The Role of Sustainability in Business Model Innovation of Start-ups in Indonesia

Multiple Case-study Design

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The Role of Sustainability in Business Model Innovation of Start-ups in Indonesia

Multiple Case-study Design

By
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Executive summary

In the last two decades, awareness for the need of sustainable progress has been widely developed and encouraged. The environmental awareness in business practices has grown to be a central issue in corporate social responsibility for many multinational companies. Unfortunately, it remains a way of brand management for many companies, rather than a drive for structural change in business practices. Customers demand the change to a sustainable business environment. This leads to a change in the economical paradigm, from traditional consumerism towards a more environmental friendly approach. A widespread sustainability movement has compelled companies to be more innovative regarding solutions on how to save the environment, while they are simultaneously pressured to develop competitive advantage from these actions. This can be an opportunity for start-ups to include sustainability in the firms' practices from the start. Delivering environmental sustainability through business model innovations may provide a holistic approach to deal with changing customer demands. Business models should therefore be reshaped, to deliver environmental sustainability based on the core logic of a firm.

While previous studies are concerned with the typological and antecedent factor of start-ups' environmental orientation, this study seeks to explore how start-ups incorporate their environmental orientation into their business model and (re)design their business model to respond to changing market demand for ecological sustainable solutions. The scope of this research is to discover practices of start-ups that are beneficial to the environment. A comparison between start-ups with different foci on sustainability based on a multiple case study is used to identify similarities and differences in order to enhance the learning process. The thesis consists of a literature study, combining literature on business model innovation, business models for sustainability and start-ups. Followed by four in-depth case studies to clarify contemporary practices on sustainability. To identify the sustainability elements that are currently employed by technology start-ups in Indonesia, four case studies have been performed. In this cross case comparison explicit attention is paid to the nature of the innovations regarding sustainability.

Through literature review, an important distinction is made between sustainability practices that are innovating the business model as a whole (e.g. architectural innovations) and sustainability practices that are affecting single components of the business model (e.g. modular innovations). It is argued that environmental sustainability can position itself within the architecture of a business model, influencing all business decisions, or environmental sustainability can position itself outside of the business model, allowing for modular business model innovations. In order to alleviate the whole business model to be sustainable, a company should take a stakeholder view over a shareholder view to transcend economic incentives. Based on previous identified sustainable business models, combined with the characteristics of start-ups, four sustainability practices have been proposed that can be adopted by start-ups. Sustainable value creators: 1) Collaboration on sustainable initiatives, 2) by-product exchange, 3) eco-efficiency; and Sustainable revenue creators: 4) Sustainable branding. Implementing one of these practices results in a component based innovation of the business model. However, creative combination of sustainable value creators with sustainable revenue creators is likely to provide the best results in terms of economic and environmental sustainability.

The aim of the thesis is to explore the role of environmental sustainability for business model innovation of start-ups within Indonesia. To identify current practices of technology related start-ups, a multiple case study design has been set up as depicted in Table A. Two start-ups that are in the process of designing their initial business model are selected, one company that has ecological sustainability

embedded in the design of the product, and one that is focused on other, mainly economic brand related, values to remain competitive. Also two start-ups that have already commercialized their product and thus have an established business model are scrutinized. Again, one company that has ecological sustainability embedded in the design of the product, and one that is focused on other, mainly economic brand related, values to remain competitive. The research design allows for cross case comparison on the different axes whilst aggregated data may reveal more general approaches towards environmental sustainability.

Table A: Case Selection

Value dimension / Development phase	*Sustainability values*	*Economic-, brand-related values*
Initial development start-up	**1) <Case 1>**	**2) <Case 2>**
Commercialized products	**3) <Case 3>**	**4) <Case 4>**

Due to limited access to extensive data that described the processes of the business model innovations, the business model innovations of the start-ups have been studied as outcomes. All four cases were found to consider the environment in their business model to a certain degree. Seven sustainability practices have emerged from the aggregated data and is linked to business model components. Five forms of eco-efficiency: external waste reduction, internal waste reduction, life cycle analysis, usage of renewable energies and positioning the office on a strategic location. Additionally, stimulating beneficial employee behavior and using environmental sustainability as mean of branding have been identified. However, the position of environmental sustainability in the business model of the cases differed for the different value dimensions. It has been found that, however space for improvement, the cases on the sustainable value dimension did place environmental sustainability within the architecture of their business model, considering the environment from the core logic of their business and affecting to a certain extent the interdependencies of the subsystems. The cases on the economic, brand related dimension showed to position environmental sustainability outside of the architecture of their business, not regarding the natural environment as a stakeholder. Consequently, they merely allowed modular business model innovations regarding environmental sustainable practices. However progressive, the ecological orientation of the cases on the sustainable value dimension can be said to eco-open rather than eco-dedicated, whilst the ecological orientation of <Case 2> and <Case 4> are to be placed on the spectrum between eco-open and eco-reluctant.

This thesis has a unique contribution to academia and practitioners. From a scientific point of view, it is unifying three literature streams that are fairly scattered by itself. Namely the abstract literature on business models and business model innovation, literature on environmentally sustainable practices through the business model and start-up characteristics. Identification of practices from start-ups on sustainability has not been presented in academia before. Moreover, practitioners and entrepreneurs may take inspiration of the demonstrated practices. Guidelines for engaging in sustainable business model innovations can be extracted and performed.

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Chapter 1. Introduction

1.1. Introduction

In the last two decades, awareness for the need of sustainable progress has been widely developed and encouraged (Keiner 2006). The environmental awareness in business practices has grown to be a central issue in corporate social responsibility for many multinational companies (Birkinshaw 1996; Chapple & Moon, J. 2005; Barin Cruz & Avila Pedrozo 2009). Unfortunately, it remains a way of brand management for many companies, rather than a drive for structural change in business practices (Schepers 2006; Sundaram & Black 1992; Weyzig 2009). Nevertheless, changing customers' preferences is demanding the change to a sustainable business environment (Baskin 2006; Miles & Covin 2000). This causes a change in the economical paradigm, from a traditional consumerism towards a more environmental friendly approach.

