market (customer segment) and led to an additional revenue stream. All the influences are presented in Figure 59.

Figure 59: Influences of business model elements amongst each other (F)



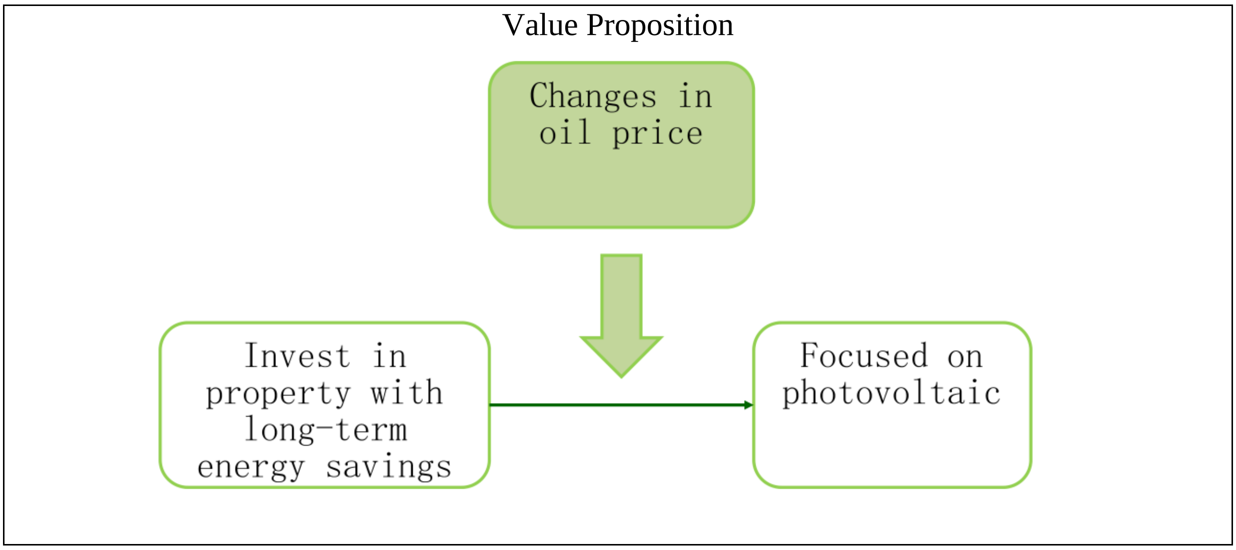
An interesting observation is that all nine blocks changed. Furthermore, imperfect market was the reason for changes in six elements as well as the resources which caused a shift in six elements. Moreover, the case of F shows how additional funding influences the customer segment and the revenue stream.

7. G

	G
Short description	G is an energy service company focused on the mission to facilitate green energy services. The offer of G for schools consists of a free installation of Solar Power with flexible and large scale arrays for any size of roof with tried and tested technology and fitting methods. The customer has no installation or maintenance issues to take care of. Moreover, an agreement is established about energy costs for 25 years to protect the customer against utility price rises. Finally, G offers an educational support in form of curriculum and lesson plans for students. In this manner public sector buildings have the possibility to benefit from renewable energy on a pay as you go basis.
Year of establishment	2009
Founders	
Management	
Contact	
Phase	Growth

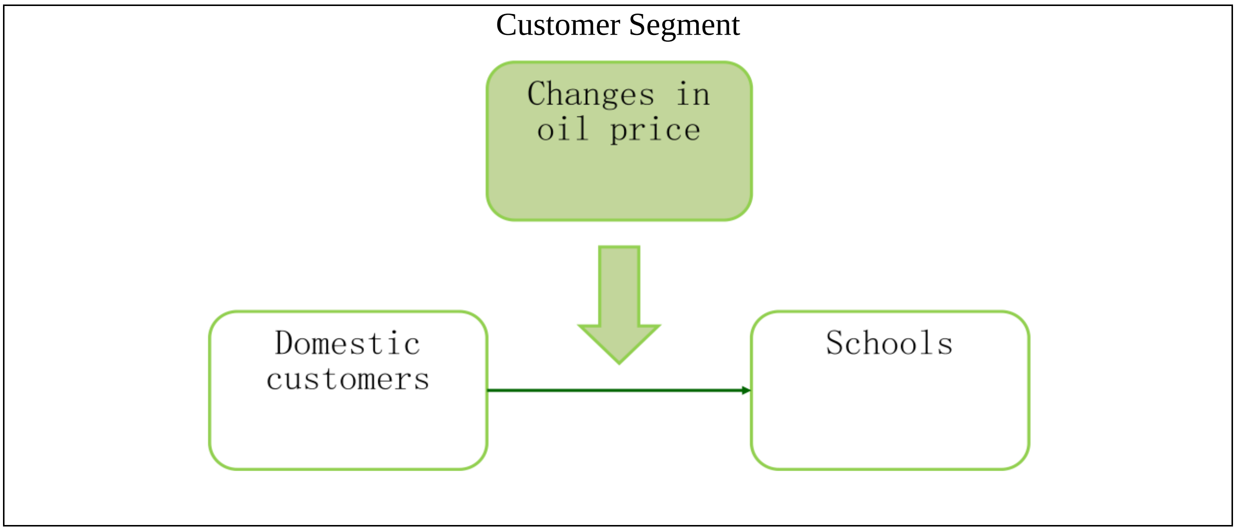
The value proposition of G was based on the promise to invest in the property of the customer with long-term energy saving when the customer is willing to switch from his current energy supplier to G. According to the founder the proposition was too broad and instead of holding on to the initial proposition the company focused on photovoltaic (PV). The main reason for the shift lies in the oil price which became very high and crashed back after a while as illustrated in Figure 60.

Figure 60: Chnages in value proposition (G)



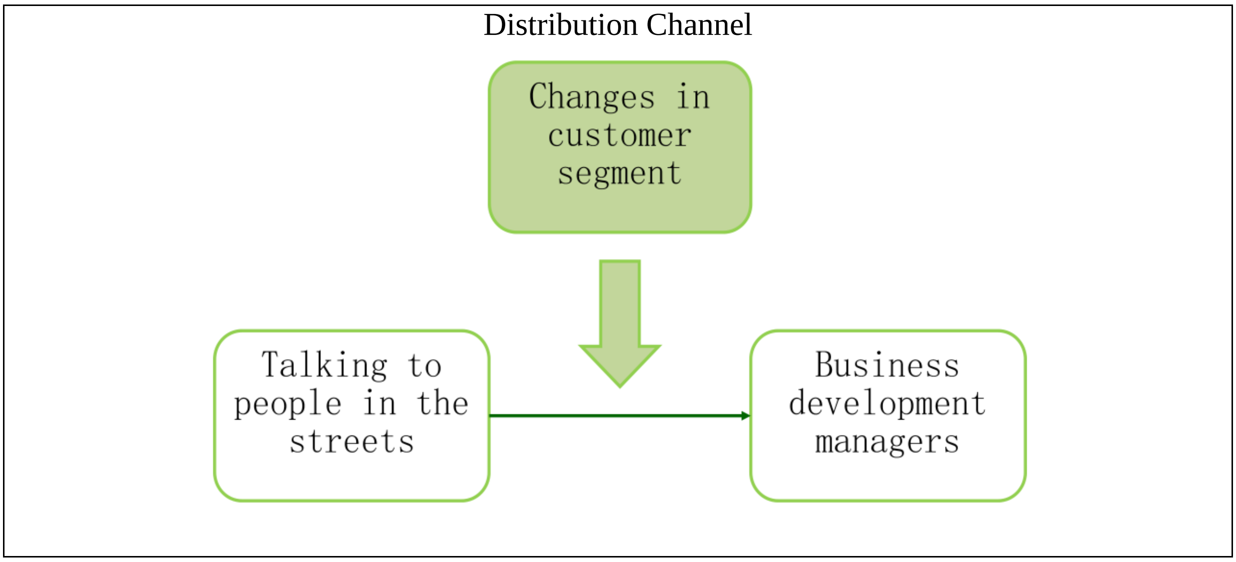
The change in the value proposition influenced the customer base in the sense that G moved away from domestic customers to schools (see Figure 61). Therefore, the customer segment changed due to the oil price.

Figure 61: Changes in customer segment (G)



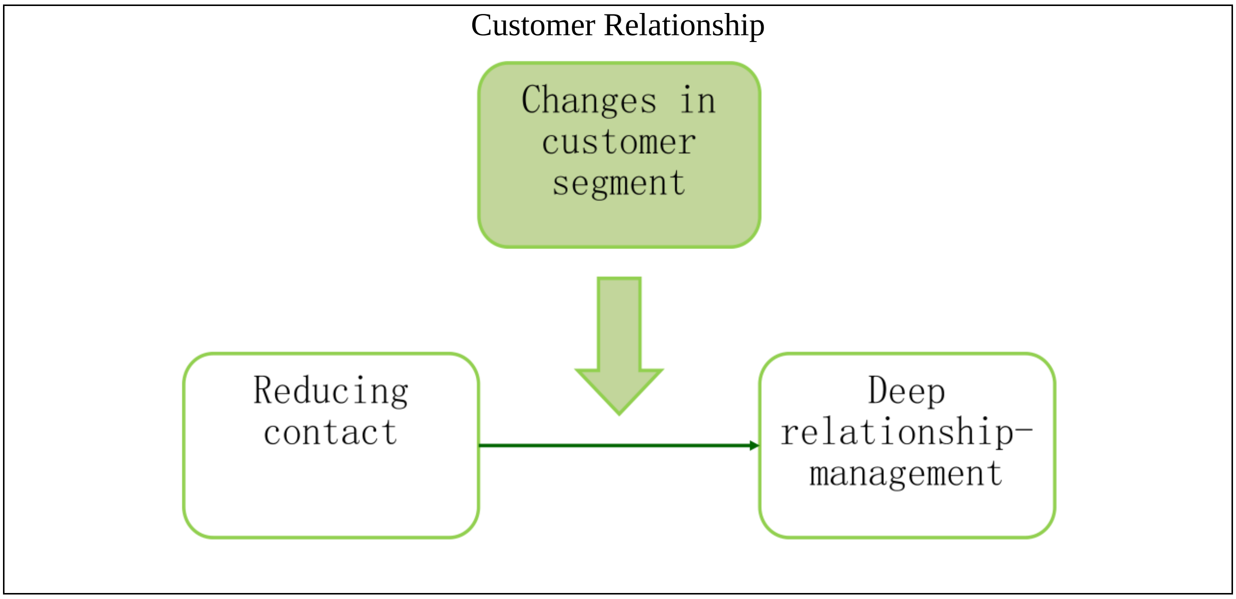
Subsequently, the shift in the customer segment led to a change in the distribution channel as presented in Figure 62. Firstly, G reached their customer through talking to people in the streets and performing other marketing activities commonly used in the B2C sector. By the time the customer segment changed the company was in need of business development managers and professional salespeople.

Figure 62: Changes in distribution channel (G)



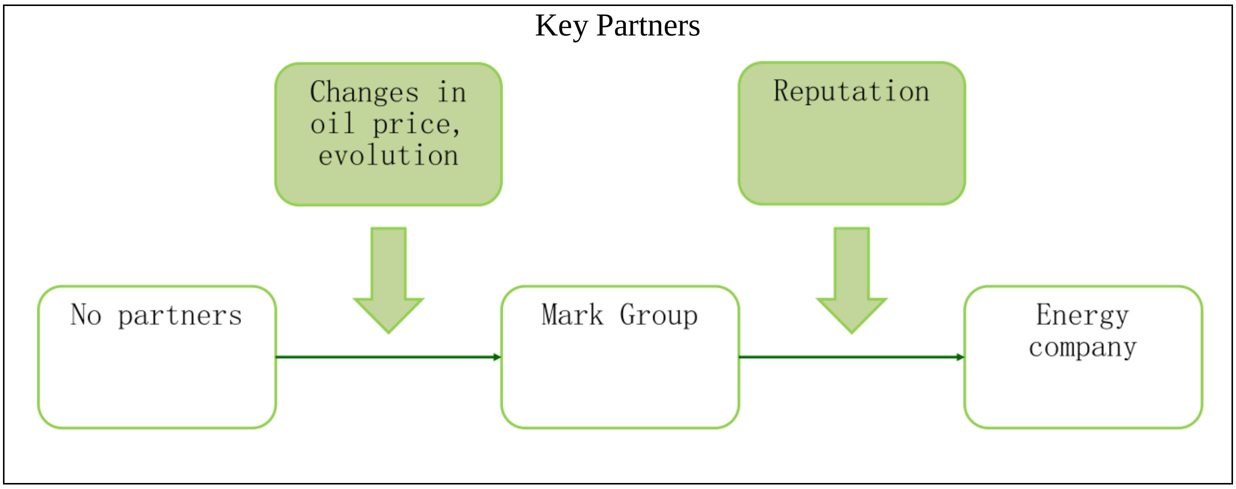
By changing the customer segment the customer relationship moved from reducing contact to a deeper relationship-management, since schools have other needs and requirements (see Figure 63). The intensive customer contact increased the associated costs.

Figure 63: Changes in customer relationship (G)



G had no partners when it was founded. After a while it found a well known partner in the Mark Group. Further, after improving their reputation G was able to establish another partnership with an energy company. The reasons for the changes can be explained in business evolution and the opportunity of redesigning the business model after the oil price dropped (see Figure 64).

Figure 64: Changes in key partners (G)



According to the entrepreneur G passed through different stages within the business model element of key activities. The company started with networking activities, later on the refinement of the value proposition was essential and finally the company moved to scaling-up activities. The mentioned trigger in both changes referred to the normal evolution cycle of a business as illustrated in Figure 65.

Figure 65: Changes in key activities (G)

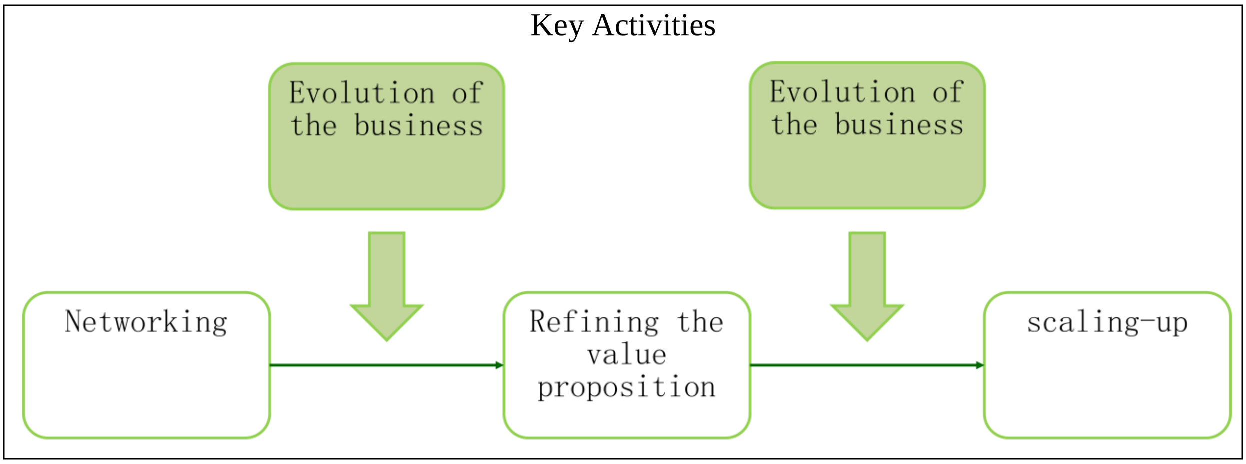
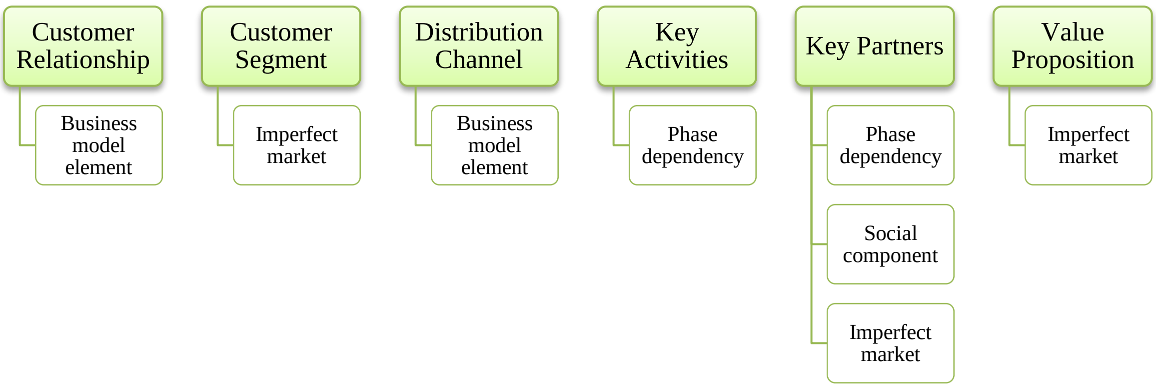


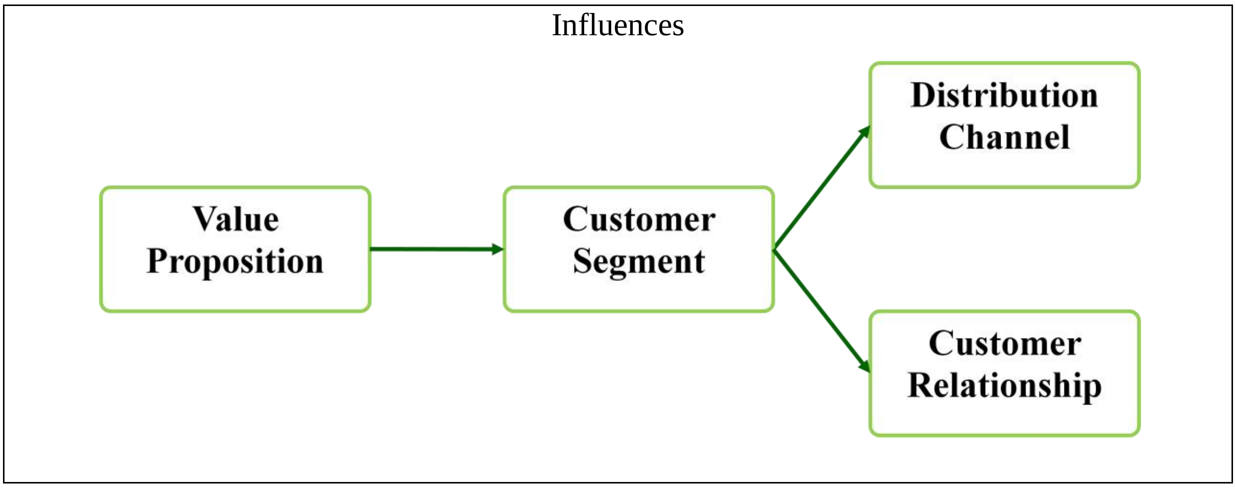
Figure 66 presents the coded reasons for the changes in G. Most commonly triggers observed are imperfect market, business model element and phase dependency. Notworthy is that five elements were triggered by only one reason in contrast the key partners by three.

Figure 66: Reasons in the case of G



In the case of G after the value proposition made a shift the company had to adjust their customer segment. The changes in the customer segment in turn influenced the distribution channel and the customer relationship since public institutions need a different treatment as domestic customers. The influences are summarized in Figure 67.

Figure 67: Influences of business model elements amongst each other (G)



In total six out of nine business model elements changed in the case of G. An interesting observation is that in five out of six elements the changes were caused by a single trigger.

B. Cross Case Analysis

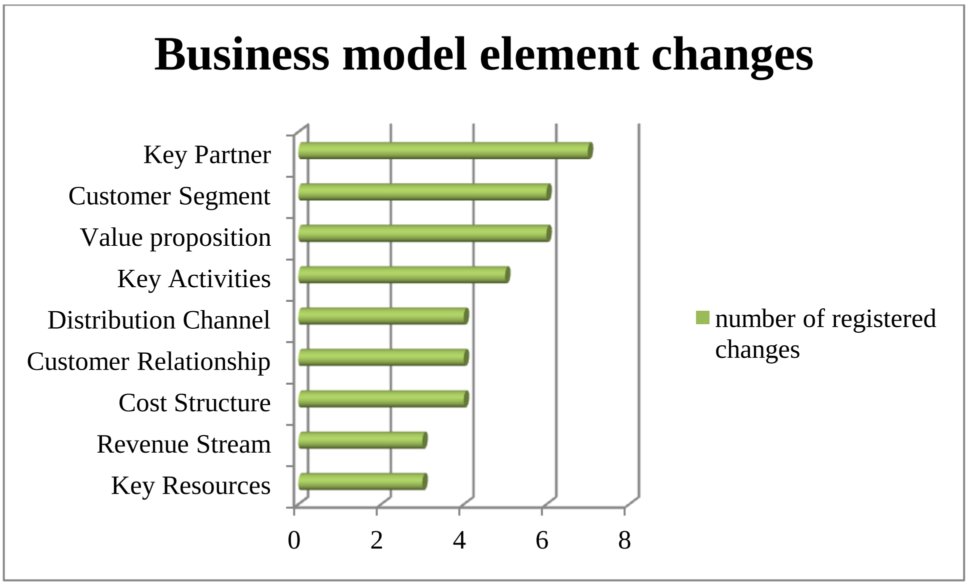
After the patterns within each case are identified the analysis moves on to the cross case examination. A cross-case analysis is conducted by identifying generalized patterns across cases (Eisenhardt and Graebner, 2007). Therefore, the cross case analysis contains information from all the cases.

The analysis starts with the investigation of the question which kind of elements are subject to change. Next, detailed reasoning is provided in order to answer why business model elements change. Finally, the influences of changing business model elements on other elements are investigated.

1. Changing Elements – "what"

In order to answer the research question it is important to know which elements are subject to change. Figure 68 shows a summary of all elements which changed in each analyzed company.

Figure 68: Frequency of changes in business model elements



The results of the analysis of the question ‘which elements are changing’ can be clustered into three groups as presented by the colors in Table 6. The clusters are empirically driven based on the co-occurrence in this study. First, key partners, customer segment, value proposition and key activities can be grouped together since they made up most of the changes within the interviewed companies. Second, customer relationship, distribution channel and cost structure represent the next group with five to four changes. Finally, three companies reported changes in key resources and revenue stream. In summary, the clusters disclose an order starting with stakeholder (partner and customers), followed by the product then the activities, and the way of delivering the value (distribution channel and customer relationship) including the cost structure. The order ends with the resources and revenue stream.

The first cluster reveals that the key partners, value proposition, customer segment and key activities elements are most frequently subject to change. In other words the essential matter is what kind of a value the company delivers, with whom and to whom and what activities are neede for that.

Table 6: Overview of changes throughout the companies

Company	KP	CS	VP	KA	CR	DC	Cos	KR	RS
A	x	x	x	x	x	x			x
B	x				x		x	x	
C	x	x	x	x			x		
D	x	x							x
E	x	x	x	x		x	x	x	
F	x	x	x	x	x	x	x	x	x
G	x	x	x	x	x	x			

Table 7: Legend fot table 6

	1. cluster		2. cluster		3. cluster

The results clearly illustrate that key partners is the only element which goes through changes in every company. A potential explanation for this is that almost all entrepreneurs start with no partners at all and as time passes by and the companies gain experience, knowledge, reputation and the according network, they start to establish partnerships and add partners to their business model.

The key partner element is followed by the customer segment which changed in six out of seven companies. As can be seen in Table 6 the value proposition and the key activities changed in all companies with the exception of B and D. The reasons for the missing change in both companies can be attributed to the thorough planning process the undertaken by the companies (according to the entrepreneurs). This is also the reason why B and D have the fewest changes in their business models, with only three changes in the model of D and four changes in the model of B. According to the entrepreneurs both companies had a clear understanding of the value which they wanted to offer and the rest of the business model was planned according to the desired value. Noteworthy is that both elements (value proposition and key activities) changed in the same companies. Consequently, the conclusion can be drawn that both elements are interdependend.

Next, the elements subject to change in four companies are customer relationship, distribution channel and cost structure. It should be noted that in three out of four cases customer relationship and the distribution channel changed. Therefore, interdependency can be presumed.

Furthermore, the results show that key resources and revenue stream changed in only three companies. From a critical point of view it is questionable that key resources were subject to change in only three companies. This is due to the importance of funding which is one of the main resources and especially essential in the birth phase. On the other side two companies namely D and A may still face these changes in the near future.

In terms of revenue stream D as well as F had to adjust the element due to internationalization of the company. In contrast to that, A had to adjust the revenue stream by increasing the price due to missing investments.

The cost structures changed in two companies in the growth stage and two in the birth phase. C and F were able to cut down costs. This is based on the focus on exploration activities during the birth phases, and exploitation activities on which a company focuses during later stages of the organizational life cycle. Moreover, E was able to reduce costs by introducing a new product which is less costly. In contrast to that B had to increase costs because of underestimation.

A, D and C reported to have started with a model which was too complex and had to step back during the business model creation. However, a conclusion is not clear from the data available.

Finally, it is noteworthy that although D, B, A and E are in the birth phase, the amount of changes differ since A and E report seven changes and D and B only four changes. Subsequently, the amount of changes can provide insights in the approach the company is following. Causation is associated with fewer changes what can be observed in the cases of B and D. In contrast, effectuation can lead to more changes as seen in the examples of A and E.