The widespread sustainability movement has compelled companies to be more innovative regarding solutions on how to save the environment, while they are simultaneously pressured to develop competitive advantage from these actions (Gilding et al. 2002). For start-ups, this should be a promising opportunity to incorporate sustainable business concerns into their business plan from the beginning of their establishment (Schick 2002). Schick (2002) describes three different ways of start-up's ecological orientation: eco-dedicated, eco-open and eco-reluctant. The differences are caused by factors such as the founder's business orientation, start-up's business advisers and the level of environmental information available for the owners.

While Schick (2002) concerns the typological and antecedent factor of start-ups' environmental orientation, this study seeks to explore further how start-ups incorporate their environmental orientation into their business model and (re)design their business model to respond to changing market demand for ecological sustainable solutions. The scope of this research is to discover practices of start-ups that are beneficial to the environment, so as to provide a clear boundary for the paper. A comparison between start-ups with different foci on sustainability based on a multiple case study is used to identify similarities and differences in order to enhance the learning process.

The structure of this chapter will have the following order: First, the research problem is clarified, as well as the current state-of-art of knowledge shall be highlighted. After that, the research objectives are presented, followed by the research questions. Finally, the research approach and the structure of this thesis is explained.

1.2. Research problem

Social relevance

Sustainability is gaining ever increasing importance as the issue is becoming more pressing by international agreements and changing consumers' awareness (Cooperrider 2008). Business model design and innovation can provide companies a competitive advantage in changing environments (Boons & Lüdeke-Freund 2013; Chesbrough & Rosenbloom 2002; Lindgardt et al. 2009). Environmental sustainability has been included in the global Millennium Development Goals (MDG), and receives high importance alongside the poverty-reduction objectives. Despite the progress of developed countries and emerging economies, there is a probable shortfall in the achievement of MDGs for emerging economies (Sachs 2012). Environmental degradation is eluding the entire planet. MDGs are set up to see what all countries can achieve together. Emphasis on emerging countries is important as they face different challenges for the balance between economic growth and sustainable development. This research takes place in the context of Indonesia, a nation that possesses one of the biggest populations in the world, is experiencing rapid economic development and has to deal with

many of the problems that are typical for developing countries, making the nation a proper example for the South East Asian region.
To identify the opportunities for small firms in the Indonesian context, this study focuses on exploring the way of start-ups in Indonesia to identify sustainability challenges and considering environmental issues into their business model. This study contributes to a learning process on why and how start-ups in Indonesia employ an environmental approach, what their challenges are and which barriers they have to overcome in practice.
Doing this study provides guidelines for other firms and at the same time enhance the adoption of sustainable business practices. Providing best practices for new firms regarding ecological sustainability understandably benefits the environment and thereby society.

Scientific relevance
From a scientific point of view, this research sets initial steps to the development of a conceptual model for the dynamics of incorporating environmental sustainability in the business model of start-ups. Best practices and real life examples for start-up companies and sustainability are yet to be described. Currently, sustainability is mostly attributed in one of the aspects of the business model only - supply chain sustainability, rather than the holistic approach in which it addresses multiple facets of the business model (Stubbs & Cocklin 2008). Technological start-up companies are particularly fit for analysis on the integration of sustainability in the business model, as these new companies are less inhibited by incumbent (successful) business models and are more likely to deliver innovative business models to the market (Chesbrough & Rosenbloom 2002; Doganova & Eyquem-Renault 2009). Although this research is providing an insight into the current practices, this qualitative research can be followed by developing metrics for quantitative research to test the performance of start-ups incorporating sustainability into their business model. In other words, by providing a start-up perspective for sustainability, a barely mentioned field is addressed in academia and contributes to a new research agenda.

Current state-of-art
Sustainability is a widely discussed topic in research and addressed by many scholars. The interpretation, nevertheless, varies widely. The most cited definition of sustainability is coming from WCED (1987) and is stating that sustainability entails the protection of the environment and natural resources as well as the protection of the social and economic welfare of present and future generations. This definition includes the three 'pillars' of sustainability (Hansmann et al. 2012). These three pillars for sustainability are regarded the social, economic and environmental pillar. It is not implied in this research that there is symmetry between the three pillars, as the economy and social welfare are tightly interconnected (Keiner 2006). Meaning that economic welfare is created by society and social welfare cannot be uncoupled from economic performance. Environment is a somewhat independent pillar, as it is not created in its essence by society, however, it is influenced by the behavior of society. Especially technological advances in society put their stamp on the environment (Geels 2002). To what extent these technologies influence the environment is determined by the decisions of the company in how to deliver their product to the market. These decisions are embodied in the business model of the company. Therefore, this research emphasizes on the environmental pillar of sustainability in the business model within technological start-ups. The way they bring the technical innovations to the market facilitates the emergence of pioneering business models, as shown by the successful BM of, among others, Spotify, Netflix and Uber (Rayna & Striukova 2016).
Innovation is essential for sustainability. The discussions on this area concentrate on companies' strategy to reduce their environmental impacts by modifying their supply chain and creating products

or services with zero waste (Benn & Baker 2009). Innovation to improve processes and products are often expensive, time consuming and sometimes need considerable investment, both for the research as for the specific resources (Avery 2005; Benn & Baker 2009). Due to these reasons, it has been discovered that a successful company is not only doing innovation through its products and processes (Mieg 2012), but also promoting innovation in its business model and the way how the company delivers value to their potential consumers and converts them into profit (Lindgardt et al. 2009; Massa & Tucci 2013).

In terms of sustainability, enhancement of the business model through BMI can provide a holistic approach to cope with changing consumers' demands (Girotra & Netessine 2013; Gordijn et al. 2005; Zott & Amit 2010). By including sustainability practices in the business model, the way a product is delivered to the market changes at the root (Boons & Lüdeke-Freund 2013; Girotra & Netessine 2013). Consequently, sustainability may prolong further in a firm's actions. The influence of BMI in changing environments is described in detail by Lindtgardt et al. (2009). This paper shows the competitive advantage of firms that react appropriately to changing environments by creating a flexible business model. Moreover, BMI for (new) technology firms has shown to deliver advantage when applied in response to market demand (Chesbrough & Rosenbloom 2002). Literature examples are given on firms that cope with changing desires of the market by creating innovative business models for their product development and delivery, i.e. Xerox in the photo copier business. This promises good prospects for the future of sustainability measures. Different phases of a start-up come with different challenges, as resource availability and knowledge of the market and essential "know-how" changes over time. Management policies of technology firms that are effective in the steady-state of a company are often inappropriate during start-ups (Baloff 1970). Churchill and Lewis (1983) have developed a framework explaining five stages of small business growth, explaining the different challenges and strategies for each stage. The framework refers to an s-curve that can be divided in two major phases: disengagement phase (e.g. existing and survival) and the growth phase (e.g. success, take-off and resource maturity). Taking this learning curve into account, it is reasonable to assume that the development phase of a start-up affects the adoption of sustainable practices in the business model.

To support starting firms on the creation of business models, the business model ontology CANVAS is developed by Osterwalder and Pigneur (2010) and has been widely adopted by practitioners (O'Neill 2015), as well as in Indonesia. The business model canvas is a graphic organizer designed to give a common framework for entrepreneurs to draft important elements of their business ideas into their business model. The value of evaluating practices according to this ontology comes from its wide-spread adoption by businesses in Indonesia. It may be a valuable tool for start-ups in their initial development phase to structure their business ideas. Despite its general ability to represent potential business models, it is argued not be the best ontology for targeting and explaining business model innovation drivers (Rayna & Striukova 2016). Different scholars promote the inclusion of value components of the business model, so as to include environmental sustainability and explain business model innovation in its context (Bocken et al. 2013; Rayna & Striukova 2016). Identifying sustainability practices in the light of the underlying values in a BM framework enhances the practical usage of this study as well as the understanding of business model innovation. It is noteworthy to mention that business model innovation will be regarded as an outcome for this thesis, because of the limited access to procedural information for the young companies.

Knowledge gap

Sustainability is greatly assessed in literature, however, it is scattered and describes mainly sustainability practices in small facets of business exercises. The importance of sustainability with an entrepreneurial origin is often overlooked. The juxtaposition of sustainability, start-ups and business

models can provide an interesting contribution towards a more sustainable way of doing business. It requires a combination of theory on what is known about the development of start-ups, the development of business models and sustainability. This is combined with information about current practices of start-ups regarding sustainability and business models to give practical implications of the theory.

In summary, this research clarifies the way start-up companies incorporate sustainability into their business model by highlighting the facets in the components of the business model that are subject to sustainability.

1.3. Research objectives and expected deliverables

Given the research problem presented above, the main objective of this research is to identify the current perspective of start-ups in the technological sector towards sustainability and how they incorporate sustainability into their business model within the context of Indonesia. Locating their actions and decisions according to context and business model characteristics enhances the practical usage of this research.
Eventually, this research aims to come up with the following results:

- Determination of how business models of start-ups can be taken into account for implementation of sustainable practices.
- A clarification on the contemporary attitudes of technological start-ups in Indonesia towards sustainability and which business model components are affected
- Identification of experienced drivers and barriers in delivering ecological sustainability through business model design or innovation.

1.4. Research Questions

In order to reach the above mentioned objectives, the following research question is formulated:

> How do technological start-up businesses in Indonesia apply business model innovation in order to regard environmental sustainability, and what are the challenges they encounter?

To come to a comprehensive answer of the main question, the following sub-questions are formulated:

SQ1. What is the current state of art of literature on business model innovation regarding the support of environmental sustainability for technology management?

The goal of the first research question is to present the current knowledge on business model innovation and business models for sustainability in the context of innovation and technology management. The findings from literature provide an in-depth understanding of the main concepts and serve as a foundation for the further research questions.

SQ2. How can business model innovation support technology start-ups in taking sustainable practices into account in their business model according to current literature?

The goal of the second literature based research question is to combine the current knowledge on business model innovation and business models for sustainability in the context of start-ups. From the presented literature, different sustainability practices are proposed that suit the characteristics of start-ups.

SQ3. How is environmental sustainability perceived in Indonesia and what are specific challenges for start-ups within this (developing) economy?

This goal of this sub question is to put actions of the start-ups in this research in perspective. It is addressed in two-fold, firstly through desk research exploring the national context in which they operate. Additionally, during the field study the exposure of start-ups to these factors are evaluated.

This may provide insights in the factors that contribute or hamper the adoption and diffusion of business models for sustainability, as well as it helps to place the decisions of the different start-ups in context.

SQ4. How do technology based start-up businesses in Indonesia take sustainability practices into account as a core value of their BM, or as a commercial value (branding) their product offering?

The goal of this sub question is to reveal current sustainability practices of start-ups in Indonesia, alongside their attitude towards environmental sustainability. Four case studies are analyzed to get an in-depth vision on current performance regarding sustainability practices of start-ups in Indonesia. These practices are evaluated in the context of the business model, according to the core values of the start-up. The result of this sub-question contributes to the understanding of the current sustainability practices of start-ups in Indonesia. Moreover, it will be assessed whether environmental sustainability stands at the core of the start-up business or whether it is a form of enhancement of commercial values.