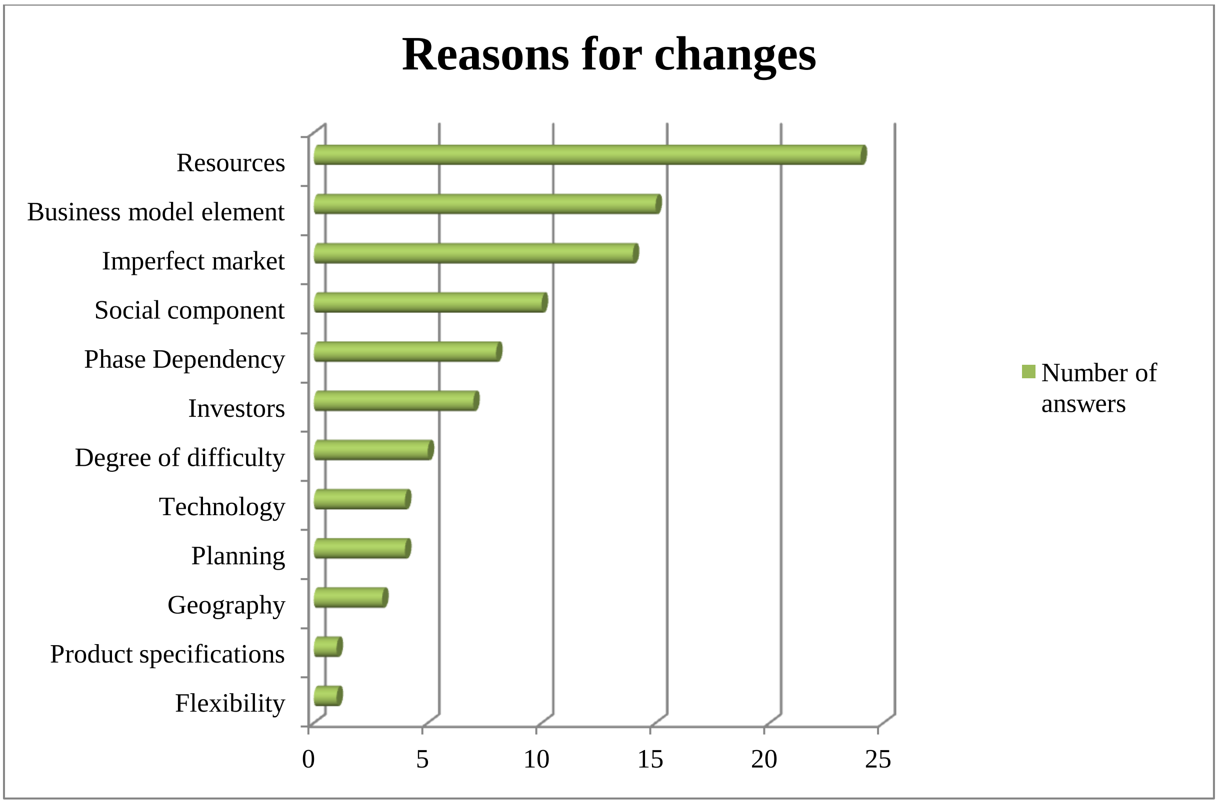
Companies interviewed in the growth stage namely C, F and G went through at least five to nine changes. Therefore it can be argued that the amount of changes differs between companies even in the same stage.

From Table 6 it can be concluded that all the elements are subject to change, especially key partners, customer segment, value proposition and key activities. Lastly, it can be inferred that the amount of changes differ from company to company even if they are in the same organizational life cycle stage.

2. Reasons for Change in General – "why"

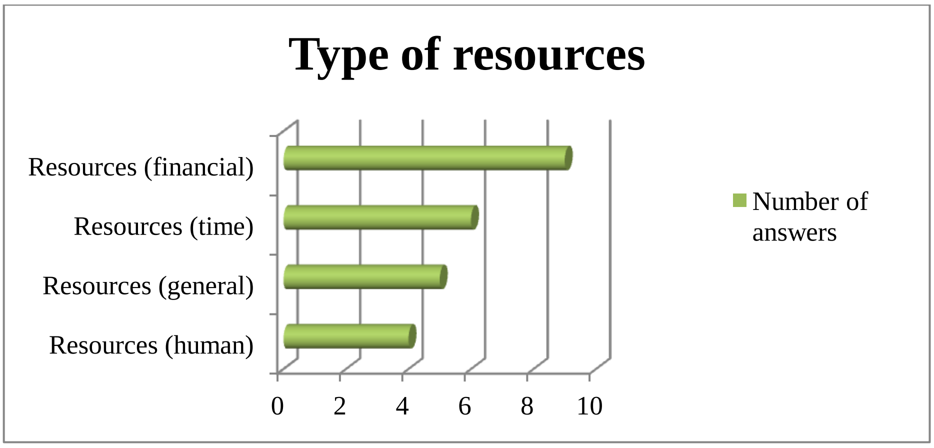
Coming closer to the answers of the research question the triggers for changes have to be identified. Figure 69 illustrates all reasons mentioned, arranged by frequency of occurrence.

Figure 69: Reasons for changes in business model elements



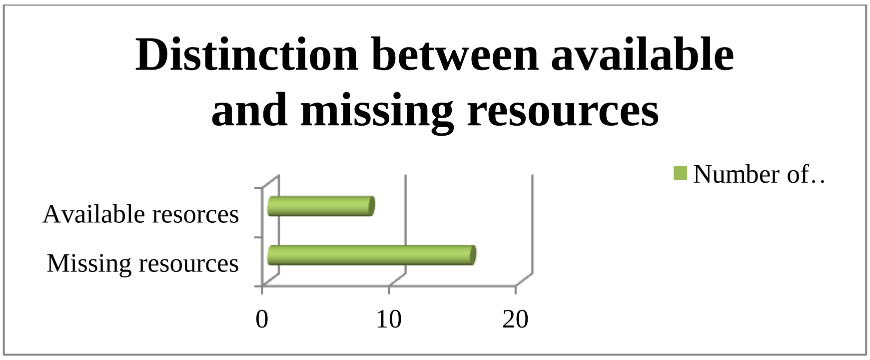
The most frequent reasons mentioned are resources, business model element and imperfect market as shown in Figure 69. First reported trigger for changes of a business model element are resources. This result seems plausible since resources are the most important driver during the start-up phase. According to the interviews the entrepreneurs had to adjust their business model to fit the available resources. This finding confirms the resource based view as well the argument by Penrose (1959) that resources are essential for promoting growth, or limitation of growth in the case of their absence. Financial resources are especially crucial for a start-up as stated by Martin and Justis (1993). In the case of breaking down the resources the vital nature of financial resources is confirmed, since financial resources are the type of resource mentioned most often. Financial resources are followed by resources of time, resources in general and human resources as illustrated in Figure 70.

Figure 70: Resources broken down by types



Another differentiation should be done in missing and available resources. As illustrated in Figure 71 changes were forced by missing resources in 16 business model elements and available resources created a shift in eight business model elements. This indicates that entrepreneurs are forced to change their business model according to missing or available resources.

Figure 71: Resources broken down by availability



The second most frequent reason is the change of another element in the business model. The best example of this is E, where due to the change in the value proposition the customer segment, distribution channel, key activities, key partners and key resources were subject to change themselves. Furthermore, a change of the cost structure caused changes in the customer segment, revenue stream and the value proposition.

The third most frequently mentioned answer is the imperfection of the market associated with reasons such as market reaction, acceptance, attractiveness, development, dynamics, entry barriers and others.

The following reasons are reported to appear from seven to ten times. For instance, the fourth most frequent cause is the social component which refers to elements of trust, awareness, reputation, credibility, interest and others. The social component is followed by phase dependency. This reason includes cases were key activities cannot be accomplished until a certain development occurs or until reaching a particular stage of the organizational life cycle. Moreover, the results offer an interesting insight concerning the investors who are mentioned seven times although the financial resources are of high significance for start-ups.

Other reasons brought up by the entrepreneurs are degree of difficulty, technology, planning, geographical reasons, product specifications and flexibility. Entrepreneurs reported the degree of difficulty[6] as a reason for changes. In that case the start-ups change their products or business model elements to simpler versions. It is worth stating that technology as a reason is mentioned by only three companies. In a technology oriented surrounding one would expect that technology would be more crucial.

Moving from the total overview to a more detailed approach, in the following sub-section the reasons for changes of each business model element are analyzed.

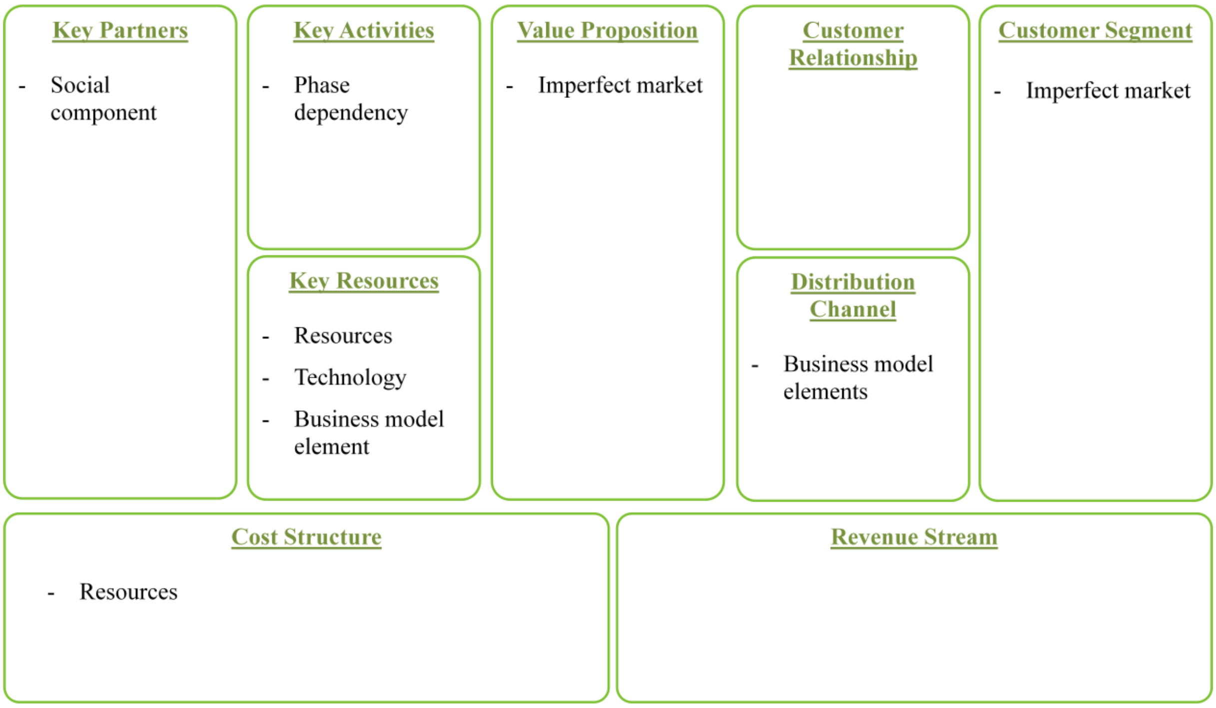
3. Reasons for Change in Detail - "why"

As shown in the diagrams attached in the appendix (Results on Individual Reasons) different reasons caused changes in single business model elements. However, only reasons which caused a change in more that 60 percent of the cases are discussed below.

According to the selection criteria, a total of three reasons are reported for key resources and cost structure, one reason for value proposition, one reason for distribution channel, customer segment, key activities and key partner. In contrast, no reason met the criteria for customer relationship and revenue stream. Figure 72 summarizes all reasons for changing single business model elements.

[6] The degree of difficulty includes the component of complexity as well as simplicity mentioned in the within-case analysis.

Figure 72: Summary of reasons causing changes in each business model element



First, the value proposition faced different changes throughout the cases due to the imperfection of the market. The imperfection of the market as a reason is mentioned in every company who reported a change.

The imperfection of the market also plays an essential role for the customer segment. In these cases, reasons such as market attractiveness, barriers and market development are mentioned. The social component, essential for dealing with people, is mentioned in the key partners block. In contrast to this, there is only one report on the social component changing the customer segment, based on the argument of missing credibility by C.

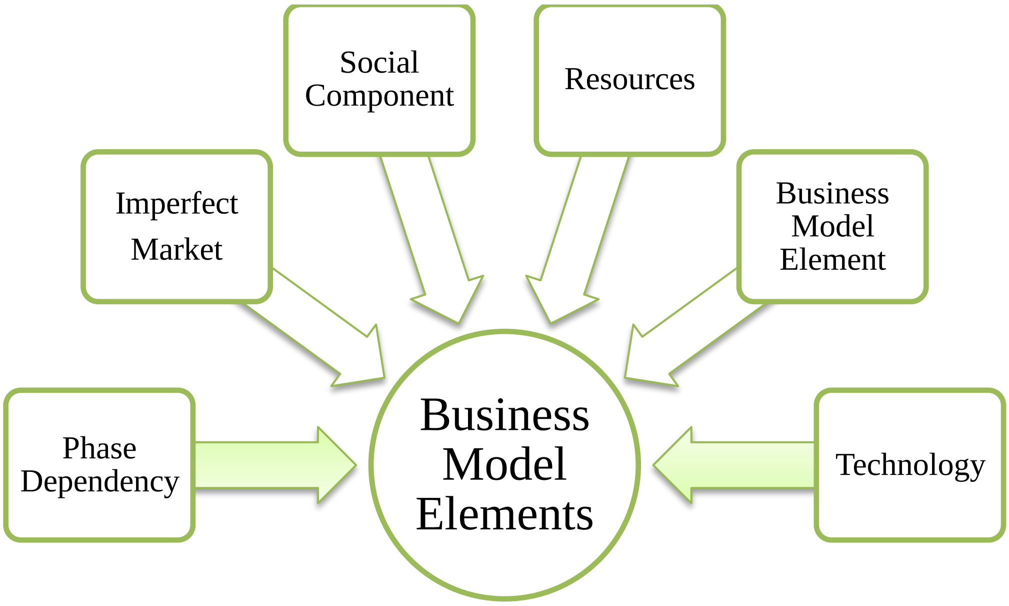
One reason which caused a change in the key activities was phase dependency, which is associated with the evolutionary process of a start-up. Some activities could not be performed at the beginning since a certain stage of development is required.

The distribution channel seems to be changing when other elements are subject to change This is due to the adjustments after a change in the value proposition or the customer segment presented in the within case analysis of G or E.

Resources are the reasons for changes of the cost structure and key resources in all companies who reported a change in these business model elements. Another influence on key resources is technology, as well as changes in other businesss model elements. In contrast to the business model elements mentioned so far, no single reason could meet the criteria for customer relationship and revenue stream.

Summarizing, triggers illustrated in Figure 73 are found to be most relevant for changes of business model elements.

Figure 73: Triggers of business model elements



As the analysis shows, a combination of factors causes change in the business model elements. As a result, it can be concluded that changes are based on a group of reasons and not single reasons.

In the following part the influences of certain business model elements on other business model elements are presented.

4. Influences

According to the interviewees, some business model elements influenced other business model elements. Additionally, a few entrepreneurs mentioned causal relationships. The observation of causal relationships is outside the scope of this research. In the following discussion both are treated as influencing elements.

The data from the analysis can be clustered into three groups. The first group consists of business model elements which influence many other elements, but in turn are influenced only by one business model element. The second group includes all business model elements which have a balance between influence and being influenced. Third group contains business model elements which are influenced by others but do not influence business model elements itself.

The first cluster is represented by key partners and key resources. Key partners are influenced by the value proposition as shown in Table 8. On the other hand, key partners can influence all other business model elements with the exception of key resources and key activities.

Table 8: Observed influences around key partners

Key Partners	
influences	are influenced by
- Value proposition (A) - Revenue stream (D) - Cost structure (D) - Customer segment (D) - Distribution channel (A) - Customer relationship (F)	- Value proposition (E)

According to the entrepreneurs key resources play an important role within the business model. The cross case analysis shows that key resources have an influence on different business model elements such as revenue stream, value proposition, key activities, cost structure and customer segment (see Table 9). In turn an influence on key resources by the value proposition could only be observed in two companies.

Table 9: Observed influences around key resources

Key Resources	
influences	are influenced by
- value proposition (C, A) - key activities (A) - revenue stream (A) - cost structure (B) - customer segment (F)	- value proposition (E, C)

The value proposition has a deep impact on the customer segment, and it can also have an influence on key resources, key partners and the cost structure.

Elements grouped in this cluster have a balance between influencing and being influenced. An interesting insight is that the value proposition and the customer segment influence four elements but totally different ones, as illustrated in the Table 10 and Table 11. In addition, both elements are influenced by the same elements namely key resources, key partner and cost structure.

Table 10: Observed influences around value proposition

Value Proposition	
influences	is influenced by
- Customer segment (A, C, E, G) - Cost structure (E) - Key resources (C, E) - Key partners (E)	- Key resources (A) - Key partner (C) - Cost structure (E)

As listed in the Table 11 the customer segment is further influenced by the value proposition, but only in one direction. No company reported an influence of the customer segment on the value proposition. Although the literature states that customer interaction is essential for companies, there is no evidence throughout all seven cases that the customer can influence the value proposition.

Table 11: Observed influences around customer segment

Customer Segment	
influences	is influenced by
- Customer relationship (G, A) - Distribution channel (G, E, A) - Key activities (E) - Revenue stream (F)	- Key resources (F) - Key partners (D) - Cost structure (E) - Value proposition (G, E, C, A)

Cost structure is reported to be influenced by the key partners, key resources and the value proposition (see Table 12). On the other hand the cost structure can also have an influence on the value proposition. Moreover, E mentioned an influence of the cost structure on the customer segment.

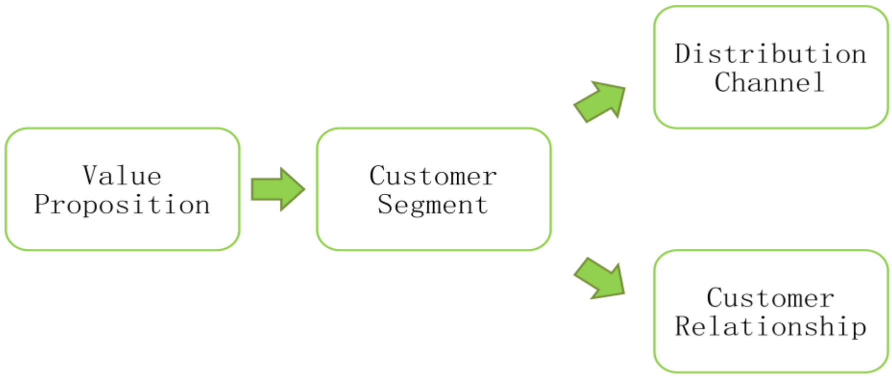
Table 12: Observed influences around cost structure

Cost Structure	
influences	is influenced by
- Value proposition (E) - Customer segment (E)	- Key partners (D) - Key resources (B) - Value proposition (E)

Finally, the last cluster consists of four elements namely customer relationship, distribution channel, revenue stream and key activities. All business model elements mentioned are common in that they do not influence other elements of the business model but in turn are influenced by key partners and the customer segment. Apart from the influence of key partners and customer segment, the revenue stream and the key activities have one additional influencing element in common, namely key resources.

Most of the influences noticed are based on examples which have happened in a single case. However, the influence of the value proposition on the customer segment is reported by four companies (A, C, E, G) and in turn an influence of the customer segment (G, A) on the distribution channel (G, E, A) and the customer relationship is noticed by at least two companies.

Figure 74: Influence of value proposition on other business model elements



To conclude from the cases mentioned above, there is evidence that the value proposition has a strong influence on the customer segment and the customer segment on customer relationship and distribution channel as shown in Figure 74.

The next section concludes the study by discussing the results, providing theoretical and practical implications as well as pointing out the limitations and suggestions for further research.

VI. Conclusion

The study is conducted in order to investigate the triggers for business model changes. Data from seven interviews is analyzed and coded. The results which were examined are discussed below. Next, theoretical and practical implications are presented. Lastly, limitations of the study are pointed out and propositions for further research are provided.

A. Results and Discussion

The present study has been conducted in order to answer the following research question:

"What are the reasons for changes of business model elements in technology oriented start-ups?"

The research question goes hand in hand with the following sub questions:

- What kinds of elements of the business model are subject to innovation?
- What kinds of interconnection exist between these business model elements?

In order to answer this question, first the results of the analysis of the elements which are subject to change ("what") are discussed; followed by a discussion about the reasons causing changes ("why") and the influences between the business model elements.

First, the study reveals which business model elements are most often subject to change namely key partners, value proposition, customer segment and key activities. The frequency could be explained through the fact that successful entrepreneurs first try to identify and define these four elements and plan the remaining elements according to the value proposition, customer segment, key partners and key activities.

An additional insight from the results is that throughout planning B and D did not have to change their value proposition, in contrast to all other companies. Furthermore, B did not change their defined customer segment. With these insights the conclusion can be drawn that D and B followed the causation approach. In contrast, it can be argued that all the other companies followed the effectuation approach. Therefore, an assumption can be made that based on the changes of the value proposition, companies can be differentiated into two groups either using the causation or the effectuation approach. The conclusion is vague since both companies are still in the birth phase and will probably face more changes in the future.

Next, the change in the customer segment is in accordance with Brettel, Strese and Flatten (2012) who states that entrepreneurs have to focus on customers; and Lee, Olson and Trimi (2012) who highlights the importance of co-creation of new products and values together with customers. In contrast, no single example could be found for the influence of the customer segment on the value proposition although the importance is highlighted by the literature.

In conclusion, it can be said that all the elements are subject to change and the frequency of changes within the company differs independently of their stage in the organizational life cycle. An assumption derived from these results is that the frequency of changes could act as an indicator for importance of the business model elements.

Second, three reasons causing business model change were reported most frequently, namely resources, business model element and imperfect market. The results confirm the vital role of the resources and the influence of the market. Business model element as a reason indicates that any time a change is happening the company has to pay attention to the business model and the business model elements influenced.

The social component is mentioned by entrepreneurs as a reason for changes in key partners of the business model. Therefore, while establishing partnerships the social component is one factor which should be thought of. This finding is confirmed by the literature which acknowledged the social capital and relationship as playing a significant role (Chetty and Campbell-Hunt, 2003; Elfring and Hulsink, 2003; Hanna and Walsh, 2002; Jarillo, 1989).

Other interesting findings are that technology seems not to cause changes in the value proposition but instead in the key resources and that phase dependency causes changes in the key activities. Finally, as presented by the results, the reasons causing changes usually occur in sets instead of as single elements.

Thirdly, the results of the analysis show that all the elements can be influenced by other elements. However, not all elements do influence others namely customer relationship, distribution channel, revenue stream and key activities.

The present research reveals that there is evidence for the influence of the value proposition on the customer segment, and of the customer segment on customer relationship and distribution channel. In summary the business models elements are influenced by several factors, even by other elements of the business model (interdependence). Consequently, reasons for change come more often in sets rather than alone.

The following sub-section describes the theoretical implications deriving from the results of the study.

B. Theoretical Implications

The research field of business models is still developing and there are no grand theories concerning the business model phenomena (Teece, 2010). This is especially true for the dynamic view on business models.

The literature review revealed a wide range of definitions of the business model. Consequently, a common understanding of the construct is missing which can be subject to rigorous analytical evaluations. Researchers use the terms business model change, business model evolution and business model innovation interchangeably. The business model is treated holistically without going into details and specifying the different dynamics.

Referring to the developed framework of business model change, business model evolution and business model innovation some entrepreneurs classified business model changes as business model evolution. For instance, F classified the expansion into other markets as business model evolution. Moreover, Cs, G and F reported to focus on exploitative activities such as scaling up or making it cheaper when their companies were growing. This also supports the argument that business model extension (Calvacante et al. 2011) goes hand in hand with the growth stage introduced by Miller and Friesen (1984). The trigger of phase dependency which represents the time component is closely linked to business model evolution.

The business model canvas developed by Osterwalder et al. (2005a) provides an opportunity to conduct micro level analysis of the changes. The present study based on in-depth case studies observed the changes in the business model elements, the triggers which cause changes and their consequent impact. Finally, the research observes frequencies and impacts of changes. The results reaffirm the practicability and usefulness of the business model canvas (Osterwalder et al. 2005a). However, the analysis of the typologies of changes (Waterman, Peters & Phillips, 1980; Beddowes & Wille, 1990) revealed some limitations of the business model canvas in the context of ignoring the organizational system, the organizational culture and the managerial style.

The results revealed an interconnected nature of the business model elements. In addition, the results confirm the importance of the market as already shown by other researchers (Phillips & Brice, 1988).

A contribution to the research field on entrepreneurship is made by showing the importance of key partners and the influence on other business model elements they have. Subsequently, the network component plays a vital role in the start-up phase (Powell, White, Koput, & Smith-Doerr, 2005; Walker, Kogut & Shan, 1997) which is confirmed by the present study. Moreover, the results highlight the significance of resources for start-ups confirming the resources-based view (Barney, Wright & Ketchen, 2001). As concluded from the results entrepreneurs focus on exploration activities in the birth phase and start to concentrate on exploitation activities when passing to the growth phase. According to Rosing, Frese and Bausch (2011) both activities are necessary to fulfill the innovation process.

Furthermore, the results are in line with Cavalcante et al. (2011) arguing not all changes lead to business model changes. This argument is reaffirmed through the case of D. Although, the company had to change its technology the change did not influence the business model elements.

The study confirms that the perfect business model is rarely designed in the early phase of an emerging business as stated by Teece (2010) since not a single investigated company remained without changes.

Finally, the statement by Demil and Lecocq (2010, p. 240) that the business model "is permanently in a state of transitory disequilibrium" finds support by the findings of this study. Companies in the birth phase B, A and E are still focusing on business model creation and adaptation. In contrast, companies in the growth stage C, F and G include extension activities. According to the interviewee from A the company went through several changes being in the birth stage. Comparable, more advanced companies such as C and F reported changes throughout all organizational life cycle stages the companies went through namely birth and growth. For instance, F decided to enter new markets after having success in Europe which led to changes in the business model. After a successful joint venture C was forced to change the business model as well. Consequently, the business model is adjusted according to the organizational life cycle as mentioned by Andries and Debackere (2007). These results confirm the business model life cycle developed by Morris, Schindehutte and Allen (2005) as well as business model change introduced by Cavalcante et al. (2011).

Going back to the typologies of changes in particular the developed typologies of business model changes based on Beddowes and Wille (1990) and Waterman, Peters and Phillips (1980) the results confirm that changes of almost all typologies occurred (Figure 2). An exception is the reduction of staff, which can be explained by the sample of start-ups that usually build up staff. As mentioned in the literature review and confirmed by the results no changes related to managerial style, organizational culture and organizational system could be identified.

The present research shows that different theoretical constructs play vital roles for different business model elements such as the resource-based view for the key resources, social capital for the key partners and the dynamic perspective for the key activities. According to the interviews the entrepreneurs had to adjust their business model to fit the available resources. This finding confirms the resource based view as well the argument by Penrose (1959) that resources are essential for promoting growth, or limitation of growth in the case of their absence. Therefore, researchers should also pay attention to analysis of single business model elements and not exclusively to the business model as a whole.

Even though the literature revealed the importance of including customers into the value creation process (Lee et al., 2012) there seems to be no evidence in any of the seven cases that the customer segment has an influence on value proposition. In contrast, the value proposition influences the choice of customers. An explanation could be that the entrepreneurs first start to think what value they want to deliver and then look for a customer segment that fits the created value. In addition, technology was not that significant as assumed for a technology start-up. Cosequently, technological start-ups are not strongly influenced by their technology or by the customers.

The study identified six triggers namely: phase dependency, imperfect market, social component, resources, business model element and technology. An important finding is that the business model element as a trigger itself can cause a chain reaction and force many other business model elements to change. This is the first scientific attempt to identify the triggers for business model change. An attempt to classify the triggers in general according to the five key dimensions introduced by Schindehutte at al. (2000) failed due to the reason of missing information. For classifying triggers identified in this study a further analysis with additional interviews is needed.

Concluding, it is important to distinguish between changes in general and business model changes, since this is not the same. Furthermore, a differentiation into business model change, business model evolution and business model innovation should be done when analyzing changes within the business model. Lastly, the business model element itself should be seen as a possible trigger.

Next practical implications deriving from the results of the study are presented.

C. Practical Implications

Apart from the theoretical contribution this study provides implications which can be used in practice.

Start-ups should not focus on single reasons from the inside or outside; instead they have to see the bigger picture. This is rooted in the observation that changes are caused by a group of reasons and not by single factors. Apart from that, the results of the study suggest that each business model element is changing due to different reasons such as resources and market imperfection, the two most frequently reported.

Apart from focusing on the bigger picture entrepreneurs should seek for simpler solutions and avoid complexity. In this case the entrepreneurs should spend more time on developing the value proposition, defining the customer segment and establishing partnerships (key partners). According to the results a change within the value proposition can be avoided by thorough planning beforehand. However, the entrepreneurs should not cling on the defined business model elements; instead they should stay flexible and acknowledge that everything can be subject to change.

A further implication derived from the results is that there is particular order between the value proposition and the customer interface, starting with the value proposition which influences the customer segment. The customer segment in turn influences the distribution channel and the customer relationship. Following this logic an entrepreneur should not start with defining customer relationships or the distribution channel before defining the customer segment.

Moreover, after a change in the business model the remaining elements of the company's business model should be adjusted. This is due to the discovery that business elements can have an influence on other business model elements.

In addition to the implications for entrepreneurs the results of the study suggest to other players such as incubants, consultants, educational institutions and the government that not only financial support is of importnance but also the access to a wide network with various players.

In a nutshell, successful start-ups have to remain flexible regarding their plans and business model. Entrepreneurs should recognize the influence of other business model elements and their interdependencies.

D. Limitations and Further Research

There are several limitations which should be addressed regarding this study. One limitation consists of the sample of seven companies. Relying on this sample makes it very difficult to derive general conclusions. Industry differences cannot be analyzed since the study focuses on one single industry. In addition, the focus of this study is on start-ups. Therefore, the conclusions cannot be applied easily to large organizations.

Another limitation can be seen in the usage of non-standardized research methods, which tend not to be repeatable. According to that, the information gathered reflects reality at a particular time and the situation analyzed could be subject to change (Marshall & Rossman, 1989). To avoid a lack of reliability, a thorough data collection process supported by memos and transcripts has been carried out. Thus, large-scale surveys with companies based on this research should be conducted in order to verify the results.

The subjectivity of the analysis could be a limitation. In order to achieve objectivity, two additional researchers have been asked to verify the coding and validate their conclusiveness and logic. Furthermore, the subjective view of one interviewer per company is overcome by including publicly available information.

Concerning further research the study shows that different theoretical constructs play vital roles for different business model elements such as the resource-based view for the key resources, social capital for the key partners. These findings could be expanded by an investigation of underlying concepts for each business model element in order to bring a structure into the research field of business models and their elements.

The terms business model change, business model evolution and business model innovation are used interchangeable in the current literature. Therefore, the terms need to be clearly defined and criteria need to be developed in order to separate them and avoid mistakes by interchanging the the terms.

Since the customers do not influence the value proposition and the technology does not play an essential part further investigation could analyse the underlying concept moving cleantech start-ups. A possible idea is the strong orientation on the value and the goal of providing clean technology.

In addition, it is interesting to know that there are some interdependencies between the business model elements, as observed between the value proposition and customer segment as well as customer segment and distribution channel and customer relationship. A research on influences between the business model elements should be done in roder to get more insights into the dynamics between the elements.

The results of this study, in particular the triggers, should be tested using quantitative studies on their significance. In addition, the vague assumption about the change in value proposition and the possible subdivision into entrepreneurs following the causation approach and others who follow the effectuation approach has to be tested.

Moreover, an analysis should be done for each stage of the business model evolution in order to find differences and similarities between the stages. This could also help to develop criteria which would assist for classifying companies into business model evolution stages. A camparison with large organizations could also be carried out as a means to analyze the difference to start-ups.

Another interesting path for further research is the comparison across industries but also gender related analysis. Do female entrepreneurs undergo more changes than male or vice versa? Additionaly, how the entrepreneur perceives the triggers is an interesting direction for further research. Does the entrepreneur see the trigger as positive or negative and what kind of reaction follows.

Finally, further research shoud aim to provide a holistic understanding of the business model concept and its underlying logics as well as a sophisticated theoretical basis from which testable hypotheses can be derived.

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Appendix

A. Summary of Case Studies on Business Models

Authours	Companies	Industries	What was observed?
Silviya Svejenova, Marcel Planellas and Luis Vives (2010)	Ferran Adria	gastronomy	What, why and how changes
Muhammad Yunus, Bertrand Moingeon and Laurence Lehmann-Ortega (2010)	Grameen bank	social business (mobile phone, water services, yoghourt)	gradual development
Benoıt Demil and Xavier Lecocq (2010)	Arsenal FC	football/entertainment	business model evolution
Marc Sosna, Rosa Nelly Trevinyo-Rodrı ´guez and S. Ramakrishna Velamuri (2010)	Naturhouse	wholesale/retail	business model innovation in established firms
Panos Desyllas, Mari Sako (2012)	Pay-As-You-Drive auto insurance	insurance	how a firm profit from business model innovation
Valerie Sabatier, Vincent Mangematin and Tristan Rousselle (2010)	Betwin; OpteX; Emics; OphSmart	biopharmacy/biotechnology	concept of a business model portfolio
Yves L. Doz and Mikko Kosonen (2010)	Nokia, easyGroup, HP, SAP and Kone	ICT; mobile telecom; easyGroup usess a theoretical business model and applies it in different industries; elevator and escalator industries	leadership actions needed to be able to renew and transform business models
Bernd W. Wirtz, Oliver Schilke and Sebastian Ullrich (2010)	MySpace; Wikipedia;	web 2.0	illustrate the differential effect of environmental changes on different business model types
Henry Chesbrough (2010)	Xerox;	ICT	barriers to business model innovation

Joakim Björkdahl (2009)	SKF; Beta; Alfa Laval	ICT	This paper explores how the integration of Information and Communication Technologies (ICTs) into the technology base of a product can open up new sub-spaces in the existing technical performance and functionality space
Michael Morris, Minet Schindehutte, Jeffrey Allen (2005)	Southwest Airlines	airline companies	six-component framework is proposed for characterizing a business model
Ramon Casadesus-Masanell and Joan Enric Ricart (2010)	Ryan Air; Telmore/TDC; Metro	mobile telecom; airline companies; newspapers	seperation and relation of concepts of strategy and business models
Muriel Wilson-Jeanselme, Jonathan Reynolds (2005)	easyJet	ICT	Internet Business Models: analysis of the causes of the transaction profitability problem and then goes on to propose a generic strategic solution
CHRISTOPH ZOTT and RAPHAEL AMIT (2001)	Autobytel.com ; Cyberian Outpost; Ricardo.de and other e-businesses	e-businesses	explore the theoretical foundations of value creation in e-business
Christoph Zott and Raphael Amit (2009)	Ebay; Inditex (Zara); and others	retail; e-business;	system of activities performed by the focal firm as well as by third parties
G.T. LUMPKIN GREGORY G. DESS (2004)	Eli Lilly and other e-businesses	e-businesses	how companies are leveraging the unique features of digital technology to create competitive advantages
Jonas Hedman and Thomas Kalling (2003)	anonymised	Multi-national Manufacturing	explaining the relation between IS and strategy
Peter J. Williamson (2010)	Shanghai Zhenhua Port Machinery; Haier refrigeration; and others	harbour machinery; wine-stor-age refrigerators;	working methods of low cost business models

B. Relation of busines model change and the typologies by Beddowes and Wille (1990) and Waterman, Peters and Phillips (1980)

Type	Sub-categories	Connected business model elements
Organizational	Structure	Infrastructure management - Key partners - Key activities - Key resources Customer interface - Customer segment - Distribution channel - Customer relationship
	System	Supports the business model
	Culture	Not covered by the business model
Business Strategy	Market led issues	- Customer segment - Value proposition
	Technology	Indirect connection to the value proposition of the company
	Entrepreneurial-creative	Relates to business model innovation as an outcome
Economics	Cost cutting	Finacial aspects: - Cost structure - Revenue stream
	Staff reduction	Key resources
	Productivity	Not covered by the business model
People Issues	Staffing within the organization	- Key resources in form of human resources
	Skill requirements	
Managerial Style	Work approach and relationship	Not covered by the business model

C. Sources used for Data Collection

A:	
B:	
C:	
D:	
E:	
F:	
G:	

D. Questionnaire Guide

Short Description of the research project:

The main focus of the research project is to contribute to the research on business model innovations that can help new smart clean tech companies to successfully commercialize their technology in the market. A case sheet on the participating company will be developed beforehand by the researcher. After that, an interview of about 45 min - 1 hour will be conducted with one of the founders or someone who has a deep understanding of the company's business model. Finally, the reasons for business model changes will be analyzed. The results of this analysis will be shared with the participant. All the information collected will be treated with utmost confidentiality and if published in an Entrepreneurship or Strategic Management academic journal, the participant approval will be sought well in advance.

Questionnaire in short:

<table>
<tr><td rowspan="2">Key Partners</td><td>Key Activities</td><td rowspan="2">Value Proposition</td><td>Customer Relationship</td><td rowspan="2">Customer Segments</td></tr>
<tr><td>Key Resources</td><td>Distribution Channel</td></tr>
<tr><td colspan="3">Cost Structure</td><td colspan="2">Revenue Stream</td></tr>
</table>

Product	**Infrastructure Management**	**Customer Interface**	**Financial Aspects**

- How did each single element look like at the beginning?
- How and why did each single element change over time?
- Why a particular incident happened? (story and the series of events which led to the changes, especially the reasons for the change)

- Did the change influence the other elements such as customer segment, distribution channels, customer relationships, revenue stream, key partners, key activities, key resources, cost structure?

Detailed Questionnaire:

Business Model in general:

- What does Business Model mean to you?

Value Proposition:

- What was your value proposition when you started the company?
- How and why did it change over time? Why a particular incident happened? (story and the series of events which led to the changes, especially the reasons for the change)
- Did the change influence the other elements such as customer segment, distribution channels, customer relationships, revenue stream, key partners, key activities, key resources, cost structure?

Customer Segments:

- For what customer segment was the initial value proposition intended?
- How and why did it change over time? Why a particular incident happened? (reasons for the change)
- Did the change influence the other elements such as value proposition, distribution channels, customer relationships, revenue stream, key partners, key activities, key resources, cost structure?

Distribution Channel:

- How did you deliver the value to the customers? (distribution channel)
- How and why did it change over time? Why a particular incident happened? (reasons for the change)
- Did the change influence the other elements such as value proposition, customer segments, customer relationships, revenue stream, key partners, key activities, key resources, cost structure?

Customer Relationship:

- What kind of relationship did you implement at the beginning?
- How and why did it change over time? Why a particular incident happened? (reasons for the change)
- Did the change influence the other elements such as value proposition, customer segments, customer relationships, revenue stream, key partners, key activities, key resources, cost structure?

Revenue Stream:

- What kind of revenue streams did you have at the beginning?
- How and why did it change over time? Why a particular incident happened? (reasons for the change)
- Did the change influence the other elements such as value proposition, customer segments, distribution channel, customer relationships, key partners, key activities, key resources, cost structure?

Key Activities:

- What kind of key activities did you rely on at the beginning in order to deliver the value proposition to the customers?
- Was a change within your key activities noticeable? How and why did it change over time? (reasons for the change)
- Did this change influence the other elements such as value proposition, customer segment, distribution channels, customer relationships, revenue stream, key partners, key resources, cost structure?

Key Resources:

- What kind of key resources did your business require at the beginning?
- Was a change within your key resources noticeable? How and why did it change over time? (reasons for the change)
- Did this change influence the other elements such as value proposition, customer segment, distribution channels, customer relationships, revenue stream, key partners, key activities, cost structure?

Key Partners:

- What key partners did you have at the beginning?
- Was a change within your key partners noticeable? How and why did it change? (reasons for the change)
- Did this change influence the other elements such as value proposition, customer segment, distribution channels, customer relationships, revenue stream, key resources, key activities, cost structure?

Cost Structure:

- How did the cost structure look like?
- How and why did it change over time? Why a particular incident happened? (reasons for the change)
- Did the change influence the other elements such as value proposition, customer segments, distribution channel, customer relationships, revenue stream, key partners, key activities, key resources?

E. Coding

Interview	Interviewpartner	Block	Code in open coding	Code in axial coding (concepts)	Code in selective codíng (categories, themes)
1	Liad	CR	limited resources and limited time	economy of time and resources	resources (time)
1	Liad	DC	put efforts on selling networks especially when resources are scarce	economy of efforts	resources
1	Liad	DC	spending same time on selling one unit as selling one network	economy of time	resources (time)
1	Liad	KA	add on as a progress but you not start with	enlarge activities as progress	phase dependency
1	Liad	KA	prioritize time	economy of time	resources (time)
1	Liad	KP	get more finance	need to raise capital	resources (financial)
1	Liad	KP	to get more reputation and create awareness	reputation and awareness	social component
1	Liad	RS	missing investments	financial bottleneck	resources (financial)
1	Liad	RS	investments gonna take time so have to compensate with raising the price	compensate financial bottleneck with raising prices	resources (financial)
1	Liad	VP	put my efforts in selling networks and not selling single essences	economy of efforts	resources (human)
1	Liad	CS	designed to work in a network and not as single units	characteristics of the product	product specifications
1	Liad	CS	resources available to you	availability of resources	resources
1	Liad	CS	resources we need to execute one deal	availability of resources	resources

1	Liad	CS	funding for a campaign	availability of financial resources	resources (financial)
1	Liad	VP	spending the same time on selling one sensor than selling one network	economy of time	resources (time)
1	Liad	CS	invest time on the right partners	effective time utilization	resources (time)
1	Liad	KA	activites depend on the investments	availability of financial resources	resources (financial)
2	Kolmsee	CR	too much work	human resources	resources (human)
2	Kolmsee	CoS	understimated time engineers need to complete a task	lack of information for planning	planning
2	Kolmsee	CoS	underestimated the general knowledge about the electrical system	technological difficulty	technology
2	Kolmsee	CR	overestimated the willingness of potential partners to receive help and information in our product	lack of willingness to help and provide information	social component
2	Kolmsee	KR	look for experts	human resources	resources (human)
2	Kolmsee	KP	interested in cooperating	lack of interest	social component
2	Kolmsee	KR	understimated time engineers need to complete a task	lack of information for planning	planning
2	Kolmsee	KR	underestimated the general knowledge about the electrical system	lack of information about technology	technology
3	Malte	Cos	focus on research instead of manufacturing	focus on research	phase dependency
3	Malte	Cos	unit costs for prototype is not important	prototype without focusing on costs	phase dependency
3	Malte	Cos	focus is on the product which is sellable	focus on sellable product	phase dependency

3	Malte	Cos	find a workable sollution for a problem	focus on workable sollution	phase dependency
3	Malte	Cos	different focus: first make it work and after make it cheap	depends on the phase the start-up is in	phase dependency
3	Malte	CS	missing resources and processes	resource scarcity and missing processes	resources
3	Malte	CS	change in VP	value proposition	business model element
3	Malte	CS	changing the customer segment because of easiness	change due to easiness	degree of difficulty
3	Malte	CS	market for electric motors more attractive	market attractiveness	imperfect market
3	Malte	CS	underdeveloped market	market development	imperfect market
3	Malte	CS	easy market entry	market barriers	imperfect market
3	Malte	CS	market attractiveness	market attractiveness	imperfect market
3	Malte	CS	easier market entry into other market segments	market barriers	imperfect market
3	Malte	CS	missing credibility	lack of credibility	social component
3	Malte	DC	change in VP	value proposition	business model element
3	Malte	DC	change in key partners	key partners	business model element
3	Malte	KA	changes cased by technological shift	technological shift	technology
3	Malte	KP	sell large volume you need some credible manufacturing partner	large volume requires credible manufacturers	social component

3	Malte	KP	need a partner with experience	experienced partner	social component
3	Malte	KP	partner with credibility, knowledge and resources	requirements on credibility, knowledge and resources	social component
3	Malte	KP	to industrialize our motors	industrialization of the product	phase dependency
3	Malte	KP	difficulty of establishing a partnership for start-ups because not ripe enough, not mature enough to actually have a partner	immaturity of start-ups	phase dependency
3	Malte	KP	easiness to deal with start-ups, when you are a start-up	start-up partners easier for start-ups	phase dependency
3	Malte	KP	changing demands	advancing requirements	phase dependency
3	Malte	KP	assurance that volume can be delivered and quality is consistent	requirements on quality and increasing volume	phase dependency
3	Malte	KR	change in the VP	value proposition	business model element
3	Malte	KR	change in VP	value proposition	business model element
3	Malte	KR	change in VP	value proposition	business model element
3	Malte	KR	change in human resources	key resources	business model element
3	Malte	KR	change in the VP	value proposition	business model element
3	Malte	KR	changes cased by technological shift	technological shift	technology
3	Malte	VP	change in key partners	key partners	business model element

3	Malte	VP	too complicated	complexity	degree of difficulty
3	Malte	VP	market acceptance	market acceptance	imperfect market
3	Malte	VP	failed to enter the market	market entry	imperfect market
3	Malte	VP	offer wasn’t right	wrong offer	imperfect market
3	Malte	VP	electric vehicles is an attractive market for investors	market attractiveness for investors	imperfect market
3	Malte	VP	selling electric motors into electric and hybrid-electric-vehicle-market a very nice story	market attractiveness	imperfect market
3	Malte	VP	in search for a convincing proposition to attract investors	convincing proposition (it's more about investors)	investors
3	Malte	VP	market more tangible for investors	tangibility for investors	investors
3	Malte	VP	nice story for better funding	convincing story to attract investors	investors
3	Malte	VP	naivety according the easiness of building a system	lack of information for planning	planning
3	Malte	VP	lack of expernience and expertise	lack of experience	social component
3	Malte	VP	missing credibility	lack of credibility	social component
4	Frank	CS	demands of other market players	market barriers	imperfect market
4	Frank	CS	demands of other market players	market barriers	imperfect market
4	Frank	CS	easier market entry	market barriers	imperfect market

4	Frank	CS	power of other market players	market barriers	imperfect market
4	Frank	CS	easier market entry	market barriers	imperfect market
4	Frank	KP	change in revenue stream	revenue stream	business model element
4	Frank	KP	growth of company and partners	growth	phase dependency
4	Frank	KP	missing reputation	reputation	social component
4	Frank	KP	shift from a national to an international focus	geographical expansion	geography
4	Frank	KP	need of partners with reputation	reputation	social component
4	Frank	RS	influence of VC on the strategy	venture capitalist	investors
4	Frank	VP	from complexity to basics	simplification	degree of difficulty
4	Frank	VP	concentrate on just charging	breaking down the complexity	degree of difficulty
4	Frank	VP	slow development of the market	market development	imperfect market
4	Frank	VP	following a plan	plan	planning
4	Frank	VP	following a plan	plan	planning
5	Yariv	CS	change in the value proposition	value proposition	business model element
5	Yariv	CS	change in costs	cost structure	business model element

5	Yariv	VP	change in costs	cost structure	business model element
5	Yariv	VP	simplicitiy of new product	simplicity	degree of difficulty
5	Yariv	VP	complexity of old product	complexity	degree of difficulty
5	Yariv	VP	simplicitiy of new product	simplification	degree of difficulty
5	Yariv	VP	attain market dominance	market dominance	imperfect market
5	Yariv	CS	new venture capitalist	venture capitalist	investors
5	Yariv	CS	experience of the venture capitalist	venture capitalist	investors
5	Yariv	DC	change in the value proposition	value proposition	business model element
5	Yariv	DC	change in the value proposition	value proposition	business model element
5	Yariv	DC	new methodology applied by the new venture capitalist	venture capitalist	investors
5	Yariv	DC	experience of the venture capitalist	venture capitalist	investors
5	Yariv	KA	change in the value proposition	customer segment	business model element
5	Yariv	KA	influence of the VC	venture capitalist	investors
5	Yariv	KP	new value proposition	value proposition	business model element
5	Yariv	KP	new venture capitalist	venture capitalist	investors

5	Yariv	KR	change in the value proposition	value proposition	business model element
5	Yariv	RS	change in costs	cost structure	business model element
5	Yariv	VP	experience of the new VC partner	venture capitalist	investors
5	Yariv	CoS	decrease of costs	financial benefit	resources (financial)
5	Yariv	KR	new VC partner with a sizable investment	financial resources	resources (financial)
5	Yariv	VP	shorten time-to-market and attain dominance in specific sectors	shorten time-to-market	resources (time)
6	Ajay	VP	high costs	financial resources	resources (financial)
6	Ajay	KP	access to fabrications	resources	resources
6	Ajay	CS	different requirements worldwide	geographical requirements	geography
6	Ajay	CS	dynamics of the installer market	market dynamics	imperfect market
6	Ajay	CS	market development	market development	imperfect market
6	Ajay	CS	industry dynamics	market dynamics	imperfect market
6	Ajay	VP	drive consumer demand	attract customer	imperfect market
6	Ajay	VP	market dictates need for technological development	market development	imperfect market
6	Ajay	CoS	gained opportunity through time and experience	time and experience	phase dependency

6	Ajay	CR	global certifications	reputation	social component
6	Ajay	CR	competetive advantage	competetive advantage	imperfect market
6	Ajay	DC	easiness	simplification	degree of difficulty
6	Ajay	CoS	cost reduction	financial benefit	resources (financial)
6	Ajay	DC	advantage of large quantities	financial benefit	resources (financial)
6	Ajay	DC	efficincies through large quantities	efficiencies	resources (financial)
6	Ajay	KA	evolution	evolution	phase dependency
6	Ajay	KA	global certifications	competetive advantage	imperfect market
6	Ajay	KA	benefit for customers	competetive advantage	imperfect market
6	Ajay	KP	partner with market forces	key partner	business model element
6	Ajay	KP	certifications	reputation	social component
6	Ajay	KA	outsourcing to partners	economy of time and resources	resources
6	Ajay	KP	differentiation	competetive advantage	imperfect market
6	Ajay	KP	benefit for customers	competetive advantage	imperfect market
6	Ajay	KR	enter a new market	market entry	imperfect market

6	Ajay	KR	access to talent, people and human resources	human resources	resources (human)
6	Ajay	RS	revenue from different geographical locations	geographical location	geography
7	Ian	CS	rising oil price	market development	imperfect market
7	Ian	VP	rising oil price	market development	imperfect market
7	Ian	CS	no demand	market development	imperfect market
7	Ian	KA	evolution	evolution	phase dependency
7	Ian	KP	evolution	evolution	phase dependency
7	Ian	DC	change in customer segment	customer segment	business model element
7	Ian	CR	change in customer segment	customer segment	business model element
7	Ian	KP	rising oil price	market development	imperfect market
7	Ian	KP	reputation	reputation	social component

F. Coding for available and missing resources

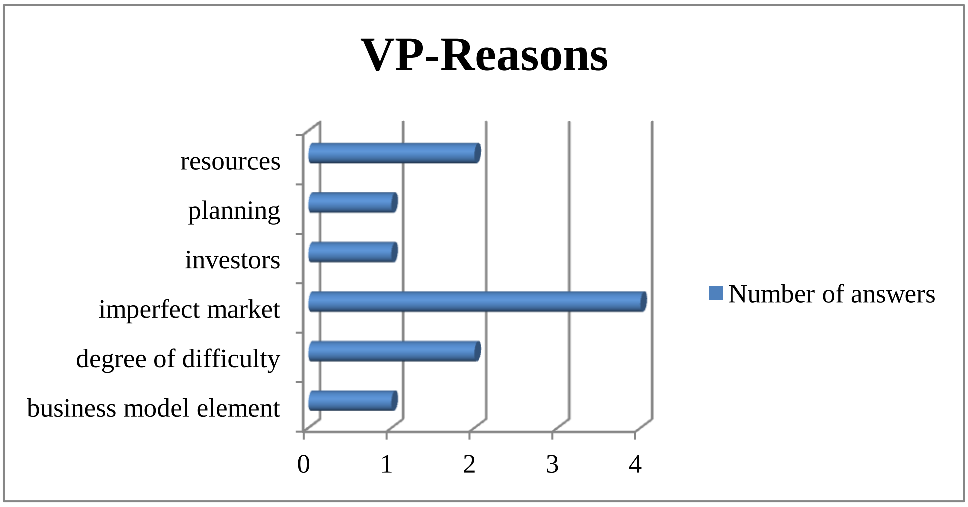
	Missing resources		Available resources

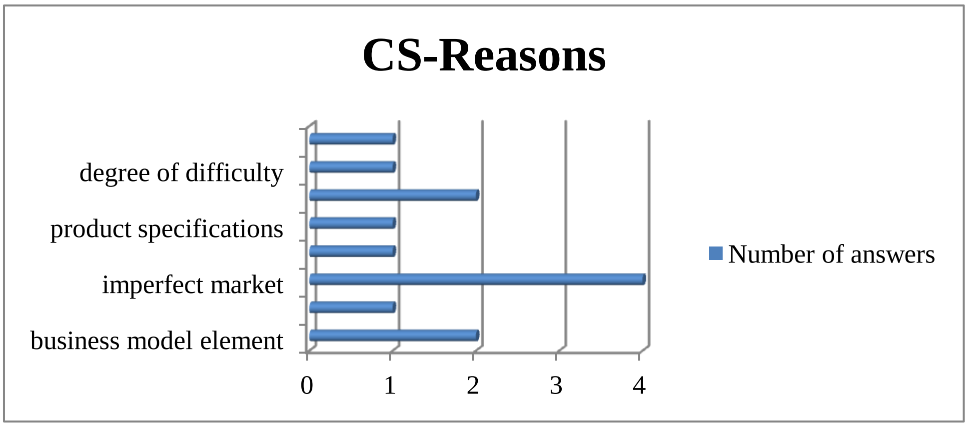
Interview	Interviewpartner	Block	Code in selective codíng (categories, themes)
1	Liad	CR	resources (time)
1	Liad	DC	resources
1	Liad	DC	resources (time)
1	Liad	KA	resources (time)
1	Liad	KP	resources (financial)
1	Liad	RS	resources (financial)
1	Liad	VP	resources (human)
1	Liad	CS	resources
1	Liad	CS	resources (financial)
1	Liad	VP	resources (time)
1	Liad	CS	resources (time)
1	Liad	KA	resources (financial)
2	Kolmsee	CR	resources (human)
2	Kolmsee	KR	resources (human)
3	Malte	CS	resources
5	Yariv	CoS	resources (financial)
5	Yariv	KR	resources (financial)
5	Yariv	VP	resources (time)
6	Ajay	VP	resources (financial)
6	Ajay	KP	resources