1.5. Research approach

The following framework is used to answer the formulated research questions:

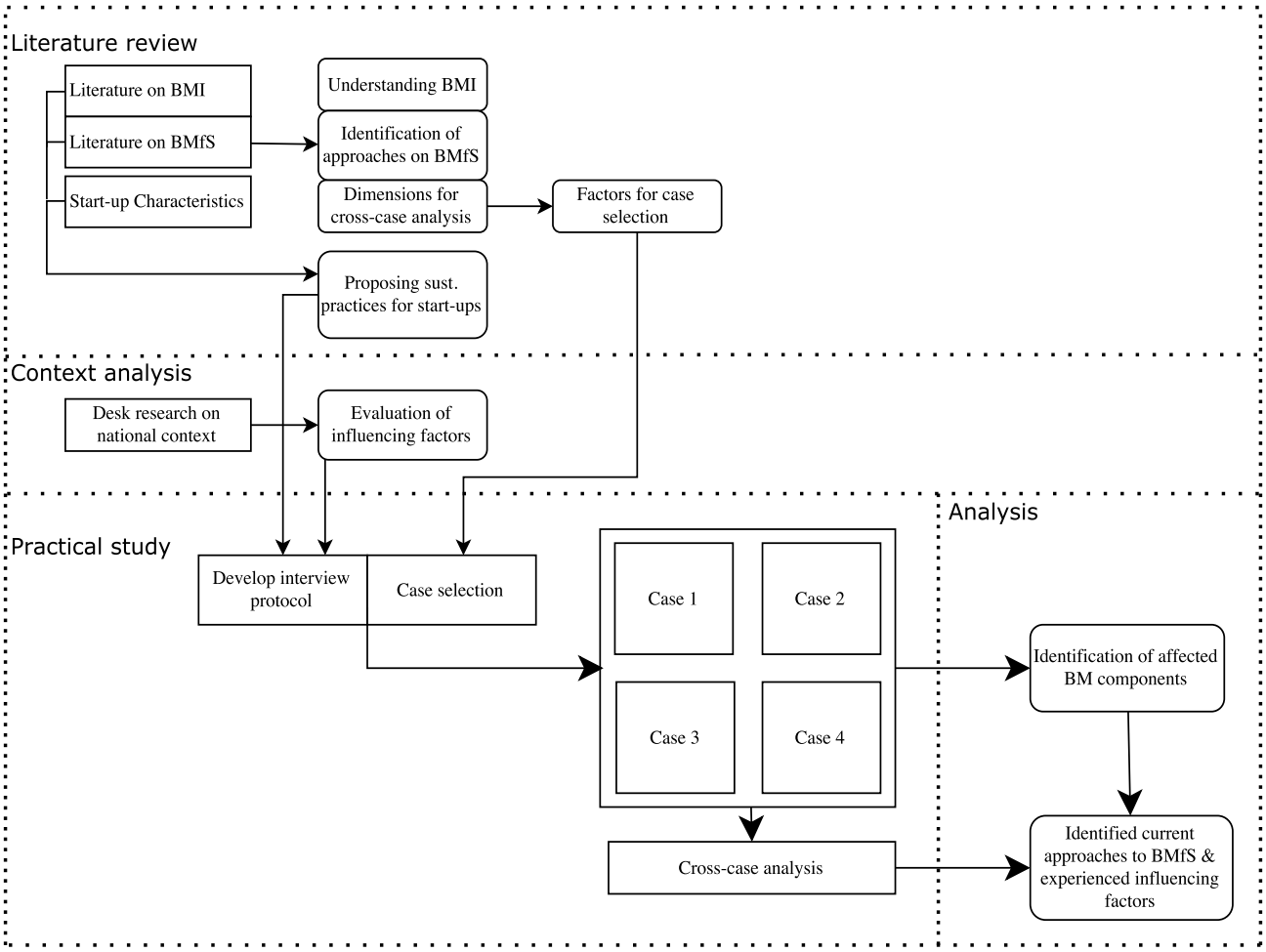

Figure 1 Research framework

The steps undertaken to come to reach the objectives of the research can be described according to the research framework depicted in figure 1.

To answer the first sub-question, the current theory on business model innovation in the context of innovation and technology management and the current practices on business models for sustainability (BMfS) are explored. This provides a deep understanding of the main concepts of this research and deliver relevant expectations for behavior along the dimensions for the cross-case analysis.

The output of the first sub question is the input of the second sub question, which is complemented with literature on start-up characteristics and sustainability. By combining the literature reviews, sustainability practices for start-ups are proposed.

The third research question serves to provide context for the selected case studies and the specific characteristics of Indonesia which influences the practices of start-ups regarding environmental sustainability are identified. These factors are included in the interview protocol, to be later discussed with the selected cases.

To answer the fourth sub-question, a field study is conducted. Four case studies serve the exploration of current practices of start-ups in Indonesia. The selection of start-up companies to be included in a multiple case study was based on factors facilitating the objectives of the research: 1) the development stage of the start-up (Churchill & Lewis 1983), and 2) the core values of the start-up. Case-study methodologies are a suitable methodology for new theory building research (Eisenhardt 1989). Inherent

to case-study analysis is the search for cross-case patterns, the juxtaposition of cases on different dimensions enables the validation or rejection of the conceptual model for sustainable business model dynamics for start-ups within Indonesia.