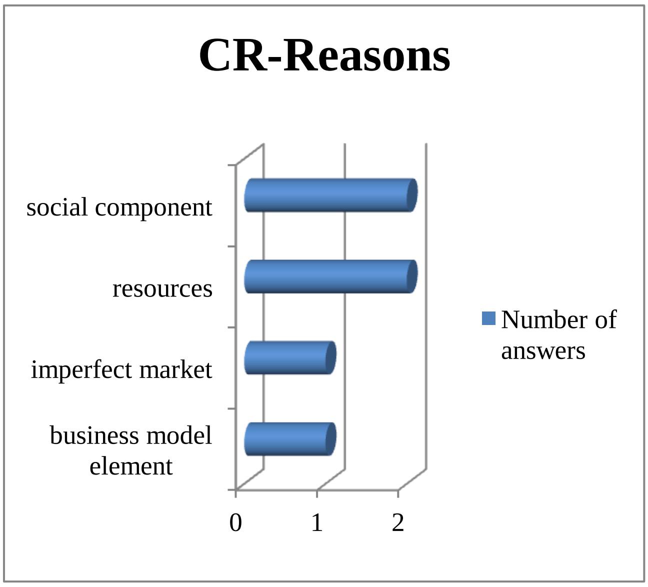
6	Ajay	CoS	resources (financial)
6	Ajay	DC	resources (financial)
6	Ajay	KA	resources
6	Ajay	KR	resources (human)

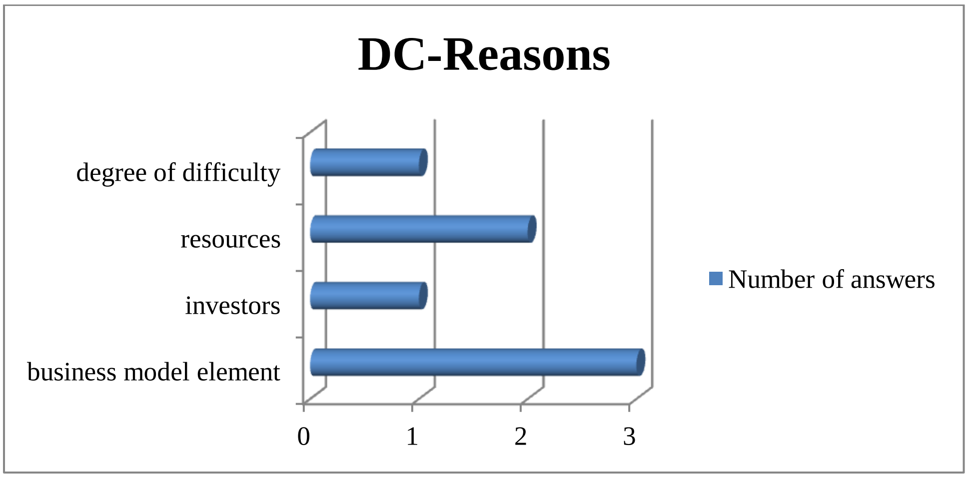
G. Results on Individual Reasons

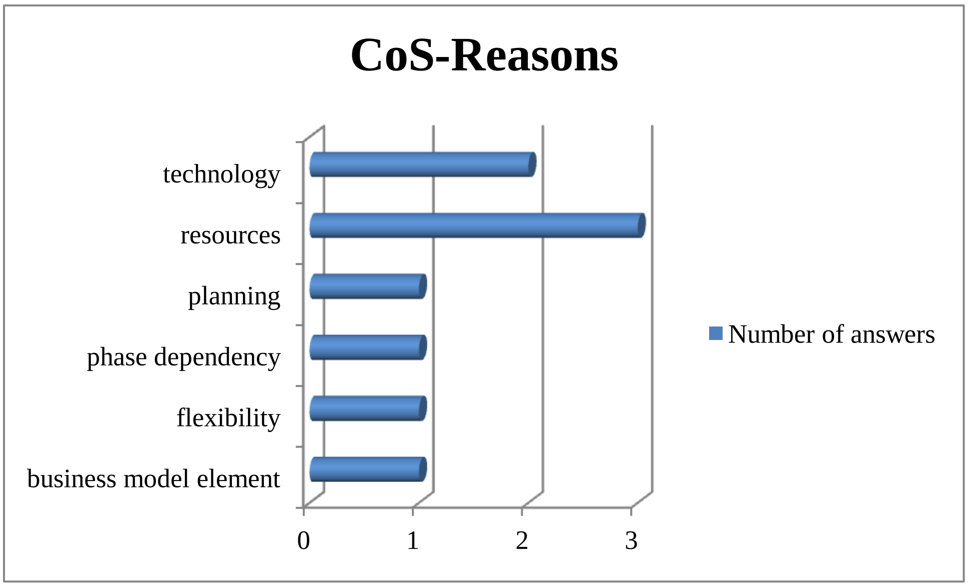
The following Diagramms show the results of reasons cauing changes broken down by single business model elements.

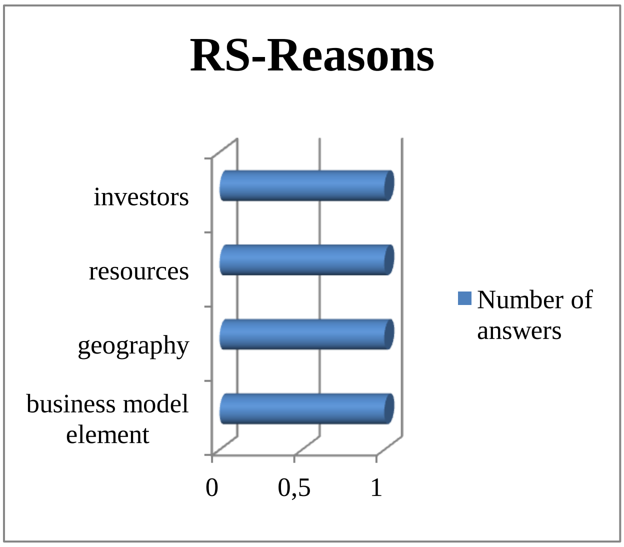


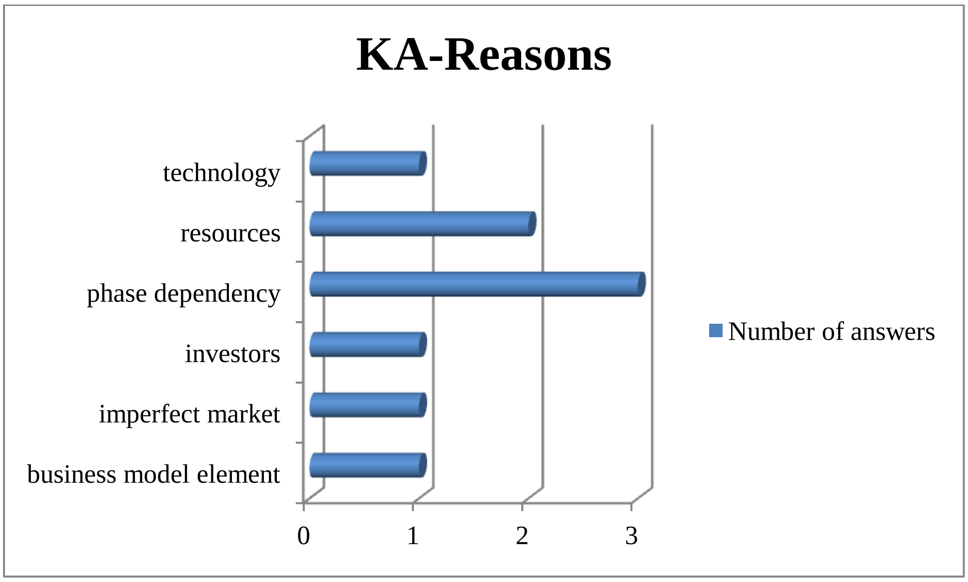


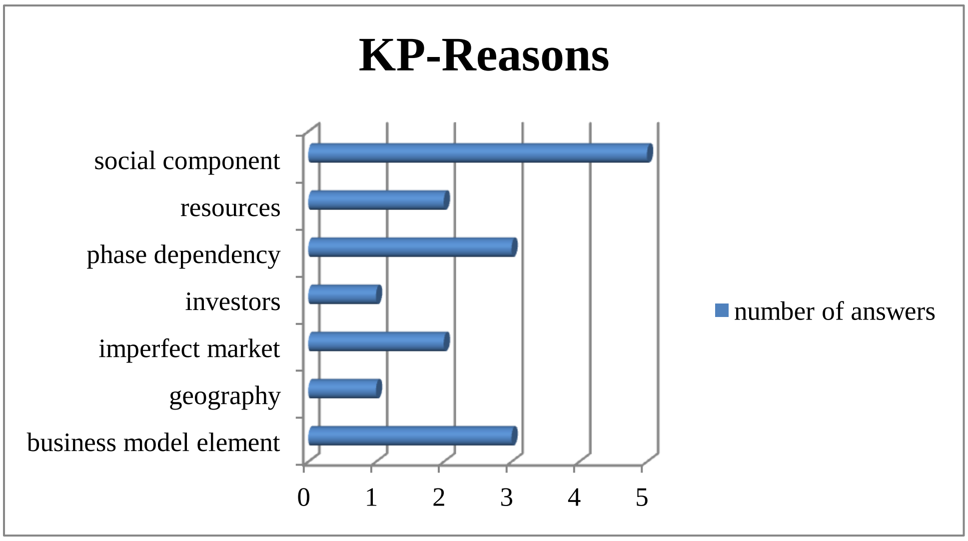


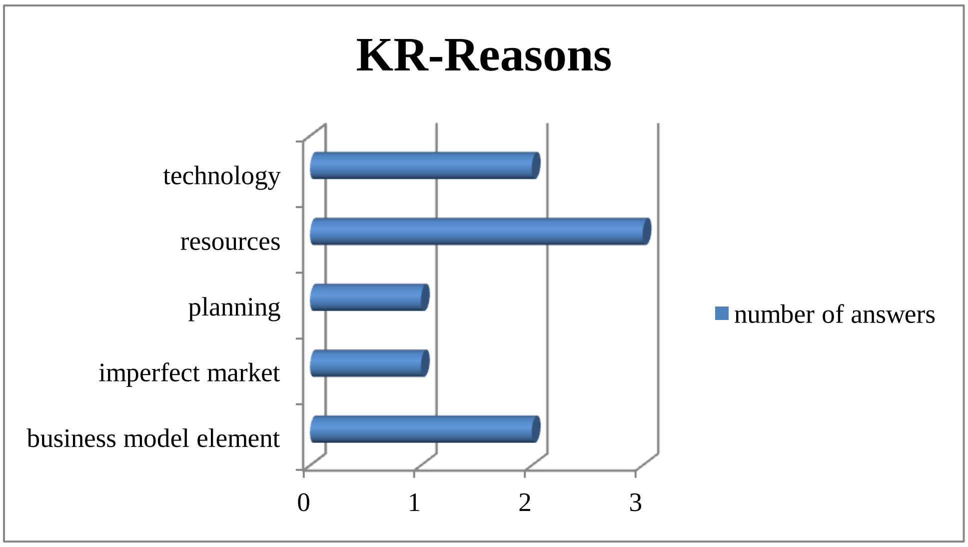

DC-Reasons
degree of difficulty
resources
investors
business model element
0
1
2
3
Number of answers


CoS-Reasons
technology
resources
planning
phase dependency
flexibility
business model element
0
1
2
3
Number of answers


RS-Reasons
investors
resources
geography
business model element
0
0,5
1
Number of answers


KA-Reasons
technology
resources
phase dependency
investors
imperfect market
business model element
0
1
2
3
Number of answers


KP-Reasons
social component
resources
phase dependency
investors
imperfect market
geography
business model element
0
1
2
3
4
5
number of answers


KR-Reasons
technology
resources
planning
imperfect market
business model element
0
1
2
3
number of answers

H. Results on Influences

The following tables present the third cluster of influences. This cluster consists of customer relationship, distribution channel, revenue stream and key activities.

Customer Relationship	
influences	are influenced by
	- Key partners (F) - Customer segment (A, G)

Distribution Channel	
influences	are influenced by
	- Key partners (C) - Customer segment (G, E, A)

Revenue Stream	
influences	are influenced by
	- Key partners (D) - Customer segment (F) - Key resources (A)

Key Activities	
influences	are influenced by
	- Key partner (F) - Customer segment (E) - Key resources (A)

I. Transcripts

1. A

[…]

Interviewer: What does Business Model mean to you?

Interviewee: I think basicly Business Model means putting your ideas in numbers. Translating your prospects, your projections, your your ideas into concrete numbers: revenue, expenses, balances, profits, flows just putting everything in numbers. quantifying your qualitative assumptions.

Interviewer: Do you know the business model canvas made by Osterwalder?

Interviewee: no

Interviewer: Explanation of the business model canvas [...] this is the most know business model template. I would like to go through every block and ask the questions how it was at the beginning and how it changed over the time. The first one would be the value proposition. What was your value proposition at the beginning?

Interviewee: ehm, I think, I think you know we are still at the beginning, it's a young company, it's a start-up, I don't know if I can say that there were changes, there were changes in some places but it's not we are talking about the business model was build up five years ago and now today huge, it's only a year old or something like that. Ehm, I think our value proposition is ehm is ehm, it didn't change much, but it's core issue is the matter of price reduction, that our technology presents a much lower offer than current technology. I'm talking about air polution monitoring units. So, I think the issue of price was and still is the major fact in what we're selling, because we're presenting our technology as a low cost monitoring technology and than all of the other let's say propositions are the result of the issue of the price. Because one you have the unit costs eh price is lowered by the technology in such a big scale there are a lot of application that are available and those applications present other propositions, so but I think the main issue is that we broke the price limit of the technology.

Interviewer: So that was the core [...] And all the add ons were made later?

Interviewee: No, there were made on a parallel level, but at the beginning seeding, the beginning, what makes it all possible is the fact that we've reduced the price in a dramatic way and then it's like you know there are so many things that you can do right now that you weren't able to do before.

Interviewer: And you would say it developed parallel from the beginning. And what changed and how did it change? Where there some changes?

Interviewee: First of all, I think in any company is a constant process of change, it is not that you have something fixed, it's all the time changing. I can tell you that at the beginning our focus was on the B2C market like we would mass distribute our technology for the people to buy. Large amount of people to buy the unit itself. Our current proposition is B2B, like network cooperators like clients are going to be business and not private people. That is something what we changed.

Interviewer: And why?

Interviewee: Because it's ehm. When you a start-up you know especially like I said when you're a lean start-up. You make decisions that are based on the resources that are available to you. You can enhance or enlarge your resources by finding other, other alternatives or other resources that are available to you but do not relate directly to you having to spend money to increase your resources. For example we talk about marketing. So you can pay money and do a campaign and if you want a larger campaign you have to put more money on that or you can do something like we did, that we don't have funding for running a global campaign and things like that and we set up a global network of what we call certified partners which are basically companies that are located in 20 countries all over the world and say I'm gonna invest time in marketing A in my country. So I basically duplicated my efforts and I have like marketing agents doing in a lot of countries. I didn't have to spend one dollar more on marketing but the overall investment of marketing in A increased dramatically with those certified partners.

Interviewer: So you had not enough resources and then you thought about other ways how to market your product?

Interviewee: How to recruit resources without having to increase expenses. And this a key issue I think in any start-up.

Interviewer: Hm. And you already mentioned that the first idea was B2C market and then you changed to B2B. And you already answered the question why. And was there a channel defined from the beginning how you will distribute your product?

Interviewee: Yes, at the beginning we wanted everything to do over our website, in an online purchasing side which are go in, buy and that's it. And then we decided to move to more direct approach with the certified partners in order for them to buy a large amount of sensors and deploy a network. There are basically two products, this a sensor a single unit as a product and there is the network as a product that you take an area in a city and you cover it with sensors and then you offer data to the people that live in the application in everything reports and things like that. And we are more and the things is that again, that I'm spending the same time on selling one sensor than selling one network. And one network can be 50 cents or so and I would rather put my efforts in selling networks and not selling single essences especially when I don't have the resources

Interviewer: That was the reason for the change from the website to because of the resources?

Interviewee: Yes.

Interviewer: And the customer relationship, can you tell me something about that?

Interviewee: Well the customer relations, there are a lot of customers here. Let's call them first tier customers and the second tier customers. The first tier customer is the direct purchases of the hardware of the units themselves, of the sensors themselves. The second tier is the people that are consuming the data but not consuming the hardware, consuming the software, the information that this sensors provide. The second tier is not yet established, we don't have it, just beginning. The first tiers these are all those that are buying the sensors and it's a very complicated relationship because there are most of them are experts that are professionals in what they do and what we do. They are very skilled people, they want the unit test them out in order it works, it's an ongoing relationship with customers, part of a dialogue and understanding of their needs.

Interviewer: The customer relationship was at the beginning different because you had B2C first and what was the customer relationship there?

Interviewee: In the B2Ccustomer relationship you cannot go in depth conversation or discussion with any customer but you need to have a template like questions and answers, FAQ, all of those kind of tools that help you communicate in having the same answers and you can send them out. And because our limited resources our limited time, I cannot spend time on each and this is why I went to go with the certified partners. I'm giving them the whole range of answers and they communicate with the custumors.

Interviewer: You already talked about the partners. Who were your key partners at the beginning and how did it develop over the time?

Interviewee: The key partners in the company, the market? Where?

Interviewer: Both, for the company you had.

Interviewee: There were several key partners. First of all the key partners are the investors and A had an investment of chip scientists. So you can take as a partner the goverment. The government as an investor, especially in very early stage companies is like government endorcement channels things like that. This is one key partner. The second key partner is the founders the employees of the company lots of them at the beginning are putting their own time in that company without knowing, it's not like just we're getting to work and get the full salary. So you have the internal staff and workers that are very important. Than you have all your vendors, all your suppliers of the different things these are very important key partners. And than you enlarge the circels with especially with what you work with civil society with NGO's with people that help you build up your reputation and create awareness.

Interviewer: So all the partners you had at the beginning they stayed

Interviewee: Just getting more and more.

Interviewer: And you had to enlarge your network and bringing partners to finance

Interviewee: Yes, we are now working to get more finance and enlarge the whole network with certiefied partners

Interviewer: And also find more customers

Interviewee: Yes.

Interviewer: Tell me something about the key activities and key resources you had?

Interviewee: Ehm. Well our key activities is first of all. There are a lot of activities going on. So one of the key activities that the scientific activity, getting the reading out of this monitoring station and validating it and comparing it and working with. That's like the technical thing, building up the unit itself, getting the readings understanding that you have something that you can sell, makes out good readings. So that's the key activity. The second key activiety, is the marketing one: building up reputation, getting interest in your internetside and putting up sales and things like that. Another key activiety is organizational build up, when you every company but especially a small company you have to invest time on how to build up the company. Relations how it's gonna be build, to build uo a vision. A lot of time is beeing invested in raising up investments, there is a lot of time in putting up business plan, executive busines plan and presentation and another presentation it's just time consuming, extremly time consuming. These are mainly the key activities.

Interviewer: Where there more key activities which you had to develop or you had to buy in over the time?

Interviewee: To buy in the company?

Interviewer: Yes.

Interviewee: Yes there are a lot of things that you need to like design, like branding things like you add on as a progress but you not start with. You prioritize your time and yu deal at the beginning the key activities really the key activities and than you do more and more stuff, but than you do what you must do in order to proceed. Like you must produce a product in order to sell it. You must make sure that the product send out proper data in order to sell it. There are things a must, things you must and you can do. All the can do you postpone as further as you can, just when you get the money to do that, but when there are issues you must do, you do them otherwise you don't have a business.

Inteviewer: But you also decide which activities you have to do yourself and you can outsource, things like design.

Interviewee: Yes, it's a matter of cost effectiveness. If you need a small design work, you just find someone you does it to you. You don't hire a designer. It just depends what is it that you need.

Interviewer: And what where the key resources yu start with and how did it develop?

Interviewee: The key resources they haven't changed from the beginning is the investment of the Israelic scientists, they could be called the founders. And this is still what we are running on. The other key resources is revenue from sales, but that comes will come just in months, just getting some stream of incoming money from buying sensors, our payments. Hopefully we gonna get some more investments in the coming months.

Interviewer: All the changes in the key resources, the key activities and key partners influenced all the other elements of the business model.

Intervviewee: It did change, because we did at the beginning iand still doing that we must do in order to survive. Every start-up that is beginning the first years is in survival mode and survival mode you do what you do in order to survive and all the things you must do. And there are a lot of activities that you postpoe or not dealing with because there are not a must on our side. But we are still in the same phase is not maybe if we had this same conversation in five years and I could look back and say it changed, but we still starting up.

Interviewer: But you also sad that resources led to changes in the customer segment. At the beginning you had B2C but there were not enough resources.

Interviewee: No, the beginning we had B2C because we put in the internetside the option to buy sensonrs and than we understood how much what are the resources that we need to put in in order to execute one deal. Well we said well it doesn't make sense because our unit are designed to work in a network. So if it were designed to work in a network why are we selling single we should sell networks and we should invest time in those partners potential partners or potential agents that could buy the networks and implement the networks. So this was the shift.

Interviewer: What about your cost structure and your revenue stream. How was at the beginning or how was it planned and how did it develop?

Interviewee: It's the same, it didn't change. The cost what do you mean?

Interviewer: Cost structure of the whole company.

Interviewee: Of the company or the product?

Interviewer: No, of the whole business, but you can tell me about both.

Interviewee: Yes, the cost it changed. One thing we did over the last month is which we raised our prices, we started in around 500 Dollars now it's around 800 Dollars, because when you put an investment that is part of your revenue stream and the investment is not coming you need to compensate that. And especially company like ourselves that can already hold sales you need to compensate the fact that you don't have an investment yet but the company is running by raising the prices and raising the revenues or the margin that you have on the price. And this is something that we did, understanding that investments gonna take a little bit of time so in the mean we gonna rise prices in order to compansating that.

Interviewer: But there was achange?

Interviewee: Yes. I can tell you at the beginning when set up and raising an investment really a year ago our goal was to get money to the company and to deploy a network on our own to do it on our own. That we will produce I don't know 200 sensors 300 a large amount of sensors and we put them in the city and we will sell the data, everything we are doing on our own and than found out that it is very hard to raise money for that almost impossible and we need to have local people that know, so we took one step backward and say we're not gonna raise money and put a network you're gonna raise the money and we're gonna sell you the network. It's a matter how you respond to the investments market or the investors whatare they interested in and how you change your business model to be responsible or be in coherent with what the investors are looking for and can the market support the gap. That keep the investors that says I'm willing to fund for this segment, but this segment doesn't make sense so the question is can the market forces compensate on this gap and oblagine to get money through the investors to the segment and just making this investments on market, sales, revenues and than using the investments as an added and capture on that.

Interviewer: You already some circumanstances, but could you please summerize the circumstances which led to business model changes?

Interviewee: This is what I told, the circumstances are the reactions from the investrors this is something very important and the other thing is the reaction from the market itself and the market segment is very responsive to us and very enthusiastic and we have a lot of partners coming in and we want them to join in put money and putting their networks.

Interviewer: And where there also some internal circumstances which led to changes?

Interviewee: No, we were very flexible. Not really, we were very willing to go on and execute what we planned going doing but we changed that because we couldn't get the funding for that.

[…]

2. B

[…]

Interviewer: So, I have a general question at the beginning. What does business model mean to you?

Interviewee: BM means to me as kind of mapping of products and services and the way we achieve money for it. On the one hand it's what we do and on the other hand it's what we get from the outside for what we do.

Interviewer: So is it a kind of a tool for you?

Interviewee: No, it's more a blueprint, I would say. I mean what it typically it's a map it's a roadmap towards business success. And defining what we want to do and why and how we get money for that. My description was a roadmap for what I want to do over the next five years and the next year in detail, that's what it describe. […]

Interviewer: Ok, so you use it like a blueprint. And do you know the business model canvas [...] What was your value proposition at the beginning?

Interviewee: Our value proposition has not changed and stayed equal. We are designing [...] So our value proposition is competitive pricing, easiness and completeness, which means project wise.

Interviewer: So, it didn't change at all?

Interviewee: No.

Interviewer: And your key activities and your key resources can you tell me something about that?

Interviewee: Our key activities stayed equal, which means we design a machine small hydro power plant and we distribute it. And we are very defined at the very beginning that we would not go into retail, but stay on the wholesale side that hasn't change either. Minus maybe that at the very start which is the first two years we do have some retail activities in Germany which is our core market to make things happen, to get the product into the market, but it's not part of the business model, it's really part of business development. So I would say the key activities haven't change. The key resources if you mean what key resources are needed, that has not change either, its engineers and sale people, technical sales people. And there is a slide switch toward in the very short between engineering staff and because the sales or admin people we are stay more to build up more engineering staff.

Interviewer: Can you tell me more about the switch?

Interviewee: I underestimated the time engineers need to complete a task and I underestimated two tings one is the time engineers need to complete a task which just means I need more engineers on the other hand I underestimated the general knowledge about the electrical system which means the micro grid which brought us to necessity to look for experts in that area. The factor is that we had to adopt our budget our budget for personal expenses.

Interviewer: Ok. The key activities. Do you outsource some things or do you develop the product all by yourself?

Interviewee: No, we are not outsourcing. Our key activities are not outsourced. At the moment fabrications is completely done by third parties, but we have not plan to change it because I mean fabrication of plastic parts is nothing we want to go into and it means a high investment for the factory which is nothing we need to do.

Interviewer: And your key partners? Who were your key partners at the beginning and how did it change?

Interviewee: Well, at the beginning as a start-up we had no key partners at all. We defined not exactly the key partners but we defined in what business field our key partners should be and the size of our key partners. So we were always keen to look for bigger companies, bigger cooperates to support our business models that hasn't change. The exact, the specific partner whether Schneider Electrics that has changed due to the fact that not all partners are really interested in cooperating. So we defined our at the very beginning we defined kind of the type of partner we were searching for we addressed several companies and now kind of in the process of specifying the partners. I wouldn't say that it changed in our direction.

Interviewer: Your customer segment. I already read it on the website. You have three types and can you tell me something about that more in detail?

Interviewee: Once more step to distribution channel. Distribution channel hasn't change either which is kind of reflecting the entire business logic. We are a whole sale company, this means we are looking for large companies that take our product and bring it into their market because we strongly believe that national local partners are much more adoptive to local market and therefore they would accelerate or can accelerate our market success, we are not easier way that we could do that bring our own people into the market. This reflects our main customer segment. Our main customer segment is decentralized electiricitation. Decentralized electiricitation is today either by government or by utilities, private companies, or in some cases by really large NGO, which is mainly the case in Africa. So we do know that decentralized electiricitation has a different type of agents making it happen, but it's always the same logic, the same logic meaning it's large quantities of the product being product to many villages in a standardized way. This is our main market which we are preparing and this is the main reason why we think to go for wholesale because we wouldn't be able to do that. The second niche, the second market segment is much smaller is the agriculture market. The agriculture market is mainly made up by large innovation fields, large agriculture companies [...]. They have the possibility to install turbines and generate electricity for the constant to come to water. In that field our main partners are agriculture retail organizations like in Germany it would be [...] and there are similar organizations similar corporates in all other countries, that sale to large agriculture companies. The last customer segment is kind of the least defined segment which is the green or the hybrid segment honestly we not really know how big that segment is, we know that only it's applicable to parts of Europe and North America which is customers which are connected to the grid and that look for the independency from their utility by self generating electricity. This segment means a high price segment again on the long perspective we do not want to serve it by ourselves. At the moment in Germany we are serving that segment ourselves to bring the product into the market. The customer segment has been defined at the very beginning and the sales and distribution channel has been defined at the very beginning, but what we underestimated is the time to build up the distribution channel in the third customer segment. We thought it would be much easier to find retail partners for this green market. As the green market is not really the segment we are most focused on, this is not really bringing any change to the company.

Interviewer: But the partners were defined at the beginning like you told and there were no changes at all.

Interviewee: The specific partners changed, but the definition of who should be the partners that has not changed. [...] There is always something like a pragmatic move. I mean we defined that we wanted somebody with a good impact in the utility segment and we found a partner [...]. You can not one to one define the exact characteristics of your partner and exactly find the partner if you do not have one specific partner in mind at the beginning. I would say we had a specifically enough definition of who should be our partner which allowed us to be open enough to find a good partner in the country where we start the selling and there are no real surprises that we would we say oh this is a partner who we had or a type of partner who we had never thought of. This did not happen, we did our homework at the very beginning.

Interviewer: And the customer relationship?

Interviewee: This is something that definitely changed. When we started we thought that there would be kind of a model of a supervisory board. We thought that we install a relationship with our wholesale customers and we would either have a share in their company or at least have a very strong cooperation which would allow us to have a much broader and better impact in what they are doing. We figured out that this is for a company with just six employees much too much, so much too much work at the beginning. And secondly, we underestimated or we overestimated the willingness of potential partners to receive help and information in our product. So they want to develop their own business and they are keen to keep us out. This is the time, where we adapting not our business model but the way we are cooperating, we need more control and we need to be not so much on the contractual side but more on the psychological side in the relationship with our partners [...]

Interviewer: Can you please tell me something more about that? A specific example or something like that?

Interviewee: Oh yeah, in a time after two months a partner showed us after to months with an idea of a second product and he was not asking us whether we could deliver it, but he wanted to do that themselves and after that selling to us. We were struggling with keeping our eyes on it so we really know what we're doing, because we do not want to sacrifice our own product in that market, which means quite a huge market. So we brought an idea to a partner usage of more hydro-power, he found our product not completely adopting to his specific market and we have to react in a way that we keep the relationship ongoing but we are able to intervene in phase we are doing something complete against our own good.

Interviewer: And now to the financial aspects, like revenue streams and the cost structure. Did it change somehow or did it remain the same?

Interviewee: The revenue stream only changed with the exact volume we thought we would have at the very beginning would have been able to sell even prototype plants, that was not possible only possible in some cases. So the volume of the revenue stream changed but the proportion of where the money is coming from did not change. The cost structure is more or less equal minus one aspect which is we are paying more today for engineering services [...]. We have build more engineers than we very originally thought.

Interviewer: And how did it come?

Interviewee: As I said we needed to adopt the ratio between sales people and engineers and engineers are more expensive than sales people.

[...]

3. C

[…]

Interviewer: The first question is what is your understanding of a business model?

Interviewee: Ok. Well, as I said I mean for me a business model is, the way I see it and I've got in on my screen here is, you've got, I think, two, two big elements the one is value-creation and the other is value-capturing. I think that is sort of what general business is about: to create value on one side and then independently and I think independently is the important bit to realize that just creating value is not good enough, that you also need to monetize it somewhat. And so are for me that two big elements and then business model is sort of a framework a model which consists of three elements. And as I said, triggers the user in a way to reflect on these elements and to understand sort of how they relate to each other and how it can be applied to your own business and using what to understand the limitations and strengths of their own business actually are. So to put a bit more detail onto the whole thing. The value-creation-part consists for me of two elements. One is the organization and architecture. Which basically looks inside and says ok organization and architecture key process. How do you design your products. How do you organize your customer relationship. Elements like service design. How you organize the interaction with your customer. Sort of one thing grouped under key process. Then the second element of organisation and architecture would be the key-resources. What do you have available. Sort of populating youre key-processes. ... It could be things like people. I did people employed, the technology. The sort of the IP you have. The brand you have. The partners you have. The distribution channels you have. So those bits and then as a third element which I think is often overlooked the culture element. Sort of what glues your organisation together. What is the vision, what is the mission. What values and norms do you have in your business. That's sort of one Element of value-creation organization and architecture - the inside looking bit. And the second bit would be for me the outside looking bit. What I call the customer value proposition. Which consists of three elements. There is the offer - what do you offer to the customer, which is of course closely related to organization and architecture. Then the offer interacts with target customer. I having something and then thinking about who I actually offer it to. That's the second element of the customer value proposition. And then from those two elements the somewhat abstract value created bit. What does this all actually deliver to the customer. What problem does it actually solve to the customer. Why would he buy in to that. This sort of for me the value-creation bit. And value capturing bit related to me for to one side the cost which comes from the organization and architecture. How much do my resources actually cost. How much do my processes actually cost. What is the cost structure of my organization. That is sort of one element in my mind of the profit-formula. Then the opposite element is sort of the revenue-element. I saying: how much based on the the value I create for the customer I can achieve a certain revenue. And now you've got these two elements of the profit-formula. The cost on the one side and the revenue element on the other side. And they together determine the value that you capture. Simply by saying the revenue minus costs is the value captured. And that in my mind forms the business model. These three elements: organisation and architecture, customer value proposition and the profit formula, grouped in value creation and value capturing.

Interviewer: That’s very close to the business model made by Osterwalder. My whole research is based on this business model canvas, so we have nine blocks. Like the customer interface, you’ve already said, the customer segment, customer relationship and the distribution channel on the one side. Then the value proposition and the infrastructure management is about the key partners, key resources and the key activities. And also the third element is the financial of course with the cost structure and revenue stream.

Interviewer: Yeah. I see it’s good, isn’t it?

Interviewee: If it was completely different than either you or I made a big mistake somewhere.

Interviewer: Sorry. What did you said?

Interviewee: I said if it was different then either you or me would have done a big mistake somewhere.

Interviewee: It's true. We did a good research. And what I’m looking for. I go to every block and I ask the entrepreneurs how was it at the beginning and how it developed over the time. So what were the changes and especially why did it change.

Interviewee: ok

Interviewer: The reasons for me are very important. And also what was influenced by the change. So if you, for example your value proposition changed which influence had it on the other elements like cost structure, revenue stream and whatever. What was your value proposition at the beginning?

Interviewee: Ok. The value proposition was at the very beginning, as I outlined in the talk which I gave to you, was to offer generator sets which is basically relatively large mechanical system which takes a diesel fuel at the one end, gives electricity at the other end. It’s a kind of thing which you have for example in a hospital as an auxiliary power unit. You have it in wherever you need electricity and you don’t have connection to the grid you need to rely on other means of producing electricity and that’s a gen-set - a generator set – it’s called. That was what we initially aimed to offer.

Interviewer: Ok, so there was a change there, right?

Interviewee: Yeah. The sort of the customers, which we aimed to offer it to initially were people from the bus-market we thought initially. Sort of electric buses, hybrid electric buses, trolley buses - those are those buses which have feed from an overhead-line. I'm not sure if you can envision them.

Interviewer: Yeah. In Moscow they have.

Interviewee: Yeah, exactly. And we had the idea to offer them a very light weight gen-set based on a somewhat unusual architecture and to those customers. Thinking, you know they move around, so they need something lightweight. And the value created to them was as I said to have a device which does what a standard devise does - just weighting less and maybe even being more efficient and also less costly. That was our initial value proposition.

Inteviewer: And what is your value proposition now and what was the change?

Interviewee: Ok, our value proposition now is somewhat differently. The appreciated generator set consists of, at the end two main bits. It is combustion engine - Verbrennungsmotor - and the generator. Now the combustion engine element fell completely to the side and we turned the generator into a motor. So our current customer value proposition is to offer powerful electric motors, which have an unusual geometry which makes them very suitably for some applications. We are offering them to customers mainly from the electric and hybrid vehicle market. Again the consistent element is they are sort of light weight and the power. You know that some element we didn't change, because that is sort of the core technology we have. How to manufacture an electric motor or an electric generator - they are both pretty much the same. To customers who value light weight and small size. And the value created to the customer by offering these electric motors would be pretty much the same that I get something which propels the vehicle – it's called the traction motor in that case - and they have the advantage that this device is light - or lighter than they could get from other people - and it occupies less space, they have more space available for other bits. So that is that and our target customer , as i said, are either OEMs - original equipment manufacturers - which are sort of the Volkswagen's or BMW's and what have you not - these kind of people. Or people who work for those people and build electric or hybrid electric vehicles for these people.

Interviewer: And why did it change?

Interviewee: It changed because we realized that the original idea of building generator sets, as I said it's an integrated system - we have a combustion engine and a generator plus and that is what I did mention you have a control system which controls the whole thing. We were somewhat naive in terms of how easy it is to build such a system. So we managed to build like two prototypes which worked. But we found that we were lacking credibility in a way, because we didn't have the resources and the processes to make the system to a standard which at the time or which is still expected by industry. So it was basically too complicated. It was too complicated a proposition. We didn't have the experience and the expertise to develop that system to a standard which was expected by the customers and we just didn't have the credibility and as a result we didn't manage to sell into that market. It was too complex an offer.

Interviewer: Ok, but was it also the reason that the customer segment changed? Or was there another reason? Because first you wanted to go for trolleys, right?

Interviewee: Yeah, we realized basically that, you're right there were two elements, you know? We found that all offer. We couldn't produce an offer which was acceptable by the market. At the same time we realized that this is maybe not the most attractive market for the core technology which we had. We found that, you know, the business model was in that respect float from two sides. From both, we realized the offer wasn't right and there were other market segments which we could get into much easier, where people were less critical in terms of certification, where we could get credibility easier and which meant we could sell an easier product basically to a market which was growing much more rapidly and was much more receptive to what we had to offer.

Interviewer: Ok, so the easiness was more or less the reason for changing the customer segment, right?

Interviewee: Yeah, it was basically, as I said two things, you know, that the market segment was maybe not the most attractive because it was need to appreciate to operating here in the market for electric mobility, which is a market over the last ten years has changed a lot and is continuing to change very rapidly. So it is not a well established market. And especially the market for sort of drive motors and drive generators was at its infancy when we entered at a couple of years ago, which is meant as a startup it is much easier of course to sell into a market which is not well developed. Because people are more willing to try new things, there are no accepted solutions yet. Your competitors like Siemens and ABB are not in that market yet, because it is too small. So if you think about the product or the sort of - how is this curve called? - we've got the early adaptors.

Interviewer: The adoption curve, right?

Interviewee: Exactly. So we found that the market for electric motors was much more jewel eye in a way. Much less developed. And it made it easier for us to actually achieve some sales.

Interviewer: You already answering the next question. So the change in the value proposition had also an influence on the customer segment, right?

Interviewee: Of course. It always will have, in some way, I guess.

Interviewer: And was there another influence on the, for example the infrastructure management with key partners, the key resources and the key activities?

Interviewee: Ehm, said, it was, as I said, it was a from, a technical side it was what we originally thought it was technically too complex. There was the customer element that the market for electrical mobility seemed more attractive. For the reasons I laid out as credibility and the ease of getting into the market and the third element which I didn’t touch and which is probably important is that: if you go out and you trying to look for money because you have a convincing proposition which attracts investors and encourages their imagination. And electric vehicles was and is something which is much more attractive to anyone who might give you money than something which is like selling something to the trolley-buses or selling something into - yeah this is slightly more obscure market. So it was something which is much more tangible for any investor. That of course forces you almost in a direction as well. So basically just in order to get a funding you need to think about things which are actually, which you can wrap into a nice story. You know that’s what an investor wants to hear. He wants to hear a nice story, convincing story and we found that we can make more convincing story selling electric motors into electric and hybrid-electric-vehicle-market than selling generator-sets into, let’s say, into the trolley-bus-market. Just more sexy - if I may say so.

Interviewer: So you would say that the change in the value proposition had an influence on the key-resources?

Interviewee: Yeah, yeah, it did as well. Of course, if you don’t need combustion engines anymore because your product doesn’t contain a combustion engine that means that you don’t need people who know how to deal with combustion engines. You don’t need to understand combustion engines. You don’t need to get your distribution, or you your supply-chain set up to give you combustion engines, which itself is very difficult bit. Buying like, whatever, let’s say five combustion engines a month is very very difficult, because these engines are produced by big companies who don’t want to deal with small companies. They make their money by selling large volumes. And if you say ok, could I have one or two or five you find it horribly difficult and we founded it actually horribly difficult to get hold on them and to get the technical support we needed. So certainly yeah. So it had a huge impact on, of course, the resources in terms of technology and people. And as I said the supply chain and also of course the distribution channels. You know you sell, we sell, these kind of complex devices in a different way and to different people than simpler motors and generators. Now it's basically a different business. A different business model.

Interviewer: So it also changed the financial elements, the cost structure and the revenue streams, right?

Interviewee: It is difficult to say, since we never got into that market. We never really got a feeling for how much we could charge. What the value created was actually. What our cost would've been if we would have been taken it serious. What a revenue would have achieved would be so we.. We never got a good idea of the value we could actually capture. So that's.. We had of course some ideas but you appreciated these things are utterly unclear when we started the business. You know you have your ideas of how much you can charge. You have your ideas of how much it might cost, but these ideas are just ideas. You know it's not more than that. And until you make a certain number of sales and you figer out what people are willing to pay you don't know. So I assume that it would have been a different profit formula but we never managed to get a hard evidence because we never managed to sell actually any anything meaningful in terms of volume.

Interviewer: And how did you try to find out? Was it by experimentation, or?

Interviewee: So you see, I mean how did we find out how much someone is willing to pay for it. I mean. You can try to figure out what your competitors sell their kit for but then they don't gonna tell you. And list prices published on their websites. Plus that your competitor sells their kit for is not what you can sell kit for because you have a different product and you having advantages to them. You might be technologically better. You also have disadvantages because you don't have a brand name and you don't have the necessary service. You can't provide the service. You don't have the distribution channels the same. So it is .. You can only find out by trying actually and getting the price wrong and then ramping your price up and then seeing.. trying to feel yourself into the market really. And the same applies to the cost. You know, you can have an idea what your costs are, but since you're basically new, and we didn't have anyone who had meaningful experience of actually dealing in this market we could only have assumptions of how much bits are gonna take and how long it costs us to manufacture it and what facilities would actually need and etc. So that's the classical uncertainness that you face when you building up a business.

Interviewer: And you already mentioned the distribution channels. So could you please explain how they were at the beginning? How is the definition or the plan to distribute the value proposition?

Interviewee: In that way the distribution channel as such didn't change much because it is basically, how to say, it is a component of a larger system. Which means you're not gonna sell it to the end customer - I, you and me, would drive in an electric bus or in a electric car. You always set, try to sell to either the next step up or two steps up. You either try to sell to people who integrate your system into a larger system - called system integrators. Or you try to sell directly to the guy who makes the final product. And so the distribution channel, or the idea of how to where to sell to, didn't change. And it's always a direct sell. You don't have a sort of, how to say, a distributor sitting in the middle. You don't sell to someone who then sells it on. You sell it to someone who uses it to build his own thing. And that didn't change in that respect.

Interviewer: And what about the customer relationship?

Interviewee: Customer relationship. Let's put it as the customer type, it's of course slightly different. It is still people who are active in the auto motive markets. And they have a certain expectation of how you deal with them, of the processes you follow. For example if your are qualified to icow2001 which is a sort of a company certification skin they have. So that didn't change to much either. It is very much about getting recognized by the market, getting a certain presence in the market. Gaining the credibility and following certain procedures when it comes to quoting for your system and that. So I think the changes were not so much on the customer relationship-basis, because in the end, you know, from how these companies are set up. A company which builds electric buses is not too differently set up from a company which builds electric cars. You know, you're still dealing with engineers. You're still dealing with purchasing and people etc. etc.

Interviewer: If you look at the manufacturing, the infrastructure management, sorry. You already mentioned that the key resources changed. So what were the key resources at the beginning and how they did change?

Interviewee: Ok. As I said, as the key resources you need of course people. And if you manufacturing a complex system you need almost by definition more people because you need more experts and more different areas. And so the resources the people-element of the resources changed of course. And that we didn't have a need for people who knew about combustion engines, about the control of combustion engines. Whereas we now mainly need people who know about development of electric motors, about the testing of electric motors. You still need engineers, you know, you still have an overlap in a way that you need engineers. You need to have support for your engineers. You still need your project managers. And you still need the administration - your general overhead. So that element didn't change. But actual the qualification of the engineers basically changed. In terms of technology as I laid out again the same applies you know, you either dealing with complex system where you're dealing with complex technology which is a lot about integrating your combustion engine with your generator generating a more complex system or you're focusing on effectively a simpler bit. So your technology comes in a way a little bit simpler to manage and build up.

Interviewer: And would you say that the investments are also key resources?

Interviewee: It's a different, difficult question. Well you could probably argue that your bank account is a key resource - a monetary resource. I'm not sure how you see that. Yeah, yeah, I think you could argue that you're bank balance is a resource.

Interviewer: And this, I think it changed, right?

Interviewee: Well yeah, it is goes up and then it goes down. And then it goes up again and then it goes down again.

Interviewer: What are the reasons for the change?

Interviewee: Well, you know, it goes up if you get some new investments and it goes down if you are developing your product. As long as you're not profitable it's very natural chain and at one point it ends. Either because you become profitable and then it goes up, up and up. Or at the other point you're go broke and it basically cross at the end of the line and that's it. You pack up and do something else. As simple as that I think.

Interviewer: And your key-activities, if your key-resources also changed and your value proposition I assume that the key activities also changed.

Interviewee: Yes. Some eleent of it, I mean it depends on how specific you defined key activities. Of course one activity that did not change for example is business development. I say: here I am a new player wanna get out in the market, I want to sell it to you. So you advertise in the magazines, you go to the trade fares you have a stand there and you produce data sheets and you have your website. And those general activities didn't change. You know, because you always need to do it if you have a new product and then you want to sell it and you're a new player. In a very specific way the activities of course changed as I said, you don't need to worry about how to buy a combustion engine, you don't need to worry about how to integrate it into your greater system. You don't need to set up your test facility such that you can test a system. So on a very very specific level the key activities changed. In a sort of overarching business building-level they didn't change.

Interviewer: So would you say that the technology had a high influence on the key activities and the key resources.

Interviewee: Of course it does, yeah.

Interviewer: Ok because I, as far as I understood is nothing changed really in the key activities and the key resources but just the technological side, right?

Interviewee: Yeah, yeah, I mean, let’s look at it like this: I mean, if you have a startup business in a technology sector and that that mandates that you do certain things. You know, you build up your administrator structure. You try to get your business certified. You do your business development as I laid out. You build up your facilities. You hire people. You try to figure out who your suppliers are. So these things are very generic. You know, this is going to be the same in every technology startup business that needs to do these certain elements. But sort of the specifics of these elements then changed. To that trade fare do you go. From whom do you buy your stuff. That is of course very specific to the product you gonna try to sell.

Interviewer: And what about your key-partners. Who were your key-partners at the beginning?

Interviewee: Ok, partners, partners. How do you separate a partner from a supplier?

Interviewer: You don’t separate it at all. Because how it’s described it is key partner - your network. Your parnter, you’re working with, is also your supplier.

Interviwee: But I think it’s a little bit sort of hippy almost to call it, we living all in this wonderful world where we are all partners. We are all living together, happy family tree hugging etc. etc. ... how it is, he? I mean a partner is someone you live with and you do favors for ..

Interviewer: Your are right.

Interviewee: You don’t look at the money. There as I would claim, you know, often as you have actually maybe a good supplier-relationship in a way that you trust each other, but it is still very much about the transfer of money. And so .. I’m not sure that I would agree with Osterwalder in that respect that the partners and suppliers are the same. Of course you can try to have a good relationship with your suppliers. But if you don’t pay them, they not are going to be your suppliers any more.

Interviewer: Yeah, that’s true.

Interviewee: So in that respect I would, for me a partner is someone you get together and say: we gonna develop something together, you know. And we both appreciate that we both maybe not gonna make money for some foreseeable future. And so I agree that there is an overlap between partner and supplier in a way that supplier may say: ok, When I get on to that project and we gonna do something with you even if I’m not immediately benefit. Well, I would see them differently slightly and to answer your question: We never in the past we never partnered. We didn’t partner early with someone. We now sort of now for the last year we partnered with a big manufacturing organization to industrialize our motors. So that is a partner, I would say. Someone you get really together with and say: ok we have a common aim and we really try to work together and we share people and we share facilities and we share marketing material etc. etc. So we have a partner now. But when we started off we didn't have a partner and I would claim it's very difficult for a startup business to have a partner. Because they just not ripe enough, not mature enough to actually have a partner.

Interviewer: And so.. At the beginning you hadn't a partner and then you had this joint-venture. So why did this joint-venture happen? What were the reasons behind it?

Interviewee: I think that is relatively straight forward. I mean in a joint-venture you have two partners, in our case, you know you can have more, but in our case we have two. There is us and there is them, so to say. We realized that, you can imagine that if you are dealing with large organizations - they have a certain demand on your credibility again. They have their people and they're ok to buy from small companies as long as it is not critical to them. As long as they don't expect high volume. And the trick lies really in the volume. You can sell small volume easily if you're or not easily but you can sell small volume if you're a small company. But as soon as you want to sell large volume you need some credible manufacturing partner. Someone who has experience in volume manufacturing. And that was sort of our side of interesting bit. Saying we need someone who has the capability and the knowledge and the resources of being able to manufacturing something in high volume. And from their side it was very clear access to technology. You know big companies are by nature relatively bad often at developing radically new technology and so for them the interest was of course to get the hands on something which could be very attractive to their customers in the future.

Interviewer: And äh, what other elements were influenced by this change?

Interviewee: Uf, pretty much everything I would say. You know, you're not operating on your own any more. Which means your decisions are not completely yours any more. That means your processes change. You might find that you suddenly need to tier to certain processes or your partner has certain demands on how you deal with things. You know, your people change in a way that you might need to succumb some people to the partner. Or you get some people succumbed from your partner. Your brand changes in a way that you can integrate the partner into the brand or you create a new brand. Your distribution channels change in that you have access to the partner's distribution channels. Of course it can also be that your values and norms change. That you suddenly see yourself as a part of a larger organization which has its own values and they sort of triple into your own culture. So it's a very different beast.

Interviewer: Did the value proposition also changed after the joint-venture?

Interviewee: What do you think?

Interviewer: I'm not sure. I think so.

Interviewee: Just think about it. If you buy a car. It's quite a different thing if you buy a car from an enthusiast which build two cars a year or if you go to your Volkswagen dealer and buy one there, isn't it? You know, and one thing if you say ok, I'm buying it from Joe block around a corner because he is a nice guy and he build this nice car. But he only builds it with ten men and little shed around the corner. And we think ok, will it work? What if it doesn't work, maybe explodes somehow unexpectedly one day. If it need its service you know, you can only go to go to Joe around the corner. Whereas if you go to Volkswagen and buy something from Volkswagen you know what you'll gonna get and you know it's not gonna break and you know if it needs service you will get your service-network over the whole world effectively, so.. Yes, yes. Your customer value proposition of course changes massively.

Interviewer: And what about your investors. You also told us in the lecture that you were .. That you've got some kind of help from university, right?