Table 1 Steps undertaken in this thesis

	Aim	**Input**	**Contribution to RQ**
Step 1	Literature review	Literature on business models and business models for sustainability directed towards technology start-ups	Answers to SQ1 and SQ2
Step 2	Analyzing context of start-ups	Literature on environmental sustainability within emerging economies, especially on Indonesia	Answers to SQ3
Step 3	Case selection	Results from step 1	Four cases on two dimensions for comparison
Step 4	Case studies	Interviews and desk research	Description of business model of cases
Step 5	Cross-case analysis	Aggregated data from step 4	Answers to SQ4

The steps that are followed to come to the answers of the sub questions are described in table 1. The literature review will serve the answers of the first two research questions in the form of three separate literature reviews. The first sub question is answered by the first literature review and the second sub question is answered in the third literature review, using the accumulated knowledge from the previous two literature reviews. Step 2 serves as the context analysis, examining specific factors that are apparent in Indonesia and answering the third sub question.
Starting from step 3, the practical study will be executed by means of a multiple case study. First a selection will be made by theoretical sampling, in order to enhance the usability of the cases. For this research two start-ups that are in the process of designing their initial BM are selected, one company that has ecological sustainability embedded in the design of the product, and one that is focused on other, mainly economic brand related, values to remain competitive. Also two start-ups that have already commercialized their product and thus have an established BM are scrutinized. Again, one company that has ecological sustainability embedded in the design of the product, and one that is focused on other, mainly economic brand related, values to remain competitive. By this 2x2 design, depicted in table 2, the comparison different practices to identify similarities and differences, opportunities and barriers towards environmental sustainability can be made.

Table 2 Dimensions of selected case studies

	Sustainability values	*Economic, brand related values*
Disengagement: Existence & Survival	Case 1	Case 2
Growth: Success & take-off	Case 3	Case 4

This matrix comparison results in four case-studies, an empirical approach to investigate a phenomenon in its real-life context. Case-studies are especially suitable when the boundaries between the phenomenon and its context are interacting and blurred (Yin, 1994). Considering the research design, it is common practice to look for precedents in the field. Business model literature mostly uses case-based and cross-sectional approaches. For example, Dmitriev et al. (2014) found from four case studies that a successful business model on commercializing technologies integrates specific elements of the business model in a dynamic and cyclical manner. Zott & Amit (2007) have conducted a cross-sectional study, scrutinizing in the impact of novelty or efficiency oriented business models for start-ups. In order to 'maximize the utility of information from small samples and single cases' on the development of business models regarding environmental sustainability (Flyvbjerg 2006, p.230), the four cases comprise a heterogeneous group of start-ups defined on basis of theoretical sampling to be able to generalize the findings among a wider area and identify the significance of various circumstances for case process and outcome (Flyvbjerg 2006).

For step 4, semi-structured interviews based on the protocol developed on BMI and sustainability regarding start-ups are conducted with the selected start-up companies. In order to make an indication on the business model developments of these companies, the interviews are recorded, while additionally field notes are taken. A cross-case analysis in step 5 serves to aggregate the data and extract general sustainability practices.

Through thorough analysis of case study data, the following identifications are made: i) sustainability practices, ii) challenges regarding sustainability faced by the companies and iii) similarities and differences between the approaches and challenges between the start-up companies from different industry backgrounds. Evaluation of these results can eventually provide as an inspiration for other start-ups for implementing sustainability practices in their business model through business model innovation, or lead to tips for improvement of the adoption of sustainability practices.

1.6. Structure of this thesis

The remainder of this chapter is structured as depicted in figure 2. The introduction has been presented in this chapter. Chapter two contains the theoretical background, consisting of three literature reviews flowing from general business model innovation to business models for sustainability and eventually presenting specific sustainability practices for start-ups. Moreover, this chapter provides the reader with understanding about BMI regarding sustainability practices with different impacts that can be expected to be found in certain cases, as well as an explanation of the different dimensions chosen for the selection of the case studies. Chapter three discusses political, cultural and economic trends in Indonesia that may affect the adoption and diffusion of business models for sustainability. Chapter four is concerned with the research methodology behind this research, explaining different steps undertaken to answer the research questions. Chapter five presents the case studies together with the cross case

analysis. An intermezzo is included in this chapter to argue for the findings in this chapter. Chapter six presents the findings per research question, a discussion on the findings, limitations and future research.

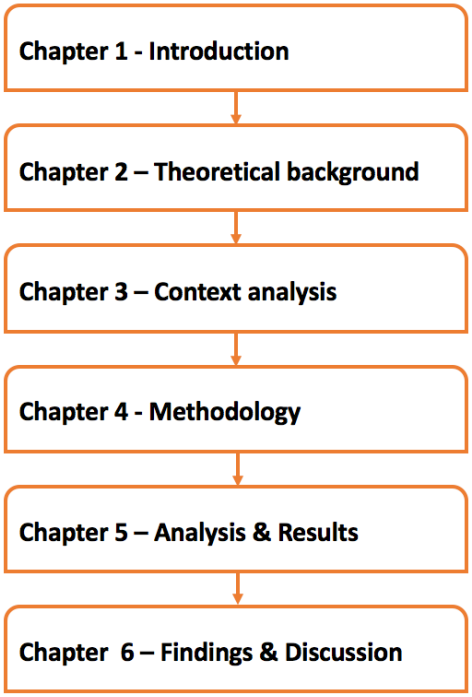

Figure 2 Flow of thesis

Chapter 2. Theoretical background

This chapter serves to answer the first two sub questions. The chapter is structured into three literature reviews, the first one presenting literature on business models and business model innovation in section 2.1. In section 2.2 the literature on business models for sustainability is discussed. The last literature review is presented in section 2.3, and connects the previous findings to start-ups and proposes several sustainability practices that start-ups can take into account in their business model.

2.1. Literature review on Business model and Business model innovation

The purpose of the literature review is to introduce the most important concepts of this study and answer the first sub question that is concerned with how start-ups can use creative business model design to implement sustainable practices that are beneficial to the environment. Three distinct literature streams are described and combined. First literature on business models is given, which introduce the common components of business models and ways of innovating the business model (e.g. business model innovation). Second the literature stream on business models for sustainability have been discussed, to reveal previous findings on the implementation of environmental sustainable practices. Third the literature is combined with the knowledge that exists on characteristics of start-ups and sustainability. The outcome of this combination of literature are proposed targets for start-ups to implement environmental sustainability into the business model and the motivation and factors for the selected dimensions of the to be scrutinized cases.