Interviewee: Yea. That is of course for .. I need to be general because you appreciate that the I can't talk freely about everything. That's in a general way for an investor this kind of thing so very attractive because that indicates to them something is moving. Something is going ahead. There is the prospect of ramping up the volume, selling completely different volumes to very different customers. So become basically.. become serious. To leave to roam of a startup business and enter the roam of the serious players in the industry.

Interviewer: And how was it for the university?

Interviewee: Basically exactly that. You know. You need to appreciate their business which is detached from university. Their sort of co-owned by the university. But at the end they're publicly listed company which has its own investors and needs to satisfy their expectations of their own investors in terms of returns, monetary returns, so in that respect they're not much different than any professional investor, you know. They give you money but they don't do it because they believe in the great and good of human kind. It's not altruism its.. you know they give you money, they want some money back. Ideally a lot more than they gave you. So every kind of step towards the situation where they can see that there is a chance of getting this money back is of course very much appreciated.

Interviewer: And what about your suppliers? Who were you're suppliers at the beginning?

Interviewee: It's difficult to say, actually suppliers.. I mean due to the fact that your volume changes. Your suppliers, some of the suppliers need to change as well because the temptation is if you've a small business and you buy small volume you're looking too often to also be supplied by other small business because you just find it much easier to deal with them. If you're then in a situation where you selling high volume from.. then you need to look often at different suppliers, right? So in that respect your demands on your suppliers change of course. Because you need to have the assurance that they can deliver this volume, that the quality is consistent. You know, as long as you buy from small companies you always can butch and improvise and that is sort of stuff that you always expect.

Interviewer: So let's move to the last block. The financial aspect of a business model. What was, we already talked about it, but I would like to ask you to summarize it. About the cost structure, how was the cost structure at the beginning and how did it change and why?

Interviewee: Wow, cost structure.. As I said it's very difficult if you build your business to really understand your cost structure. Because you're initially building prototypes, right? You're not setting up, you're not starting up with business saying ok, or typically saying ok, I'll start with building assembly line. You know you start up building one or two units and you test them and you try to sell them, it doesn't work. So you improve your business. So your cost structure is very much tailored to what it's development, research and development and not about manufacturing. And then at the later stage when you have a product which is accepted by the market and you're maybe partner with someone who gives you the access to higher volume sales then you move somewhat away from the research element and move much more to what's the manufacturing element. You start to think much more about how much it cost to make each unit, right? So the unit cost initially if you build a prototype is not that important because you're not gonna make money with that anyway. It's much more about having a product which is actually sellable. And so you don't pay much attention to getting the last pound out of your product and then optimizing it you get it in your focus and then getting it to work. Where in the later stage the emphasis on making it cheap. So basically it changes from making it work to making it cheap. And that's sort of most important element of the cost structure. Plus at the later stage you also, you overheads basically you need to act as more professional actor which means you need in a way larger overheads in order to professionalize the administration the purchasing system. So say you want to get your company certified, these kind of elements.

Interviewer: And did it have influence on other elements in the business model? So as I understood at the beginning were exploration activities and then exploitation, right? And how did it influence for example the customer interface?

Interviewee: Since especially once you partner, you have access to the, almost by virtue, to the whole thing. You have access to the customers distribution channel. And the customers relationship effectively opens doors, you know? So you probably don't go to the trade fair any more where all sort of little businesses presented their technology. You go straight to the big players and just knock on their door and they let you in.

Interviewer: This is the reason the joint-venture was..

Interviewee: Exactly, exactly. This was one of the main motivations.

Interviewer: And what about your revenue stream? How did it look like at the beginning?

Interviewee: Virtually not existent. You know, you have cost on the one side but you don't have much revenue on the other side. So to come back to my model. What you're initially doing is you're creating value. You not very much focusing on capturing value. And once you managed to create your value you then try to focus more on capturing it. You know? And your value creation element moves a little bit to the side. You know, you still try to improve your product but at some point you also need to earn your money.

Interviewer: What do you say in general are the reasons for changes in your business model.

Interviewee: Well, I would say that a business model doesn't work in a way that you just don't make money. And you know, success can be in a business environment typically defined are you profitable as possible as you think you should be and if you're not, then need to change something, otherwise you just gonna broke. So that is clearly, I think, the main trigger. You're just not profitable. You're just not earning money and there is maybe also no future scope. So you realized that something is wrong. It just doesn't work the way you thought it would work. And that can be quantified in monetary terms of course. I think it's always the same you know. If you have a business which works beautifully and you're earning a lot of money then you're not gonna change it unless you thing you can earn even more money. If you have a business which doesn't earn money and just gables up your resources and you ... cost without getting revenue then lately you need to change something. Otherwise you're maroon.

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Interviewer: What does Business Model in general mean to you?

Interviewee: Actually, to us it means ehm making e-mobility affordable on the one hand and at the second hand be nevertheless in the position to earn the respect of money to survive with your company. The interesting thing of our business model is that we, other than the other parties involved in the e-mobility market, thought about business model first instead of thinking a technology first whereas most people who install are these huge charging pulls thought about technology first and now try to find urgently business models for their services and hardware whereas we thought first about the business model that can fly and how the technology that is based on that should look like to make the business model fly actually.

Interviewer: That's very interesting and why did you focus on the business model first?

Interviewee: Because if you found a start-up you think what can be my value proposition what can be my usp and well in the end we all want to earn money, just thinking technology, thinking about technological solutions is fine and you can do lots of great things in the world with technology the question is always will someone pay for it and that is the key question for e-mobility: Will someone pay for the cars or other electric vehicles, will somebody pay for the infrastructure and the infrastructure services and currently we are faced with the situation that all the hardware and the services are extremely expensive and no one actually is really interested to install charging point, because charging points are extremely expensive. Than we thought if we want to be in the position to have a very dense network of charging points and want to make people buy and install charging points, than we definitely have to make sure the charging points and services for billing these transactions done at the charging point are as cheap as possible to make it attractive.

Interviewer: Can you tell me something about your customer segments?

Interviewee: We have three typical groups of customers. The first group probably most important are the EV-drivers. We want to insure that drivers are able not only to charge at home or at expensive charging plugs, but we want to make sure that they can charge where ever they park is possible and we will charge for electricity and we will charge a base charge as you know it from your household electricity contract currently. So drivers is one peer group. Second peer group of customers will be a group called infrastructure providers by us. And the infrastructure providers are the guys who install our special sockets and offer electricity at these sockets. This is not a pier group to us as customer as we try to keep the cost down as I explained to us it is extremely important to win this group, it is our peer group but actually, but not our peer group regarding cash and turnover, because we try to bring down the cost for these guys.

Interviewer: So it was the third one or the second one? Because ehm the first one is the EV-drivers, the second the infrastructure providers.

Interviewee: EV-drivers, infrastructure providers exactly the second group. The third group will be utilities, because we will be enable utilities to deliver energy through that sockets, let's make an example Lichtblick or who ever will be able to have their customers, the EV-drivers, withdraw or charge energy from these sockets as well. So these are our main targets.

Interviewer: Ok, I saw it also on your webpage, but what's interesting for me was it from the beginning on that you had these three segments or was it different?

Interviewee: It was different actually, but only in one point. From the start we said well we will deliver services for e-mobility and we focused strongly focused on B2C so, delivering service to EV-drivers and well B2B in terms of infrastructure providers and we learned that it is extremely important to the utility for the utilities to keep their customer relationship and well if you try to establish in a country as Germany where we live in a strongly liberalized market if you try to establish such a service it might be much easier to do but if you have the municipal utilities on your side for example and you can do this if they are in the position to keep their customer relationships, so we will put these utilities to keep their relationships and to make sure that they can send bills to the EV-drivers under their own name showing what kind of energy and what amount of energy they charged from their for example their local utility.

Interviewer: Ehm, and could you please summarize the main reasons for that, you already sad something about that, but the main reasons for the change to make market entry easier actually or more likely probably. It strongly depends if you look at a different market where you do not have liberalization that strongly for example in France you basically only have IDF and if you only have IDF, you only have to make sure that IDF likes you and than they could do the market entry together with you alone, but in Germany we have like 900 utilities and they all have or most of them actually have small monopolies in their regions and it is very hard to act against them, they have a very strong lobby here in Germany and it definitely easier to do it together with them although we still would have the option to do it alone we think, but we think the cake is large enough to share it and to make it easier to do the market entry.

Interviewee: Did this change effect other elements of the business model such as the value proposition, distribution channel or customer relationship.

Interviewee: Not necessarily actually it makes it broader, it makes on the hand a little bit more complex, because you have to take care of more players, more market players. You have to take care of the complexity in your data model, we have an internet platform with a very complex data model with all the different market roles are model, that makes it on the one hand a little bit more complex on the other hand it gives us much more room for arguments in lots of directions for example if you're talking to the politicians they always like a liberal approach and they more likely to favor your model and to support you if they see these attempts to liberalize your business model.

Interviewer: So it was very important for the stakeholders?

Interviewee: Yes, it is actually at least in Germany given the market, yes.

Interviewer: Ok and about the value proposition how was the value proposition exactly at the beginning?

Interviewee: Actually, well it's a kind of a longer story, but I will try to make it short. If you take a look at our company's name we are D company for distributed energy systems, so the value proposition the first place was actually to commercialize vehicle to grid services, to be one of the first companies, most efficient companies to offer system services for grid stability by combining by aggregating the batteries of large number of electric vehicles connected to the power grid and by offering those services like we are able to charge 10000 cars now, or we are able to stop charging 10000 cars now, we are able to use the battery as a large pother large storage, 10000 batteries of the cars as a large storage to charge or to recharge energy or whatever. It was very ambitious and we learned very early, that it was not too ambitious but too early to do come out with that approach. We had a wonderful Business Plan like 50 pages pure text no graphics, we are both trained lawyers so that text is very familiar to us. Still if you read the business plan today, 4 years later, it still completely the way we are going, but the stages, the stages we have foreseen in our first business plan take much longer than we thought, because when we founded in 2008 most people said oh that's a long way to go, first to establish sockets, than to establish mobile meters, than to be able to aggregate all this, why don't you concentrate on just charging cars first instead of looking for the aggregation in the very early step, well yeah it was definitely right because the development of the market is much slower than we thought initially, so we build exactly that our approach is still to offer these energy system services to the market, we think if we are the guys who have the most sockets out there for the lowest prices, we will be able to deliver the system services to grid operators most comprehensively and for the best price but currently we not having or not seeing such services because everybody only cares for the fact how we create charging infrastructure, not how we can aggregate the combined battery power EV's, I mean now that was 2010 at least, now 2010 people start talking about that issues actually, 4 years on after we founded our company, but well now we do it step by step and the first step just creating charging spots and being able to have a billing systems in the back that makes it possible to reimburse the energy to infrastructure providers and to send the drivers a bill, is the most first step and aggregation will be a second step.

Interviewer: Could you please again summarize the reasons for the change, so you told something about the market is very slow, but do you have another example or was it the only reason?

Interviewee: Yes, were much more basic, not that complex as we tried to make them from the start.

Interviewer: Of course it influenced the other elements as well, right?

Interviewee: Absolutely,

Interviewer: Could you give an example for that?

Interviewee: In terms of influencing, you mean how we reacted on that change?

Interviewer: Of course, yes.

Interviewee: Well it's strongly influenced our business plan in terms of our funding. First we tried to get money from investors based on that full business plan and the full roadway until 2017 - 2018 having aggregated systems of storage in place and we 2009 we have decided cut down that complexity and just go to out with a BP offering a very smart and efficient solution for building a very dense infrastructure in Germany and so it worked from the start.

Interviewer: And did also change the customer segment?

Interviewee: It made it a little bit narrow in the beginning, because grid services you typically offer to grid operators and grid operators currently is not part of our business plan until we haven't done that aggregation system. So in the first step we only concentrate on these three peer groups we already talked about and we will concentrate in the second step on the grid operators.

Interviewer: And how do you deliver your value? What are the distribution channels? What were they at the beginning?

Interviewee: It strongly depends. The distribution channels, we tried to use partners for that actually, so if we are looking at our peer group the EV-drivers, we still think that the best way to distribute these services which is basically energy at home and on the way on the root what can be distributed directly when you buy your car. So you sign a contract for the energy when directly when you buy your car, so the OEM's the automobile manufacturers and sellers should be the best way to distribute it, because they directly have the contract to their customers, but one way distributing the services using the utilities is another way, as we decided to make the utilities our friends is the second way and we currently do not think about direct marketing that strongly that will be probably happen as we one of the utilities, we founded an own utility in 2009 and of course we will be able to deliver the energy as one of the utility.

Interviewer: So, and were was there a change or did it remain the same from the beginning on?

Interviewee: No, actually not. Still the same if you read our BP from 2008 it's still the same distribution channels as we would use in 2009 as we try to use now.

Interviewer: And your customer relationships? Can you tell me something about that?

Interviewee: Well currently we do not have customer relationships with customers charging energy as we still are developing the whole system. We will start testing the systems with first test customers probably in December this year. So, there is no experience with customers at that point. Well, we do have customers for household energy, but well that's not our focus, that's more or less a part of our business to just become familiar with all the processes in the energy market.

Interviewer: This was concerned the EV-drivers, but what is with the infrastructure?

Interviewer: It's the same. We are in a very early stage currently. We've presented our first laboratory samples last December, we have just completed our first prototypes now. We are working and we think if we are ambitious that we will be able to enter the market end 2014 or the beginning of 2014.

Interviewer: Your revenue stream? Did it change?

Interviewee: Oh, no income, we have no income only from household energy but not really earning it's just a black zero. The cost are exactly the same as our turnover. From that it's just a business to learn that's all and otherwise we just spend money because we are founded by venture capital companies and well they make us spend money.

Interviewee: But you have plans for the revenue stream. Did the plans change somehow?

Yes, but well I can only explain it on a more general basis. It strongly changed on the idea to internationalize the whole system. We started with a very basic idea of establishing this in Germany and once you have VC on board, you can forget about thinking small, you have to think big and so internationalizing is now what we are planning. That's probably the biggest change in order to be able to internationalize our model we certainly have to cooperate in all the countries we're planning to go to, with strong players well and they will earn a large share whatever is earned in these markets. So we think about forming joint ventures for example.

Interviewer: And did this change effect or had an influence on the other elements of the business model?

Interviewee: In particular costs yes. If you thinking big if you thinking international it's strongly changes, but still we try not to oversize all this and we try to explain to our shareholders or VC shareholder but we nevertheless how much money we raise we will never be able to raise enough money to conquer international market on ourselves. It will just not happen, because often there are very strong players that are typically already existing in these markets. But still it's costly. Well in the beginning we didn't think well we didn't talk about our technology in detail so far but as you know we have two different ways of mobile metering either you can put the billing technology directly in the car or you can put it into the charging cable. Whereas our original business plan was strongly focused on installing all the technology within the car, finding an OEM to work with and using the OEM as distribution channel and well yeah saving costs by having a partner like the OEM we very soon learned that installing new components within cars is very hard and convincing the OEM to do that was a very long way. Well we do not have the time and in particular we learned that if we are able these cable solutions on our own we're much more flexible. So now in our business plan we have a position for development costs for this cable that wasn't existing a long time. We are not planning to sell hardware, we have partners for that, but to be able to find the partner to present the idea not only the paper but actually with electronics to potential partners, we started developing all these components on ourselves and well it's making good progress.

Interviewer: And what about the key partners? When you decided to go international, so you had to add more key partners?

Interviewee: Yes, absolutely. We can only explain our ability to become international by pointing out our partners, our investor our VC investor is still sometimes of the opinion that we are able to just go to foreign markets and to say: hey we are D we're here, we won't go away and we do it on our own but that will at least in our opinion would not work. We are just not, we are in the middle of two extremely large industries between energy and automotive and they are typically very strong players in that field, so we need a plan for example we just signed a contract with a very large international tier one in automobile an automotive supplier and they are highly interested to manufacture our system sockets in our cable meters and distribute them internationally. They already have the distribution channels to the OEM's and this in perspective to do international business and not to say well we're D we will mandate Foxcorn and we will conquer the world on our own. That's at least for us it's not possible in hardware business, I mean that's possible if you thinking internet business but it's not possible in components business any more.

Interviewer: So key partners are very important for you?

Interviewee: Absolutely.

Interviewer: And how did you define the key partners at the beginning and what changed over the time?

Interviewee: Well, the change again comes from the changing the focus from national to international, so we're growing, our partners are growing and in the beginning we only focused on local market players, market leaders in Germany and we always tried to find market leaders to work with us because well as a strat-up you just do not have the reputation to go to wherever and automobile maker or utility oh trust me we will do. We can only do that if you had the partners with the reputation that trust in you and that your new partner will trust in the partnership of the existing, too. That's the way we did it from the start and we well we started growing our partners our partner base from 2008 on, one of our first partners was ITF, you will them on our website, they are market leader regarding the meter read technology. So that was the core for us, because I mean building a meter in the car or in the cable is one thing but reading out the data, the metering data remotely out of the meter and providing this data for billing purposes is the core of our business, that was very important to us to win ITF as partner.

Interviewer: You already told something about the core, so the key activities could you please describe them a little bit more?

Interviewee: Key activities in terms of what?

Interviewer: Of your business model. So what are the key activities you're doing, you have to do for delivering the value.

Interviewee: You mean the technical the technical way? How the transaction is handled? [...]

Interviewer: These are the activities the customer has to do actually, but what are your key activities as a company?

Interviewee: Ok, well basically if we're building the complete system. We're aggregating all the system components to be able to deliver that billing service in the end. So we designed the system, we made the system design and we now fill all the position for all the various system components with partners to make the whole system work and to be able to deliver the services.

Interviewer: Was there a change or was it from the beginning on defined in this way?

Interviewee: No it was from the beginning on actually. We have become our role has become stronger than we thought. We didn't think about big in the beginning and we are now have a strong much stronger position in that system as we learned that most of our partners or who you are talking to they typically try to focus on the things they already can do and do not think that much about doing more than they already can do. So all positions in our role model that weren't typically taken by partners, because for example ITF is delivering a technology for meter read art or Voltage is doing the data services, all other positions we never thought we could get in the whole very complex system we indeed got, so we have much more power in the whole system, than we originally thought.

Interviewer: So you added more activities to your business model?

Interviewee: Yes, yes, yes.

Interviewer: What kind of activities? Could you give an example?

Interviewee: Administration activities. Acctualy, we know well if all these ever occurs we now will be able to administrate all user in the whole system, so we have all roles wherever there is a use of data comes in to administrate these data. We will administer the system sockets, we will administer the mobile meters, we will administer the customers who install the system sockets, we will administer the customers who are charging energy the EV-drivers and that brings a lot of power into the whole system because all other roles are more or less depended from this administration.

Interviewer: Could you please summarize what lead to the change, the reasons for the change.

Interviewee: The unwillingness of the other players we're developing the system with to actually take the roles. They just said oh well yeah we do what we are good with and that's it and we were always happy to take the head and to say ok, than we do it. We just didn't think that they would leave such a lot of room for our roles in the system. But now we have a very strong position.

Interviewer: And how did it influence the other elements you had to add more activities to the business model? What was influenced?

Interviewee: Yeah, costs again, again costs, because the development work became again larger. We're now developing hardware, we are now taking care for security design, we are now taking care for software design, we are now taking care for a complete internet platform for the administration of all these participants of the system. It definitely it makes it more complex and more expensive and what still your investor is typically happy if the power is not.

Interviewer: The key resources are also an element of the business model. What were your key resources at the beginning?

Interviewee: Resources, well in terms of human resources two people. Well we started with three but already after two months the first one left, so two people for a very long time and a very little amount of money. A good idea as we think at least and well we were convinced that we are able to convince partners to do it together with us. Basically a good idea and a lot of ambition.

Interviewer: And what are your key resources now? So did it change somehow?

Interviewee: Well a lot more money to invest. Lots of people who are working on that what we are doing here, I mean internally we are 11 people now but externally if you add together all people working on the mobile metering system you easily really easily have more than 50 or 60 people working on that systems. I mean from 2 to 60 or whatever, that's a lot. So the resources really really really multiplied.

Interviewer: And how did it influence the other elements?

Interviewee: Well, as always it makes things much more complex. Dealing with all these partners through the whole development process in particular as we are not all at one place but distributed in all over Germany and now even all over Europe and some US some Asia. Is much more complex, it brings up risks not to be able to control processes anymore at least not that perfectly and on the other hand it brings much more opportunities.

Interviewer: Thank you very much. I have one last question, it's about innovation. How do you arrive at your innovations?

Interviewee: [...] With a lot of work and a lot of ambition, definitely and probably the ability to build, to convince a lot of partners and to build a very strong network, to convince more partners, to convince politicians , to convince investors but in the first place with a lot of work and more and more making visions becoming facts.

[…]

5. E

Questions were answered vial email.

E is still in the research and development stage. For one product the company is in the final stretch and plans to begin sales within several weeks. Therefore all our answers are based on plans, estimates and market research; not actual sales.
For E the business model includes our product (what we develop and manufacture), our market definition (including segmentation), our financing structure, and our distribution.

The company was established with seed money from one investor and reached agreements with additional venture capital investors over time, in further rounds of capital raising. One of the major changes to which I will relate most of the aspects of the questionnaire is the arrival of a new venture capital partner on the scene. This new VC is very process driven and as part of the discussions and negotiations, has led the company towards changes in marketing strategy, sales tactics, and even engineering R&D practices.

A second major change was the realization during a long R&D process towards a certain product that the know-how and engineering thus developed, can lead to another product (an off-shoot or a bi-product of the R&D process) that is aimed towards another market and opens up many new possibilities for the company.

What was your value proposition when you started the company?

Our value proposition when we began was to provide our future customers a product that produced electricity while treating wastewater. Wastewater treatment is a high-energy-consuming process (energy is by far the highest operational cost in a wastewater treatment plant). E worked on developing a product that uses no energy for aeration (and only minute amounts of energy in general) and also produces energy directly from the treatment process, reaching an energy-positive process.

Advanced stages of R&D led the company to the realization that simply reducing the energy consumption by about 80%, together with additional significant benefits of the product, provides a very good solution to a vast market that the company did not initially target. A major change was thus made to the company view of its market, which led to changes in distribution methods, sales, etc.

The initial product, our Electogenic Bioreactor (EBR) was intended (and still is) for the industrial wastewater treatment market. The product is complex and can treat strong concentrations of influent. Our new product, the Spiral Aerobic Biofilm Reactor (SABRE), which is market ready much before the EBR, is much more simple (to construct and to operate) and treats low-strength wastewater, such as municipal influent. The two markets are very different. The municipal market's alternatives at present are inexpensive compared with

EBR and therefore initially this market was not considered. However SABRE is cheaper to produce, very simple to operate and has added benefits that are important to the municipal (and municipal-type) market, such as simultaneous nitrogen removal, no odor, no noise and more.

The value proposition changed and we actually speak about several value propositions, when we segment and sub-segment the market. Different segments within the municipal-type market, such as remote sites with a need to treat their wastewater (e.g. casinos, resort hotels, etc.), have different pain points: some need an extra source of cheap water for irrigation (if they're in a place where water is scarce); others need to reduce their energy costs (if they're in a place with high electricity costs). Others still may need a treatment solution that is silent, odorless and esthetically pleasing (near hotel rooms for example) and so the value proposition is tailored by segment.

For what customer segment was the initial value proposition intended?

Initially EBR was to be sold to industrial clients via representatives/distributors. SABRE on the other hand will be marketed to certain segments via salespersons directly employed by E and via reps and OEMs in other segments. Some segments are inclined to working with representatives and others less so.

The second major change, as mentioned before, was the new VP partner who came with a very cohesive methodology for much of the marketing strategy development. This led us to look at market segmentation differently and even to a decision to forgo the main market and concentrate on few sub-segments initially. The VC partner has much experience in bringing new technologies and innovative companies to market and E embraced their approaches and techniques to shorten time-to-market and to attaining market dominance in specific sectors.

Customer relationship and revenue stream:
We have nothing to add regarding customer relationships and revenue streams, as the product is not yet freely sold, and the few customers we do have are not necessarily representative of our main market.

Key activities:
The two mentioned changes have impacted our key activities, as the marketing division needed to work much more on segmentation and validation of sub-segments before going to market. Fewer agreements with representatives need to be signed. Advertising is less general: more geared towards certain segments and not to the overall wastewater treatment market. Exhibitions attended are different: also more specific to segments and to certain territories, which were selected more methodically than previously planned.
Initially many countries were considered: wastewater is a global need. With more strict methodology and more formal processes, we have established criteria to prioritize territories

and came up with results that surprised us. Procedural validation is on-going and will lead the company to working in different languages, with different partners and even to different-sized wastewater treatment plants.

Key resources:
The changes lead to changes of key resources needed. For example, an engineering VP became a necessity earlier than planned. Product managers, who were planned years down the line, became a requirement at a much earlier stage. The new VP partner, coming in with a sizeable investment, also opened new possibilities and horizons for the company, that can now afford to move faster on many fronts.

Key partner:
Relationships with partners are not yet prevalent but the plans for such relationships have changed. For EBR and before the new VP partner, the company planned on providing turnkey projects for some of the customers and not to provide only its product. Now, we are considering key relationships with integrators in different segments, within various territories, who will purchase our product and install it with other peripherals at the clients' premises. This is still a work in progress, but the changes in strategy on on-going.

Cost structure:
Moving from EBR to SABRE – a more simple product – changed our costs tremendously. Not so much the structure of the production costs, but the actual costs. Overall company cost structure changed, since the production is now a smaller part of the overall costs of running the company. This in turn changed the value proposition – we can offer a more cost-competitive product; changed our market – we can offer the product to larger and poorer markets; changed our projected revenue stream – we need to sell more products to attain the planned revenues, etc. etc.

Innovation:
Regarding the final question about innovations, we are an R&D based firm. More of our employees do R&D than anything else. We encounter problems in the processes and we search for solutions, try them out (in the lab, then in field trials and finally in full-scale). We also have relationships with various universities and experts in our field, with whom we consult on a regular basis.

I hope this helps your research. If you feel you would benefit from a phone call, we can schedule one later this week.

6. F

[…]

Interviewer: Hello.

Interviewee: Hello, I'm not sure what happened there.

Interviewer: I don't know either. What did you --

Interviewee: So I heard that you said that we were listed in the Global Cleantech 100 then we got cut off.

Interviewer: Yes, and Cleantech might be a contact possible more or less.

Interviewee: I see, okay. Great. Well, thank you again for inviting us to participate. It's our pleasure to help you in any way we can. What would be -- how should be --

Interviewer: Thank you very much for your participation.

Interviewee: Sure.

Interviewer: So let's start with the first question. It's about value proposition. How did the value proposition developed over the time? So what was it at the beginning and how does it look like now?

Interviewee: Yeah, sure. One of the main -- and at any time, please interrupt me if you have a question or you don't understand what I'm saying. Basically, the inventors of this company try to come up with a micro inverter solution. What a micro inverter does is transforms the power that is captured by the sun, by the modules. That power is captured as DC. It has to be converted into AC to be used in your house or fed back into the grid. That's the main function of an inverter. Are you familiar with a micro inverter as well or just -- should I --?

Interviewer: Not really.

Interviewee: Okay, so maybe let me just step back a little bit and give you some context and then I'll answer your question.

In the broader, we operate -- we're a manufacturer -- our micro inverter is in the solar industry segment. In the broader solar industry segment, there are probably three or four big categories of market segments. The very large market segments are utility scale solar that provide power to complete neighborhoods or factories and things like that and there's industrial or light industrial solar that provide power just for a particular factories and rooftop as an independent power generation plant and then there are smaller solar applications. That's called residential rooftop, solar to be put on your roof to use for your own residential use and then even in smaller applications, you can have solar on the top of street lamps or garages or things like that.

When this energy of the sun is captured or that's captured by these things called modules that are based on silicon and the energy of the sun that is captured by modules is captured in the same way like you might have a flashlight battery. That battery is called a DC battery. DC stands for direct current, but the electricity that we use in our homes and the electricity that is transmitted by power stations across the country and used by factories and so forth is called AC and AC stands for alternating current.

So one of the challenges in solar energy is after you captured the energy of the sun by the solar panel, it has to be converted to AC or it's known as inverted because alternating current is the opposite of direct current. This process of conversion or inversion happens in something called an inverter. We operate primarily in the residential segment and the light commercial segment. Light commercial, meaning small commercial buildings.

One of the things that happen in a commercial segment, which part of your Germany are you from? May I ask [inaudible 00:03:45]?

Interviewer: From Berlin, from the capital.

Interviewee: From Berlin, okay. So when you're in a nice neighborhood in Berlin where you have residential homes and rooftops, many times, there are nice neighborhood structures like trees or there is a certain structure of the house like a chimney or interesting window. That as this -- during the course of the day as the sun travels from the lowest point in noon and then back to the lowest point in the evening, there are shading created. When that shade falls upon one of the solar modules that dramatically diminishes the output of the entire solar system on your roof.

The reason for that is all of the modules are connected together in series, which means that the output of one is connected to the input of the next one and then the output of those two is connected to the input of the third and so on. At the end of that string, the output of all those combined is fed into what is called the string inverter. The string inverter inverts the DC into AC and then you get the electricity.

In that situation when one module is shaded, let's say the third module that's shaded, the output of the entire string even if it's 24 panels, 24 modules, the output of the entire string is reduced to the lowest performing module. It's like if you were to connect a thick pipe to a thin pipe and then another thick pipe, the output of that whole system would be limited by the thinnest pipe.

This problem is one of the things that the company's founders try to address, which is instead of having inverters be connected in series and have energy lost due to shading, how can you create a micro inverter that is attached to the back of each module and each module then is connected in parallel. That means that if any one module is shaded, then the other modules are still working at full capacity and the overall energy powers this much greater.

On micro inverter in general, the main idea is to minimize the effect of shading. The shading again comes from hospital structures, it could come from lead. It could come from dust and debris. It could come from bird droppings. It could come from anything that covers the panel. The main innovation of F was to realize that once you have a solar installation on your residential rooftop in Berlin, you don't want to have someone go up there and repair it often.

It needs to be very, very reliable and the lifetime of solar modules is approximately 20 to 25 years. They last for a very, very long time. Which was about the same time, at least in the United States, it's about the same time as the roof of your house will last. Probably, it would last even longer, but the roof's waterproof capabilities and so forth are normally warranteed for 20 to 25 years. And so the solar module makers also make modules that are warranteed by the same time because once the installer goes to the rooftop and installs a module, you don't want that person to come back and interrupt, do it again in two years to do something.

So the main innovation of F was to come up with a micro inverter that has the same long life and reliability as that of a solar module, i.e. in other words, something that lasts full 25 years and provides maximum energy harvest. So that's the key value proposition as maximizing energy harvest in shaded situations.

Your question was how a value proposition evolves. So initially, the value proposition -- is this speed of speech okay? Am I going too fast?

Interviewer: Well, it's -- thank you for the great explanation. Now I know everything about that or more or less the --

Interviewee: Good.

Interviewer: Thanks.

Interviewee: So it has evolved the way that the value proposition evolved is initially the company focused on providing a very reliable solution and the way they have produced a very reliable solution is by eliminating the electrical components in the inverter that usually fail in a short period of time. It's more technical detailed and perhaps you want to – but one of the main things in an inverter, in a traditional string inverter that fail is called an electrolytic capacitor.

It’s basically an energy storage device, a piece of electronics that stores energy after it has been converted and electrolytic capacitor means a capacitor that’s filled with electrolyte. Electrolyte is a fluid, is a liquid and when you use this fluid over and over again, it is converting and inverting and storing in hot temperatures, cold temperatures, morning and night, expanding, contracting, the liquid in about five or seven years evaporates and the electrolytic capacitor fails.

So one of the key patents that F has is the use of non-electrolytic capacitors or what’s called thin film capacitors to accomplish this energy storage and transmission. The value proposition has now evolved now that we have a very reliable product where we focus on is producing the maximum energy output. And in the solar industry, the word they use is called maximizing energy harvest. How much of the sun’s energy that you capture can be converted into useful electricity? That is one of the evolutions of the value proposition.

One more point on the evolution, which is initially, it was thought that distributors around the world in Germany and other places, companies like IVC and Sonepar or Sensor Solar and other companies would like to buy micro inverters that are packaged individually or discreetly. Now, the evolving trend is instead of a solar installer buying a solar module separately and buying a micro inverter separately, they would like to buy them together bundled together. We are working with companies to offer them our micro inverter product.

We work with module companies to people who make the solar panels and they will buy our micro inverter. They will assemble the micro inverter to the back of the solar panel and they will sell these combined products called an AC module to their distributors and solar installers around the world will buy integrated AC modules from those distributors and install them on the rooftops. This will make the installation process much easier, much simpler, take less time, and be less complicated, fewer parts, things like that.

Interviewer: Okay, so as far as I understand, there was no big change, right, in the value proposition?

Interviewee: Well, there was. The initial focus of the value proposition was to build a very reliable micro inverter.

Interviewer: Okay, and then?

Interviewee: And then the next value proposition was to make sure that the micro inverter would have the maximum energy harvest. And then the third evolution of the value proposition was to create a micro inverter that could be easily integrated with a solar panel to produce an AC module.

Interviewer: What do you think why did the changes happen? What was the reason for it for this evolution?

Interviewee: Sure, good question. So the way that we buy a solar panel is based on the amount of energy that it can capture from the sun. So solar panels, solar modules are related as a certain number of watts, a watt is a unit of energy that they can produce. Over time in the last five, 10, 11, 15 years, the module manufacturers had been investing in their research and they're open and they are producing better modules with higher power outputs.

So one reason for the evolution of our value proposition to maximize energy harvest is to enable the researching development of the module manufacturer to be realized on the rooftop. If we only have a micro inverter that can produce 200 watts of AC power, but there are modules in the market that are 250, 280, 300 watts of AC that are capable of 300 watts of DC output, then we need to evolve our technology roadmap in our value proposition to offer the maximum possible AC output conversion.

And finally, the other reason the market force driving the change, driving the change of the value proposition is that the process of putting -- let me back up a little bit. One of the reasons solar energy is a very promising technology, but there is no natural demand for it. Germany is a leader in the world's -- it is the largest solar energy market in the world not because people like you have gone to their German industry and said, "I want to have solar energy on my roof," but primarily because the German government has provided very significant financial subsidies and what's called feed-in tariffs and incentives for you to put solar energy on your roof. They do that because it's good for the environment and it's good for national security, but the actual cost of solar energy compared to energy from nuclear sources in Germany or other non-renewable sources in Germany is still higher. So the only way that the German government could convince consumers to put solar energy on the roof is by making it cheaper and that they feel that this is a good investment.

So the German solar industry grew for example at a very rapid rate and it remains the biggest industry in the world right now. Germany and Italy are the world's largest solar energy markets, but in many markets, the cost of solar energy is still more than the cost of conventional electricity. And as long as that is the case, people will not automatically go for solar unless they are maybe members of the green party or they are environmentally friendly or things like that. The average consumer will wait until that's cheaper.

And so one of the things that have been driving the cost of solar up is the cost of the components and the installation cost because it takes a qualified technician, electrician to come to your roof to measure the roof, to measure the shade, to calculate the length of the wire, to calculate the number of modules. And so the reason we evolved our value proposition to integrate the micro inverter with the AC panel is to help minimize the cost of installation to drive more consumer demand.

Interviewer: Okay.

Interviewee: Does it making sense?

Interviewer: Yes, of course.

Interviewee: The [inaudible 00:15:30]?

Interviewer: Yeah, I really like your explanations. It's very clear.

Interviewee: Well, thank you. I teach at a university myself so I get a lot of good --

Interviewer: That's why -- yeah, now I've seen.

Interviewee: I get a lot of good feedback from my students.

Interviewer: You already mentioned that the customer segment has changed, right, so that it was initially intended to be sold to the end customer and now you have to work with partners together who combine it, right?

Interviewee: Almost. It is true that the customers have changed so let me explain a little bit more about how that works. So when you are buying a solar system, you and I can go to IKEA and buy a shelf and we can assemble it at home or we can go to [inaudible 00:16:24] and buy something and put it together ourselves. We don't need any special qualifications, but in the vast majority of solar installations around the world, well, there are two kinds of residential solar installations. One is called on-grid or grid-connected and the other is called off-grid.

So off-grid means that if you're sitting in the middle of the Kalahari Desert in Africa and you want to have a -- and there's a lot of sunshine and you want to have electricity and you use solar energy, you can have solar energy, but it is off-grid, there is no public utility there that can supply you electricity. You're only able to use electricity from solar that's off-grid. The market for that is actually reasonably small. Most electricity consumption is done near a place in the metropolitan area or in a city where there is a public utility and you pay a monthly bill to the utility for the amount of electricity that you consume.

The governments in all countries, Germany, America, Italy, and Thailand require that when you connect a solar installation to the public electrical wires, the public electrical utility, then you must get government permission and it must be certified that it is safe. One of the ways that Germany and other countries had provided a financial incentive is something called a feed-in tariff.

This means that if you have a very large home in Berlin, you have a very large roof in Berlin, you put on a big solar installation, let's say it produces more electricity than you can use, the German government will pay you to sell that electricity back to the network, to the utility and they will give you -- I don't know, but nowadays, the rate is 17 euro cents per kilowatt hour and so forth. Some people used to buy very large installations even though they don't need such a large installation because the incentive was so high.

So anyway, because the government is involved in this connection, you have to hire an authorized or a licensed electrical contractor or a solar installer to design and install and connect your system, turn it on onto your roof. So the initial market focus used to be the installer, just the installer themselves and around the world, the installer dynamics are different. In Germany, which has a very large Mittelstand as you know, there are lots of small businesses and there is no one large national installer. In the United States, the situation, even though United States also has a large Mittelstand in the—for the solar industry, there are one or two very large national installers. And so the ability to reach and influence to market and sell to installers is different around the world depending on where you are around the world.

And so, our focus has changed to take into consideration where people buy their products from. As the industry has evolved and become more mature, then we have learned that the [inaudible 00:20:08] maybe I should spend one or two minutes on the module maker situation. The Chinese government realized that the market growth potential for solar was very, very large and so they invested a lot of money in factory capacity to build solar modules more cheaply than German and American companies could build them.

As a result, many German companies and American companies have struggled to produce solar modules at competitive prices. And now, the top five or 10 manufacturers of solar panels in the world are actually Chinese companies and they have driven American and German companies out of the market because our cost are much higher. So they now have significant market power, but they don't make a good inverters or micro inverters.

So our strategy has been to partner with the market forces, meaning the large module makers to provide them with an ability to differentiate amongst themselves. Because what has happened now is there is so much overcapacity in the module market, but module class have dramatically gone down and these companies are going out of business because they cannot make money. I'm being very general.

So if we can provide a very reliable micro inverter and we can provide a power output roadmap that allows the R&D class an innovation of the module maker to be realized and value to be captured for that the people will pay for a higher output product, then there is a winning strategy for us. So yes, our customer focus has evolved. It used to be just installers. Installers used to buy from electrical distributors so we used to sell directly to installers or primarily sell to distributors. And now we sell, not only to distributors, but have a very heavy focus on selling to the module and manufacturer themselves and the module manufacturer, which are much bigger companies, multi hundred million, billion dollar companies, they can sell our integrated product to their distribution network and they can sell that product to their branded and authorized installers.

Interviewer: As far as I understand, the market development was the reason for the change.

Interviewee: That's right, the market development was the reason for the change and the change in the industry dynamics from where -- meaning, who was controlling the market, who was influencing the market heavily.

Interviewer: Okay. Did it influence the distribution channel?

Interviewee: Very much, very much so. So we -- as I mentioned, our initial focus was very much on installers and when we think about installers, there are thousands of installers. In Germany, there are probably 14,000 to 17,000 installers. So we would not sell directly to installers because installers buying small quantities so we would sell to distributors, to larger stocking distributors, sent them through United States, there are many, many thousands of installers and we would sell to large distributors.

Now, we do not -- we still sell to distributors, but we are interested in selling large quantities, pallet loads, cases and cartons, factory direct shipments to these large distributors, but even better for us is to ship directly to the module maker. So before, we were not focused on module makers, module manufacturers and now, that is a very big part of a focus.

Interviewer: Okay, and the reason is also the market development or are there any other --

Interviewee: Yeah, the reason is market development, but the reason is also -- let's say efficiencies. If we can sell 100,000 units to the module manufacturer, it's much better for us than if we sell 10 units to 10,000 installers each, the marketing cost are different, the sales and logistics cost are different, the supply chain dynamics are different, the packing and shipping cost are different. So when we can sell a very large quantity to the module maker, it's better for us.

So yes, it's an evolution of the market, but it is also an acknowledgement that for a small company like us, being relevant directly to an installer or influencing the installer to purchase F is a very expensive proposition. It is very hard for us to reach an influence tens of thousands of installers around the world. Much easier for us to influence and reach a few large distributors or a few large OEMs, Original Equipment Manufacturers.

Interviewer: Is it right that it's not only about the cost-efficiency, but also about your activities so that you don't have to do a lot of things to -- do you know what I mean? So that --

Interviewee: Yes, that's gone out. That's exactly right. If we have to -- I used to work at Intel, actually, Microstar, a CEO also worked at Intel. Many years ago at Intel, there was a sticker on your computer, it said, "Intel Inside," and you and me would go to maybe a marketer or some place and say, "yeah, I want a new computer and I want to [inaudible 00:26:07] Intel Inside, I like Intel Inside, I trust Intel Inside." As a consumer, you and I knew who Intel was that's because Intel spent billions of dollars everything, on tradeshows, on advertising, on campaigns, on the marketing, on media and whatnot.

So F doesn't have that kind of money even though it's ran by Intel people and we have to be more smart about building our market share and building our brand. And so our brand is not a consumer brand, it is really a business to business brand. We are not a business to Consumer Company or business to business company. Even though our consumer will see our brand when they log onto the website and they look at the monitoring software that can show them the conversion of energy. We at this point in our life, in the growth of our company, it is not practical for us to be a consumer brand. And therefore, you're right the business has dictated a module manufacturer and distributor focus that permits us to gain broad reach to the market with low investment and marketing cost.

Interviewer: Okay and I also assume that the customer relationship has changed, right, because yeah-- also influenced by the distribution channel by the changes there.

Interviewee: Yes, it has. The distributors -- they have always been -- distributors like to have a relationship with a large manufacturer and so when we are a young -- relatively speaking, young company, when we go to a distributor and say, "Hi, we would like you to carry the F micro inverter." The first time, they say, "Well, who are you and how long have you been around?" On the other hand, when one of our module manufacturer partners [inaudible 00:28:08] and say, "Hi, I want you to carry this new product I'm selling. Next year, you can buy my module bundled in with the F micro inverter." And they say, "Oh, great that sounds great. So if you've already done the research and you tested that the F micro inverter is the best in the world, we love to. We've been buying modules from you for 15 years and now, we buy a new kind of module from you."

So yes, the trust that comes from working with a large and well-known brand very much helps us. In the United States, we use the word bankable. It makes us more bankable. People are more willing to risk their money on us because they know that we are affiliated with a very large brand.

Interviewer: Okay, and can you tell me more about the customer relationship? How was it at the beginning and how's it now?

Interviewee: Sure. One of the things that maybe back to the -- your first question about value proposition, because all of these solar installations need to be certified by a national electrical authority, the national electrical authority of all these countries, of Germany, of Italy, of Thailand, of America, Canada, they have what I call certification bodies. They must certify that your product is legally usable on the public electrical grid.

And gaining that certification is not very easy. It is a very complex process to gain the electrical certifications. And one on of the focuses of F has been to produce a product that has the maximum number of global certifications. So we are for example, the only -- even though there are other micro inverter companies in the world and in America, there is - in United States, there is another micro inverter leader by a different name. In Germany, we are number one and we are the only micro inverter company in Germany. In Germany, they say [inaudible 00:30:33]. We are the only micro inverter company in Germany that could pass the strict German electrical laws.

The benefit of that is that when we shifted our strategy to partner with module manufacturers, all the module manufacturers are international companies, large international companies: Yingli, Trina, Hanwha, Canadian Solar, Schuco, Schott, Bosch. A lot of these companies are international brands.

And so when they -- since they manufacture solar panels for use and sale around the world, if they want to have an AC module. And again, an AC module is a solar panel, plus a micro inverter bundled together. Then they are very attracted to the company like F because F has the most global [inaudible 00:31:32] because we are certified in Germany. We are certified in Italy. We are certified in Spain, in France, in UK, in Canada, in Australia and North America and things like that.

We're the only company that has that many international certifications and that has made the customer competition very interesting because that is a key differentiator of ours not only do we have the most long life reliable micro inverter that has the maximum energy harvest, but we also can manufacture in high volume and ship around the world. And our micro inverted is [inaudible 00:32:08] accepted by the regulatory authority in all of those countries. That [inaudible 00:32:14] simplifies the ability for a large module maker to accept our product in one country and ship it around the world.

So that again had an impact on the customer relationship-- a very positive impact because we are the only one that has that level of global certifications. Not only that, as I mentioned to you, Germany is one of the largest solar markets, something like -- I don't remember the exact number now, but I think maybe 13% or 15% of the German electrical supply now comes from renewable sources, the vast majority of which is solar.

Interviewer: Yes.

Interviewee: What that means is that the German industry is one of the most advanced for solar and when the -- one of the things about solar electricity is that it depends of course on the sun shining. The sun shines in the day, but not at night and so there is a period of time for the German electrical utilities that in the daytime, maybe on a sunny day, they need to produce less electricity because the sun is [inaudible 00:33:30]. But at nighttime, they need to produce more electricity, of course.

But not only that, during changing weather patterns, when it's a winter storm or it's cold or foggy and the sun is not coming through to the panel so much, then the electrical supply during the daytime from solar can also drop and the utility needs to supply more. But utilities are very, very large companies. It is not easy to instantly increase or decrease the amount of electricity supplied by the utility. It's a complicated process and the same thing is true for -- when a -- if half of Berlin is suddenly covered with clouds and the electrical supply from the solar residential rooftops drops dramatically, the Berlin public utility must respond quickly to ensure that you don't have any interruption in your electrical supply.

As a result of these types of forces of nature: cloud, storms and the fact that there are so many producers, there are so many residential rooftops in Germany, the German rules for connecting and disconnecting from the grid when you are producing or not producing electricity are the strictest in the world. And other countries believe that if you are certified in Germany, you must be excellent. It's like the reputation of German engineering around the world. German engineering products are known as solid, very high quality, very reliable. The same thing is true for products that are certified to work on a German solar market. People say, "Oh, yeah, if they could certify their product in Germany, it must be good because the German standard is so difficult to meet."

Interviewer: Yes, it's so high. That's true.

Interviewee: And so that has helped our customer relationships also. We often tell people that we are the only micro inverter company certified by the German authority and therefore, they should feel confident that our capabilities are excellent when they contemplate their purchase even though this company or customer might be in South America or in Asia or Thailand or whatever.

Interviewer: What about your key activities? How were the key activities or what was essential at the beginning and how did it change?

Interviewee: The key activity for me -- you mean for the company at large?

Interviewer: For the company, yeah, for the company.

Interviewee: Well, the key activities in the beginning, were to make sure that we could manufacture the product in a high volume high quality. So again, we are a relatively small venture backed company, company backed by venture funds. We do not have access to large fabrication facilities that cost hundreds and millions or billions of dollars to build. So we have partnered with one of the key to the activity is to identify and partner with a third party contract manufacturer that can produce our product in high volume and at low cost. High volume, high yield and low cost.

So the initial activity of [inaudible 00:37:00] where we focused on ensuring that the product that was invented by four Ph.D. students at the University of Cambridge was not just -- we say in United States, not just a science experiment, but it actually was manufacturer low. And so one initial activity of the company was focused on making sure that the component selected or what is called the BOM, Bill of Materials are the types of components that can be easily acquired at low cost and are of the reliability that we require to guarantee the quality and the long warranty that we offer. And that our manufacturing partner can successfully assemble manufacturer test and supply this product reliably around the world.

Initially, there is a lot of work on in that area, in the manufacturer ability of the product. Now, the company's focus is less on that because we have a tier one third party outsourced manufacturing partner. They are well respected around the world, they are ISO9001 certified and all of our customers gain confidence, but we are working with them. Now, the focus is more on international expansion and new customer acquisition. Initially, the company started out in Cambridge, England. This past year, the company shifted its headquarters to

United States to penetrate the United States market and the Canadian market. Now, we see significant opportunity in Asia particularly Japan. As you know, Japan had a major nuclear crisis from the tsunami and they very similarly--actually right after the Japanese tsunami, the German government also declared a shift away from nuclear sources and the Japanese government is doing the same. They said they want to reduce the [inaudible 00:39:07] nuclear energy and dramatically increase their focus on renewable safe sources like solar.

So now, the focus of the company is on driving the cost down of our product, continuing to improve manufacturing operations and supply chain logistics to supply our worldwide customers and acquisition of new customers and new partners to penetrate North American, broader European and Asian, South American markets to address the residential solar market segment that is growing in those countries.

Interviewer: And would you say it's the normal evolution or are there reasons behind the change --

Interviewee: I would say it's the normal evolution. First, you get the product, you make the product perfect. You make sure it can be manufactured in high volume. You start out in one local market. As you gain experience, you look for other growth markets. In Europe, we were a leader, we were the only real credible supplier or marketer [inaudible 00:40:19] is always sounds interesting, it sounds exciting, but it's a very big market and we have very big competitor in the United States so you have to be careful and thoughtful about that whether the risk or reward is worth it, whether the cost benefit are worth it in your analysis.

And as I mentioned now, there are a lot of interest in Asia, so I think it's a natural progression. You start out in one market, you gain experience with manufacturing products, sells marketing customer acquisition, customer support and service and use that experience to branch out into other growth markets depending on where your value proposition is strong and continue to look for opportunities like that around the world through a strategic growth process.

Interviewer: And like your key activities, did your resources change?

Interviewee: I'm sorry. Once again?

Interviewer: Did your key resources change?

Interviewee: Key resources, well, in a sense, yes, they did. When the company was founded in England, it was a very small company founded by the Ph.D. founders then over a few years, they found some German Cleantech funds that invested in them and grew the company to be a little bit bigger. Then the board of directors decided that the American growth opportunity was quite large and a lot of the world's engineering talent was or metal talent was available in Silicon Valley. So they moved the company to Silicon Valley and the company further grew in personnel and broadened its management ranks and hired people like me from Intel or manufacturing guys from Cisco or other people like that. Our CFO is from NVIDIA. So the management ranks broadened.

The initial manufacturing strategy evolved from multiple manufacturing suppliers around the world to consolidate into one primary one in China. So yes, there was a shift in the key activities as time has gone on and as the company has gained more success in the marketplace.

Interviewer: Okay and it's also -- how do you say that? It's also the same case for the key resources.

Interviewee: Yeah, I think so. It's a normal evolution.

Interviewer: Okay, so you would say it's a normal evolution, there were no other reasons behind it.

Interviewee: Well, actually, I don't know. It depends on what -- not everyone would -- not all European companies that are born in Europe move to United States. So in a sense, it's not a normal evolution. For example, the worldwide leader in inverters is a German company called SMA. They are obviously happy in Germany and they have a strong market share around the world. They didn't pick up and move to United States. So one of the things that is particularly unique about F is that it took that risk of completely picking up the entire company out of its original headquarters, moved away from the university [inaudible 00:43:51], which it was founded in Cambridge and went to Silicon Valley. And the reason as I said they did that is to access not only the North American market, but to access talent, people, and human resources in Silicon Valley.

So I guess I should say it's not that typical that a company would take such a dramatic change or risk. Most companies will probably say, "Okay, let's open up a sales office in New York or in Los Angeles." But F' case, they didn't open up a sales office, they moved the company headquarters and they hired a new CEO in the United States and they look for somebody else significant experience in the manufacturing of high technology industry and that was Mike Fister who you heard about from the Cleantech Conference.

Interviewer: Yeah. And, I assume it's the same case to the key partners, right, that's -- the key partners changed over the time.

Interviewee: The key partners did change over time, but this is again where we are unique. Our primary competitor in United States, actually, who is the market leader in United States, they have a very different strategy than we do. They did not sell to large manufacturers. We do. We sell to both distributors and manufacturers.

So as a means to differentiate ourselves, number one. Number two, also, because we have the differentiating ability, our key competitor in United States is certified in United States, but does not have as many international certifications and the power output of their micro inverter is lower than [inaudible 00:45:30] and they have fewer variations than we do.