2.1.1. Introduction

The concept of the business model emerged somewhere around the 1990s with the upcoming of the internet and the e-commerce business. It gained momentum among scholars and business practitioners from that moment on (Timmers 1998; Zott et al. 2011). Over the years, multiple scholars have aimed to unify the scattered, fuzzy front-end, literature on the concept. Six notable stages on the evolution of the business model in literature have been identified, each stage providing a particular outcome: 1) define & classification of business models; 2) list of business model components; 3) description of business model elements; 4) business model ontologies; 5) application of the business model concept, and the sixth stage added by El Sawy & Pereira, 6) theory building & dynamic modelling (Gordijn et al. 2005; El sawy & Pereira 2011). Zott et al. have analyzed the divergent literature and separated the literature into three silos: 1) e-business and the use of information technology in organizations; 2) strategic issues, such as value creation, competitive advantage, and firm performance; 3) Innovation and technology management (Zott et al. 2011). Their combined efforts have structured the until then scattered literature on business models.

As business models have gained attention in a variety of industries, the interpretation of the concept itself experienced an equal divergence. A plethora of definitions on business models have emerged, this has led to confusing interchangeability of terms as business model, strategy, business concept, revenue model and economic model. Despite this, wide-spread recognition exists in that the business model should at least enable the linkage of two dimensions of firm activity, which are value capture and value creation (Zott & Amit 2010; Casadesus-Masanell & Ricart 2010; Baden-Fuller & Haefliger 2013).

There has been referred to the business model as an architecture, design, pattern, plan, method, assumption, and statement (Morris et al. 2005). For this study it is useful to clarify the distinction between business model and strategy. A strategy is developed to create strong and unique characteristics of the company in order to compete in the marketplace. A business model, however, does not exclusively nor essentially describe the firm's unique characteristics as it is more concerned with the overall organizing logic of the firm (Richardson 2008). The business model has been identified as an instrument of strategy execution, it can be conceived that the business model is a reflection of the

realized strategy of a firm (Casadesus-Masanell & Ricart 2010). Meaning that the strategy of the firm can stay true whilst business model components are altered in order to reach the firm's objectives.
It is important to take note that rapid advances in information technology have drastically altered market structures and the way firms compete and cooperate and that one firm's actions also affect the relationships and possibly the perceptions of other firms. Business models are evaluating the firm's actions within the ecosystem they are part of, the exchanges with others are a unit of analysis within the business model, and is describing how a firm or a network of firm's deliver value to its customers (Bouwman et al. 2008). These developments shape the actions of companies with regard to their business environment, and can create opportunities for innovative business models.
These sections provide further insights gained through the literature review on the business model concept and is organized as follows: first, there is theoretical building giving an overview on the research relating the concept of business model to technology in the field of innovation and technology management. Second, a more practitioner-oriented approach is explored explaining contributions to business model ontologies aiding in the development, analysis and innovation of the business model.

2.1.2. Business models and business model innovation for technology firms

The business model concept has been linked with the emergence and success of technology related companies. The typical assumption that a radical product or service improvement will automatically lead to increased profits for the innovative firm is ignoring significant problems a firm can encounter: connecting the interdependencies of the business model with the technological effectiveness. That the business model is a significant element of a business to unlock a technology's success is established by several scholars. The business model can be translated into an ontology in which it connects a firm's innovative technology to its customer needs and/ or to other resources, and a good business model is regarded essential to unlock the value potential of the technology itself (Chesbrough & Rosenbloom 2002; Chesbrough 2007; Zott et al. 2011). Al-Debei & Avison (2010) explain that a technology is only successful if it fulfils the needs of its customers and are explaining the business model concept as an interceding framework to align the technological artefact with the attainment of strategic goals and objectives.
Added to the traditional objects of innovations like product, service and organizational innovation, the business model has been expressed as a unit of innovation. It represents a holistic form of organizational innovation that may cross a firms' boundaries by affecting the business ecosystem. The business model can either be radically changed in an architectural approach or the innovation may occur in its components. An empirical study has shown a positive correlation between novelty centered business models and firm performance (Zott & Amit 2007) and Cucculelli & Bettinelli (2015) show that entrepreneurial firms who innovatively modify their business model over time experience a positive effect on firm performance. The literature on BMI can be divided in scholars who view BMI as a process, looking into the organizational characteristics that facilitate or hinder the process of BMI, and scholars who are regarding the outcome of BMI as a static object, more looking into the particular feasibility of the resulting business model (Foss & Saebi 2017). As this thesis concerns technology start-ups, the unit of analysis is the outcome of business model innovations, regarding BMI as a static object whilst looking for motivations and reasoning of the firm's decisions.

<u>BMI typology</u>

Foss and Saebi (2017) have developed a BMI typology for four types of BMI, in which they differentiate between the novelty and the scope of the BMI (see figure 3). The business model is explained as a "complex system", in which complexity refers to the non-simple interaction between parts of the business model. These parts are in turn interdependent subsystems, in the business model this may refer

to the value capture, delivery and appropriation mechanisms. While the interdependence of the activities within the subsystem are regularly highly interdependent, "the degree of interdependency among subsystems may vary" (Foss & Saebi 2017, p.216). Nondecomposable systems express high interdependency between sub-systems, a change in one of the subsystems inherently involves major architectural change. Decomposable systems, however, express low interdependency among its subsystems and a change in one of its components does not necessarily involves architectural change, thus referring to "modular" change. Evolutionary BMI is the alteration of business model components which tend to happen naturally over time, during the fine-tuning process of the firm's activities. An architectural change of the business model transcends modular changes as multiple components of the BM are interconnected and affected. Architectural changes that are new to the firm but not to the environment are mostly a response to external events as when an innovative BM emerges in the face of competition (Foss & Saebi 2017). Changes in the BM that are new to the industry requires active management involvement, is mostly directed to disrupt the market, and has therefore a higher potential to bring competitive advantage.

		Scope	
		Modular	**Architectural**
Novelty	**New to firm**	Evolutionary BMI	Adaptive BMI
	New to industry	Focused BMI	Complex BMI

Figure 3 Business Model Innovation Typology (Foss & Saebi, 2017)

Companies intrinsically valuing the natural environment are likely to express through the architecture of its business model; collaborating on sustainability initiatives with key partners on one hand, whilst performing heavy deforestation to obtain key resources on the other hand is an example of a value mismatch. On the contrary, companies focusing on economic, brand related values may innovate their business model in order to implement sustainability practices, but these BMIs are likely to remain modular in nature, not altering the interdependencies among subsystems. To examine the role of environmental sustainability in an entrepreneurs' decision making models, the position of environmental sustainability with regard to BMI will be established for the cases of this thesis.

The evolution of the business ecosystem is shaping the emergence of business models. There has been a shift in the development and application patterns of technologies. Where in the past commercial or societal problems were solved by a single directed technology, nowadays general technologies tend to emerge first, after which multiple commercial applications are connected to it (Gambardella & McGahan 2010). This variety of commercial applications can be translated into multiple business models, unlocking the multi-potentiality of a technology. Calia et al. (2007) show how an innovation network enables business model innovation. El Sawy & Pereira (2011) have predicted areas that will experience shifts, which require and foster new business models: 1) digital platforms (internet of things, cloud technology); 2) societal trends (demand for sustainability, collaborative consumption); 3) distributed co-creation of value (open innovation, bottom of the pyramid markets). These findings exemplify the close connection of technologies with disruptive business models.
Overall, the literature shows that business model innovation can be an influential system to reshape a firm's or even an industry's behavior and shows that emerging technologies are closely connected with innovative business models.

2.1.3. Business model tooling: connecting the theory to the practitioner

Over the years, many scholars have developed business model tools to help practitioners implement the theory. Wirtz et al. (2016) have conducted an extensive literature review on the BMI literature to date and have distinguished four approaches that can be used for business model design and innovation: 1) linear approaches that follow a step-by-step procedure; 2) semi-structured approaches, which proclaim the need for a basic systematic structure, but explicitly mention the need for creative process steps; 3) mixed approaches that combine procedures from the linear and semi-structured approaches; 4) method-oriented approaches, that emphasize on the methods and techniques applied instead of focusing on the processual perspective. Heikkila et al. (2016) have scrutinized BMI for SMEs, and identified an innovation path that occurs for starting up a new business. They emphasize the need of a simple baseline ontology, like CANVAS, STOF or CSOFT, which coincides with the first approach of step-by-step procedures. It is from the second approach it is proposed that CANVAS could implement a trial-and-error-loop by using it as an experimental instrument (Hoveskog et al. 2015). Another interesting approach comes from Günzel and Holm, whom divide BMI into a front-end (externally-oriented) and a back-end (internally-oriented) innovation, and suggest an experimental approach for the front-end innovation and a structured linear approach for the back-end innovation (Gunzel & Holm 2013). Chesbrough (2007) has developed a business model innovation framework which contains a typology of different types of business models for an enterprise. It distinguishes six types, from type one being a very basic (undefined) business model, to type six where the business model is an adaptive platform where key-partners and customers have become business partners engaging in the business model. The typology gives insight into what is possible with the business model and highlights how a continuous and open innovation approach can leverage the firm's success (Chesbrough 2007). Technology start-ups may take this into account to see whether they are able to further innovate their business model.

To further categorize past efforts on business model tooling, Eurich et al. have analysed the different methods of business model design, and revealed six distinct approaches with their strengths and weaknesses displayed in table 3 (Eurich et al. 2013).

Table 3: Identified approaches to BM development (Eurich et al., 2013)

Approach	*Strengths in supporting the business model design process*	*Weaknesses*
Cases and lessons learned	• rich insights into specific design details	• not generally applicable • low structural guidance through verbal representation
Component-based approaches	• structured process, ensuring completeness • discussion and comparison of business model options facilitated	• interdependencies between components not considered • no assumptions about external factors and dynamics visualized
Taxonomies	• systematic representation of options and parameters	• guidance on high level, lack of details • low flexibility
Conceptual models	• highly structured and formal • interdependencies between components considered, internal consistency	• limited expressiveness, hard to extend • consistency of the model potentially over-emphasized
Causal loop diagrams	• explicate core logic, decisions, and dynamics • concise representation	• no guidance which factors to include and to analyze
Design patterns	• reuse of proven structures • flexible recombination	• new options and firm specifics not present • no guidelines regarding recombination logic

The first approach that concerns cases and lessons learnt are focusing on specific designs of business models and form rich insights to practitioners in a similar situation, however they are hardly generalizable and have low structural guidance. Component-based approaches are providing a structured process facilitating the discussion on various options of business models, but are typically neglecting the interdependencies between components or the effect on the business ecosystem, with the exception of the STOF ontology which is deliberately considering these interdependencies (Bouwman et al., 2008). Conceptual model approaches are addressing these interdependencies and hence give a more rigid framework supporting consistency to build on. However, this rigidity is both a strength as it is a weakness, as a practitioner might depend to forcefully on the framework and overlook important aspects as the organization's mission and its environment. Causal loop diagrams are more concerned by describing the core logic, neglecting specific choices, and design patterns are more concerned with the replication and recombination of proven structures. For the practical use of new firm entrepreneurs, it seems vital to include a quite rigorous framework in order to give direction to the thoughts and ideas (Heikkilä et al. 2016).

2.1.4. Conclusion

In these sections the literature on business model innovation regarding technology and innovation management has been provided, and has been presented together with ontology efforts of scholars to facilitate the adoption by practitioners.