So in terms of the key resources and key customer strategy, that's also a very different and very unique because we realize that not only do we have a very good business opportunity to sell to traditional distributors, but we also are very well suited to partner with an international module manufacturer because we have such good international module certification, because we have such good international micro inverter certifications and because we have world-class logistics in manufacturing and can supply our module partners around the world.

So, in a sense, it's normal, but in another sense, it's not. There is another company in United States that makes micro inverters and they sell only to manufacturing partners. They did not believe that they don't sell a discreet micro inverter through distribution channels. You cannot buy one of their micro inverters off the shelf at their distributor. You can only buy it packaged with an OEM, with the module maker. But they're not doing very well.

So we think that our strategy is the best of both worlds. If you are a capable and large distributor that can handle the complexities of micro inverter, we'll sell you one. Actually, we'll sell you a hundred thousand. If you are a module manufacturer and you understand the value of marrying or integrating your own module with our micro inverter and selling it as a more attractive bundle to your customers or your distributors, great. We will have a relationship with you too and we'll sell you 200,000 micro inverters or million.

So, our strategies actually quite thoughtful and unique that we did not rush to be a supplier to manufacturers too soon and we did not close doors of opportunity to distributors only to focus on manufacturers or vice versa. Like I said, our -- the main competitor in United States, they don't have a strong OEM partnership capability because their technology doesn't permit it and their international certifications are not as strong as ours. So in our case, the business model, the customer type, the use of resources are all actually quite unique.

Interviewer: Okay. Thank you very much. There are two more blocks remaining. It's about the cost structure and the revenue stream. So could you tell me the changes which happened there?

Interviewee: Sure. Well, one of the main changes that happened in the cost structure is related to the product itself. When you first design a product, you design it with what are called discreet components, individual capacitors and resistors and circuits, and sometimes, the circuit board itself is a little big. And as time moves on and you have validated and verified the functionality of your components, you have the opportunity to reduce the component count. Again, reduce what is called BOM, Bill of Materials, which is the list of components used.

So in between our first generation and our second generation product, we are now manufacturing our second generation product. We have had a dramatic reduction in the BOM count. A dramatic reduction in the BOM count means there is a dramatic reduction in cost. Dramatic reduction in cost while there has not been a need to dramatically reduce the sales price. And therefore, our second generation products enable us to have a much more profitable product portfolio or product cost characteristic.

In addition, in the electronics industry, there is a technology called ASIC, I'm not sure if you've heard of it, A-S-I-C. It's called -- it's an abbreviation for Application Specific Integrated Circuit. And what we have done is we have taken a number of components on our first generation board, we've combined them into a single component called an ASIC. So we have several ASICs on our board, which improves the reliability because you're no longer dealing with many components, you're dealing with one and it reduces cost because instead of using 20, 50, 80 components, you're using one.

So one of the main pieces around cost has been product cost and product -- the focus has been to dramatically reduced product cost while maintaining a healthy ASP, Average Selling Price. And this has enabled us -- this gives us a lot of margin leverage. Our profit margins and gross margins have the opportunity to be heavily improved by an aggressive reduction in the product cost. And as our manufacturing volume increases, we expect to realize even more savings and improvement in product cost. So that's a key component around costs.

On the revenue side, most of the change in revenue has to do with where the revenue is coming from on a geographic basis. In the very beginning of the campaign, the company like I said was founded in United Kingdom so a lot of the initial sales and revenue were in United Kingdom. Then over time, they expanded into Continental Europe and penetrated the German and the Italian markets, also the Netherlands' market. One of our [inaudible 00:51:31] was actually a Dutch as well and the Dutch market even though it's small, they are very interested in solar energy.

The certifications were received for those countries and the initial revenues of the company were primarily a combination of the United Kingdom and Continental European countries. As time has moved, now, our revenue profile has shifted and we get more percentage -- we get a greater percentage of our revenue from the United States. It's still largely European because we have a strong leadership position in Europe, but more -- we are getting more revenue from United States and we expect over time that we will get initial revenues from Asia. We also sell in Canada and Australia today and so we do have certain amounts of revenue from those countries as well.

So the big change in revenue has largely been geographic -- the change in the geographic complexion of the revenue, the geographic composition of other --

Interviewer: Okay. Thank you very much for your time. It was one of the most interesting interviews I had.

Interviewee: That's very kind of you to say that. I appreciate your very thoughtful questions and I wish you all the best of luck. When will we get any feedback from you on --?

Interviewer: Yes, of course. I have my defense in March and after that, we will decide how to proceed further for the paper and it's also possible that I will do my PhD on it.

Interviewee: Oh wow!

Interviewer: Yes, it depends what my supervisors tell me if it's accepted, but if it will be published, then of course, I will ask your permission more or less what to publish and tell it to publish. But in your whole, you will get my [inaudible 00:53:34] thesis so I will send it to you and yeah, hope you will find some interesting things there.

Interviewee: Sure, and I [inaudible 00:53:43] send a note to Mike Fister and you can copy me and tell him that you did have the -- that you did -- the interview was closed and everything went well from your perspective and I'm sure -- I'd be happy to know that you got your questions answered.

Interviewer: Yes, I will do that. Thank you very much. […]

7. G

[…]

Interviewee: Yeah, I – well – half an hour, maybe.

Interviewer: Okay. So, just let me know when you have finished, okay?

Interviewee: Okay.

Interviewer: Good. I have one general question at the beginning. How do you see or what is a business model for you?

Interviewee: Are you talking sort of G? Yeah, I guess you are. Sorry, your question was what is our business model, or – what do you mean by business model?

Interviewer: Yeah, what do you understand under a business model? What position do --?

Interviewee: I guess, really, a business model is a way of describing and understanding how a business conducts itself, I guess. It's a tool that structures you and – [insight], isn't it?

Interviewer: Mm-hmm. Okay. And do you use the business model canvas, you know it right, because you show it on the slides?

Interviewee: Yeah, I used it as – [Ibrahim] asked me to talk about the journey that we've gone through in G and the modeling [that we'd obviously got]. And then, he mention the business canvas, so I sort of looked it up, and – I mean, the downloaded the application, and I've given it a try on a couple of occasions, including the morning of the talk – as a new organization that's looking to do some new things – and I tried it out then. So, I mean, I've used it. I'd say that the canvas – I wouldn't really call the canvas a complete business model in itself. I think it's quite good brainstorming thing. I think it's quite good for sort of getting agreement for – around definitions of things, especially with people that have not done an MBA or something. So, for people that haven't been sort of educated in sort of business-speak, I think it's quite a useful tool in that regard.

Interviewer: Okay. So, I based my whole research on the business model canvas. And the things I'm looking for is, I take each blog and try to find out how it was at the beginning, when you started up your business – and how did it change over the time, and especially the reasons, why did it change? And I would like to go through each blog review, and ask you – yeah *(laughs)* the questions.

Interviewee: Okay, yeah, no problem. Bear with me – just for a moment, my cup of tea's on the other side of the room. Hold on… Okay, so, well, if you just want to shoot and ask questions and then yeah – we'll go from there.

Interviewer: So, let's start with the value proposition. What was the value proposition in your company?

Interviewee: It – well, yeah, okay. It's kind of interesting because it changed, and I guess that's really one of the things that you're looking to understand, I guess. Which value proposition of [[still for Green]], which was the first thing I talked about on my blog, which was the entry that we put into the business plan competition. And [[still for Green]], the value proposition was, you switch from your current energy supplier to me, and I will invest in your property and give you long-term energy savings. Does that make sense?

Interviewer: And did it change somehow, or --?

Interviewee: Yes. It did, because the oil price reached $147 a barrel, and then it crashed back down to $80 a barrel. So, the competing proposition – I guess, really, the people that I was competing against was just a regular energy supplier who would supply gas and electricity. And yet, prices had been rising very rapidly when oil went to $147 a barrel. And then, when it dropped back down to $80 a barrel, their prices dropped. So the value proposition – there wasn't the perceived value in value proposition when the oil price crashed.

Interviewee: Okay. Yeah?

Interviewee: So what happened then was that we focused on the individual elements of the value propositions. So, instead of doing multiple things to our property, we just focused on one particular thing, which was PV. So Photovoltaic. So rather than doing everything – so, installation, PV, solar thermal, etc., whatever our building would require in terms of the light heat and power – so yeah, we just focused on bits that were workable within that current sort of context.

Interviewer: Okay, and did it have any influence on the customer? Customer interface, or the infrastructure management?

Interviewee: Yes, it did, because the customer based changed. So, before – in the [still for Green] model – the kinds of customer segments that we went after were domestic customers who fitted a particular profile. So newly retired. So somebody, let's say 65, just retired – you know, probably you're gonna have the next 20 years living in that house. So – but they weren't gonna move again or whatever. So that was a particular customer segment. The schools were a particular customer segment. So when your price crashed, and you're then back looking at just straight PV, the kinds of people that were really interested in it – people who were price-conscious – so schools, well, schools wanted the educated value of it. But there's the pricing benefits of it. So, I guess really what happened was, was that the original proposition was very much centered around price and people's price sensitivity. So, they were concerned about rising energy prices. They were – they had a perceived inability to do anything about it. And when the energy prices fell, [audio drops in and out: they were not able to work with that]. So, the properties had to change. So, it changed in two aspects: it changed in terms of who we targeted, and what we actually targeted. But it was still the underlying same technologies, per se – it was just packaged differently.

Interviewer: Okay. Sorry. I'm a little bit sick… And did it have an influence on the infrastructure management? And the change in the value proposition? And by infrastructure management, I mean the key partners or key activities, key resources?

Interviewee: You're breaking up a little bit – can you hear me okay?

Interviewer: I asked you if it has an influence on the infrastructure managements, or like, the key resources, key activities?

Interviewee: Key resources, no, because PV designers and technicians remained exactly the same. I mean, instead of looking at the domestic property, you'd look at a bigger property. So, maybe some of that – the surveying skills changed. So you now start worrying about things like asbestos or other – you know, so the quality of the design goes up a couple levels, I suppose.

Interviewer: Mm-hmm. Okay. And let's move to the customer segment. You already told me that it changed. So [a rule] – or what was your target group at the beginning?

Interviewee: Target group at the beginning was domestic customers who owned their homes, and had a long-term interest in either A: fixing their energy prices, or were environmentally [grid], so they were concerned about property emissions, etc., etc. [And they weren't processed/wanted prices.]

Interviewer: Okay, and the customer segment also changed due the oil price, right?

Interviewee: Yeah.

Interviewer: And there are other reasons for the change?

Interviewee: Yeah, I guess really it was just the perception that once the oil price crashed, there was a perception really that there wasn't really the appetite for the product at that point.

Interviewer: Mm-hmm. And what kind of influence did it have, let's say, the financial aspects – as a revenue stream, or the cost structure?

Interviewee: Well, the revenue was a bit of a – don't know *(laughs)* – was put under great pressure initially, because obviously, you've got fixed costs with any business. So if you stop doing something, you still have to pay your wages of the people that were employed by the business. But the new business, the – obviously the new revenue stream, you know, you building the propositions, which -- as a function of your costs. And a target gross margin, and – you know, so they're broadly similar in terms of what you're seeking to get back in terms of return. I mean, most businesses have a notion of [return] of capital. So, you [some poor business] that wants to make a 10 percent return on capital. You know what your costs are. You work out [proposition] and what your target market is. You work out how many of those customers that you need to go on here, and you're broadly trying to sell the same problem – you're trying to see whether you can still achieve the return on capital that your investors require. That's one of the weaknesses in the business model canvas, is that kind of mathematics. I mean, the stuff that's actually in the application on the iPad is pretty lightweight in terms of the scenario analysis and the variable analysis around things like return on equity and stuff that life. It has a quite naïve of net profit, doesn't it?

Inetrviewer: Mm-hmm. Yeah. So – and since your customer segment changed, did the distribution channel also change? Or did it remain the same?

Interviewee: Well, yeah, I guess, because again, in sort of [the stuff for Green Days], the idea was lightweight web marketing and getting people, effectively, to sign up and then go do a survey, etc. When you're getting into the schools, then it become more what we call business development managers. So there's the professional salespeople who will go out and find the right links into schools and local authorities. And then conduct a sale. So domestic customer acquisition you can do by go and standing in a shopping center, drumming up some interest, doing some pilots, knocking on doors, etc.

Interviewer: And – yeah, the change in the distribution channel was due to the change in the customer segment? Or--?

Interviewee: Yeah, basically. I mean, again, if you identify a proposition, you have to think about, how's the best price to actually get that proposition into the market, [and how] you actually get it delivered. And, you know, you don't get many headmasters working at a shopping center, and you could just hand out a leaflet to them.

Interviewer: What kind of influence did the change in distribution channel has on, let's say, infrastructure management? On the key activities -- that you had to change the key activities, for examples, and key resources?

Interviewee: Well, yeah, I mean, I guess some of the key resources changed, and you know have business development managers. But – so you [have] first, salespeople. The other big change, effectively, in the infrastructure, was that the timelines of the projects changed. So, a domestic customer could, you know – could have expressed an interest on Monday. You know, you do a survey Tuesday. You send in the paperwork and the agreement. You give them, say, I don't know, two weeks to consider it – you know, which is standard sort of cooling off criteria. And then you could go and fit it, so – you know, you could have a customer [done] that was say, three weeks. If you take a school, you know, from the initial contact with the head teacher, head Board of Governors that they're responsible – doing the surveys, doing the structural surveys, doing the planning applications, etc., etc, -- that journey is no longer three weeks. That journey is probably six months.

Interviewer: It takes longer. And what kind of resources do you had or activities do you had to add?

Interviewee: Well, like I said, the [drawing function] changed a lot. And you – key activities. Yeah, I think it's just sort of what I would actually just call professional services. You know, you end up having to use things like project managers and professional resources that – to deliver a project in either the public sector or the commercial space. It's very different that delivering it in a private, domestic [space].

Interviewer: Mm-hmm. Of course. Okay, since it is so different, I – the customer relationship has also changed, based on that. Right?

Interviewee: Well, they're no longer the same customers, are they?

Interviewer: And how exactly?

Interviewee: In terms – okay, so forgive me? What do you define as the customer relationship?

Interviewer: The customer relationship is how you communicate with your customers, for example?

Interviewee: Is that during the sales process, or is that the long-term relationship?

Interviewer: Both, actually.

Interviewee: Right, okay. So, on a domestic situation, you're trying to minimize customer contact, because obviously, customer contact is expensive, and the unit price of what you're actually selling is quite small. You start [looking at] a lot of systems and schools, then your customer contact changes into more a relationship-management-type piece – especially, if you remember my thing where we talked about [PPA], you're gonna continue to build a customer for the life of the system. So, on a domestic level, you just kind of want to automate that, and have that [standing orders] and bits and pieces. On a commercial level, that changes. It's still automated, but you – occasionally, you do need to do just – as well as just sending an invoice, saying, once a year you do need to call the customer and make sure he's happy and stuff like that. So level of customer contact goes up, level of cost associated with customer contact goes up.

Interviewer: Okay. Now, you're already answered the question what was influenced by that, so [past] also. And could you please summarize the reasons for the change in the customer relationship?

Interviewee: Well, I think it's really a case that externalities – so, you know, in this case, the price of oil – meant that the original market that we were interested evaporated overnight. So, it's really a case of, you know, strategic – you look down and you see what resources you've really got, that you still deploy in your new target markets, don't you? So, in that case, the strategic change, or the change that happened to the business model – was actually driven by an externality. It was a risk – or it was a threat to the business that actually came true.

Interviewer: Okay. And let's move on to the infrastructure management.

Intrerviewee: Okay. Actually, just on that last point, again, I think that's one of the key weaknesses of the business model canvas – that, again, you don't model – you need to be able to model scenarios, and you need to be able to model the risks – and the probability of those risks. And you know, that's where the true – the true insight would actually come from, if that tool was actually adapted to have A: a time dimension, and B: a [wrist] stroke of ability of outcomes dimension.

Interviewer: And what kinds of risks do you think of?

Interviewee: Well, I think you go across the model and you look at, you know, all the kinds of risks that can come up as a business. So you've got supply chain issues. So what happens if the product's not available. So if you've gone out and committed to customers you're gonna install 10,000 units of x, but you can only buy 5,000 units because everybody else is installing them, you've got externalities that are completely beyond your control – like, say, an oil price shock, a recession, banking crisis. I mean, bizarrely, all these things, you know, are very much in [full] mind today. But if you wind the clock back five years ago, nobody was thinking about these things. And yet, you know, we've had them in the 70s, we've had them in the 80s – you know, these things do happen, but tend to get forgotten about when people are thinking about general business. So, what other risks can you have in a business. So you can have competitor entry, competitors entering with a proposition that is 10 percent cheaper than your proposition. So, you know, can you react? What would you have to actually change about your proposition to still remain competitive?

Interviewer: And would you also say that there are not just externalities, but also internal factors which force you to change the business model?

Interviewee: Yeah, very much so, because we've got a situation where availability of key resources can change the business model. So, as multiple – so I work in partnership with a very large company that does many, many things. And if one of the other markets in which they're participating in suddenly gets a very rich or golden street, then that business can make a higher return on capital by investing in that area of the market. And therefore, it switches key resources away from me, and – even though I've got a sound business model, and a sound proposition, I can't get the resources that I need to actually meet my planned role, etc., etc.

Interviewer: Okay.

Interviewee: Just general things, like individuals either resigning, going sick, etc., etc.

Interviewer: Mm-hmm. That's true. And what about your key activities, if you go back to that. What were your key activities at the beginning? Maybe you can combine with the key resources as well. How was it like in the beginning.

Interviewee: Well, the key activities in the – well, I know it sounds funny, actually, but you know, constantly looking at the business model and not – [not believing it the same stone] – was perhaps one of the key activities. In an entrepreneurial-startup-type business, you constantly have to keep asking yourself the question, "Have you got it right?" And what improvements can you make, and all the rest of it. You need some confidence to proceed, and you need to try and test, you know, "think phase", as it were. So, you know, key activities there, key activities with networking -- getting out and promoting the proposition and seeing what the people are actually – market testing, as it were. And once you actually start to get some genuine feedback that the proposition was sound, or that there was genuine interest, then it was about refining the proposition to actually make it economic. So, you know, what does it – or what value does it become a proposition everybody wants?

Interviewer: So, and since you've spoken about the entrepreneurial or the starting point, how did it develop over the time – so, did it change? Because I think if you once developed the business model, of course you will try to develop it further, but you're more or less safe, and what kinds of key activities did you have to add or to remove?

Interviewee: Well, once you've got a – I guess really, once you've got a model that stands – so you take, say, summer last year, when we had – we were doing domestic PV. We were working in partnership with EON the energy company. We knew how much it cost to install it, we knew what the financing costs were, and we knew what the acquisition costs – we believed that we knew what the acquisition costs was of acquiring each customer. And at that point, you then do the – the scaling up, so you do the operational scale-up plans, so you know, you're recruiting staff, you're training staff, you're ordering equipment – you know, we're having to then deal with things like working capital and the general scaling-up issues that then come from success, I guess. And again, one of the insights there is at some point, there comes a point where you can grow too quickly – you know, and the working capital becomes too much of an issue, or the training becomes too much of an issue, or the quality gets lost. So, so you're constantly looking at it and saying, you know, "Have we got the plan right?". And in our case, we're giving promises to very large power companies, so they want to see you get to a certain scale within a certain period of time. So, it becomes sort of a multi-sided problem. It's not, you know, it's not just – it's not just finding customers – you've got to find the customers, you've got product to announce, you've got to deliver the scale that the utility company wants. And ultimately, you know, when you get into – when you start looking at our business, a simple question like, "Who's the customer?" that's not actually that easy. Because I don't know if you – I mean, you're studying businesses?

Interviewer: Yeah, I'm studying business. Yeah.

Interviewee: Okay, so when we – did you understand what I meant by the term "white label".

Interviewer: Yeah, more or less.

Interviewee: Okay, so we own the power company. White label's my company's proposition, which is G At Home. Who's the customer? So if Mr. Smith is having PV installed on his house, is it my customer, is he EON's customer?

Interviewer: Oh, that's not so easy to say. *(laughs)*

Interviewee: But this is what I'm saying.

Interviewer: [friend] *(laughs)*

Interviewee: Yeah, because for the next 25 years, you know, if he needs the panel replaced or the invertor fixed or what, it's gonna be me that's gonna go there and do that.

Interviewer: Mm-hmm.

Interviewee: So – but, you know, the big power company's not interested in just serving Mr. Smith. They wanna serve all of their customers.

Interviewer: Right.

Interviewee: And they're a big power company because they've got lots of customers. I'm a small business because I haven't got lots of customers. So, you know, at what point – anyway, I'm sorry, I don't know where we got – where I was referring to this question was, but certainly when we're talking about risks, and we're talking about business model evolution, there are a number of things that go into now – and not all of it is sort of articulated in thought in very simple language. A lot of it happens as a function of the business just [right now].

Interviewer: Mm-hmm. Okay. What kind of influence did the change in the resources or the key activities have on financial aspects, for example? If you – say you had to recruit staff and to train staff so it has an influence – had an impact on the costs factor right?

Interviewee: One of the hidden costs is customer dissatisfaction. So when customers decided they wanted the product, and that we did a survey on the house and found out that their house wasn't suitable. But we then told them it wasn't suitable, That wasn't the end of the journey. The customers wanted to know why their house wasn't suitable what could they do to make their house suitable, and stuff like that. So, customer contact became actually quite – was a cost that wasn't the level that we assumed it would be, if that makes sense.

Interviewer: Mm-hmm. Okay. But – so you say it had an impact on the hidden costs?

Interviewee: Yeah.

Interviewer: Okay. And also on the revenue. If you changed – when you changed your activities or key resources? [And]

Interviewee: Well, I guess you could almost argue that they were very, very different business, that – I mean to me, though, they're the same business, but by totally shifting the customer segment, totally shifting propositions – you know, the revenues will be different as a consequence, won't they?

Interviewer: Mm-hmm. And what about your key resources? You already mentioned some – how, or what were your key resources at the beginning?

Interviewee: Key resources – well, you've got the process of actually doing the installs. So the designers, the electricians, etc. I know, I probably mentioned enough of those key resources earlier. One resource that I hadn't spoken about is a legal element. So contacts, in terms of getting the contracts drafted, and actually then doing the commercial negotiations around contracts as well.

Interviewer: Okay. And the three things left are the key partners, for example? What key partners did you have at the beginning?

Interviewee: In the beginning – well, I guess, the energy company that I was working with, I guess really the supply chain. Some people [do] supply me equipment and things.

Interviewer: Okay, and did you also have some investors?

Interviewee: No, [still for Green], I invested myself.

Interviewer: Okay, all right. And did it change over the time, or had not?

Interviewee: Well, yes. I mean, I think when we moved into sort of G, then Mark Group was obviously a key partner. And then a new energy company was a key partner. Yeah.

Interviewer: Okay. And why did it change?

Interviewee: Opportunity, I guess. So as the business evolved – and as the externalities happened – i.e. the oil price, then you know, the opportunity to look at it again and do it a different way -- presented itself.

Interviewer: Mm-hmm, and what about the aspects about revenue stream and the cost structure. How was it at the beginning? Yeah, where are the changes?

Interviewee: [Well, we] have a very small overhead, you know, and therefore, you know, you could accept quite a small margin on the equipment. A small gross margin would actually make it – make the business work. But once you add a lot of scale and substance, then, gross margin needs to be bigger.

Interviewer: Okay. I think that more or less, that was it. *(laughs)* So you answered all my questions. Maybe – the last one, you already mentioned it – how do you arrive at your business model?

Interviewee: How did I arrive at it?

Interviewer: Yes.

Interviewee: I think – well, as I said on my talk, I had this notion that what you look for as an entrepreneur is where industries are about to change. So I seek out opportunities where an existing – okay, so my – market is where propositions are faced and where customers actually transact. An industry is the organizations that put together propositions, which get pitched into – into our market. Yeah. Industries tend to get quite stale and quite entrenched, and therefore, you end up with a top half a dozen organizations that dominate a particular industry. But every now and then, industries get redefined. Something happens. So – be it again, externalities is normally the biggest source. So it's either the government, says, wants to shake up, the oil prices make something very expensive, or [potentially] introduces a new way of doing things. So, you know, I was always interested in energy, and I look for changes in the industry structure and then think of propositions that make sense, if that makes – so, you know, that's how I – so I spend a lot of time thinking about, you know, if you were starting with a blank sheet of paper, what would an energy company look like? Rather than what actually exists today.

Interviewer And after you found an opportunity, how did you arrive, then, at your final business model? You said something about trying it out.

Interviewee: Yeah. I invested my own money, and I piloted it, and that the was the [still for Green] phase, so I invested my own money. I stood in a shopping center with sort of leaflets and brochures. I spoke to people in the street, to see what they – what the appetite would be. So I did all my market research, you know, I found early adopters that were interested. I then installed, you know, the products, and delivered the proposition, and then monitored it and then refined and you know, etc., etc. And then once I understood it – and once I genuinely understood what the benefits were to the customers, then, at that point, I looked at – how do I actually scale it. There's a sort of an investment period where you're working up the proposition – yeah, the business proposition. And then the business model is sort of a function about how you actually scale that up, and how you bring all the other bits and pieces to make the business proposition work.

Interviewer: Okay. But would you take the business model canvas, for example, right from the beginning on, and try to work at – take it as an imprint for--?

Interviewee: I think – again, I think, it’s all about is it – what strategic, where do you fit within a sort of the strategic evolution of the business. So brand-new business, I think the business model canvas is probably not adequate. I think an existing business that’s looking to reshape itself or to understand what it’s currently doing – I think it’s a tool, but I think it’s a tool in conjunction with a bunch of other tools.

Interviewer: Oh, okay.

Interviewee: I think, if you were – if you had invented a widget, what do you actually do with that widget? You know, where do you actually take it, you know, what’s the architecture of revenues, how could you actually – what’s its best use? You know, typically, what you find is, that with any widget, there’s actually two sides to the coin. You know, there’s – and it’s about understanding what you could actually – that kind of exploration, I don’t – I think the business model canvas is too simple for it. And I think it’s not at that right stage of that business proposition piece, if that makes sense?

Interviewer: Mm-hmm. Thank you very much. You gave me a lot of insights. […]