The business model is demonstrated a necessary instrument to bring new technologies and business ideas to the market, also it may serve as a unit of innovation to unlock the technology potential. By means of business model innovation, different approaches have been explained. The innovation can either be architectural, e.g. an alteration in one part will affect all other parts, or the innovation can be modular of nature, e.g. an alteration can be self-contained, hardly affecting the other components of the system. The position of environmental sustainability with regard to this BMI typology will be assessed for the selected start-ups. The position of environmental can be either in the architecture of the BM or it can be represented in the components of the system. As start-ups do not have a very long timeline and history in data, business model innovation is examined as the static outcome of decisions.

Business model ontologies are often at the front-end of business model development and innovation, these sections have explained different approaches to these ontologies. It is important to understand how starting entrepreneurs come to a business model and where decisions can be influenced by values that affect environmental sustainability. Different approaches come with different rigor, which provide differing strengths and weaknesses. These basic approaches form the foundation of more specialized business model ontologies, like the one including environmental sustainability. As the business model is mostly formed by the adoption of business model ontologies it comes at hand understanding the efforts of scholars in how to implement environmental sustainability in business models, the next sections elaborate further on business model ontologies that have been adapted for sustainability.

2.2. Literature review on business models for sustainability

2.2.1. Introduction

The importance of the relation between business and sustainability is widely recognized (Avery 2005; Hall et al. 2010; Sachs 2012). Sustainability is mainly referred to in the context of the triple bottom line which explains the concept according to three dimensions of sustainability: the economic, social and environmental dimension, as proposed by Elkington (2004). However, Hansmann et al. (2012) argue that the synergy between these three constructs is not necessarily balanced. Correspondingly, it is not implied in this research that there is symmetry between the three pillars, as the economy and social welfare are tightly interconnected (Keiner 2006). Implicating that economic welfare is created by society and social welfare cannot be uncoupled from economic performance. Environment is a slightly independent pillar as it is not created in its essence by society, however, it is influenced by the behavior of society.

Sustainability has been connected to business practices in the form of corporate social responsibility (CSR), in which ecological and social beneficial practices are campaigned. A literature review of Salzmann et al. (2005) has examined the relationship between financial performance and ecological-social performance as well as the attitude of the management towards ecological sustainability. In this review, financial performance is set apart from the social and ecological performance and ecological performance is mainly assessed by means of eco-efficiency. In other words, how can social and ecological performance enhance financial performance. A notion that is criticized by other scholars who view sustainability more fundamentally (Dyllick et al. 2002; Schaltegger et al. 2012). Dyllick et al. argue that, besides eco-efficiency, it is needed to change the awareness of customers regarding their consumption patterns (Dyllick et al. 2002). Schaltegger et al. (2012) encourage to move from the single implementation of a sustainable practice to the inclusion of the business model for sustainability, so as to position sustainability as an integral part of the firm's value proposition and value creating logic, i.e. in the architecture of the business model.

In order to achieve a sustainable impact, companies have to work towards sustainability which involves rethinking the business logic and therefore incorporate the practices into the business model (Stubbs & Cocklin 2008; Hall et al. 2010; Schaltegger et al. 2012; Boons & Lüdeke-Freund 2013; Bocken et al. 2014). As it is not an integral part of many business model tools, the previous chapter has not included business models that guide practitioners in becoming a sustainable enterprise. However, there has been a literature stream devoted to this topic and the following chapter will describe past efforts of scholars to develop environmental friendly business models and subsequently review the literature on identified drivers and barriers towards the implementation of sustainable business models. These sections will elaborate on the current efforts of scholars to implement environmental sustainability into business models, an essential construct chosen for this thesis.

2.2.2. Business models for sustainability

Business model innovation is recognized as a key to the creation of a sustainable business (Bocken et al. 2013; Boons & Lüdeke-Freund 2013; Girotra & Netessine 2013; Stubbs & Cocklin 2008). In the analyzed literature for this study, heterogeneity is found on the vocabularies and definitions used for sustainable business model innovation. Several papers describe BMI as a mean to support a sustainable technology (Boons & Lüdeke-Freund 2013; Ludeke-Freund 2010), while others refer to a more pure form of BMI for sustainability, where the configuration of the business model itself results in benefits for the environment (Girotra & Netessine 2013; Lindgardt et al. 2009). Additionally, Schaltegger et al. (2012) encourage corporations to adopt continuous BMI in order to identify cost-saving business cases for sustainability. Despite the different approaches, these authors are contributing to a mutual objective:

improving the business model to create a sustainable ecosystem. It can be stated that the terms sustainable business models, sustainable business model innovation and business model for sustainability are used to describe the same general concept (Schaltegger et al. 2016). For clarity this research will further refer to business models for sustainability (BMfS). BMfS have been defined as a "business model that creates competitive advantage through superior customer value and contributes to a sustainable development of the company and society" (Ludeke-Freund 2010, p.21). Schalteger et al. (2012, p.112) argue that a BMfS supports "... voluntary activities which solve or moderate social and/or environmental problems. By doing so, it creates positive business effects". Although there is disagreement on the dominant value creating logic for BMfS (e.g. economic or social/ecological), there is agreement on the creation of customer and social value and on the integration of social, environmental and business activities (Abdelkafi & Täuscher 2016; Schaltegger et al. 2012)

Multiple scholars have attempted to accelerate the integration of sustainability into the business model (Boons & Lüdeke-Freund 2013; Bocken et al. 2013; Bocken et al. 2014; Stubbs & Cocklin 2008; Schaltegger et al. 2012). To achieve a BM for sustainability, Stubbs & Cocklin (2008) state that a firm only becomes sustainable if it derives from the neo-classical paradigm; they argue for sustainability as an objective and strategy in itself and emphasize a stakeholder view over a shareholder view of the firm. Ludeke-Freund (2010) contributed by the development of a conceptual model for BMfS, highlighting sustainability practices that emerge on the intersection of ecological development and business development (e.g. sufficiency, efficiency and consistency). Later, Boons & Ludeke-Freund (2013) set up normative requirements a BMfS should contain to support sustainable innovations; they mention that the value proposition should provide measurable ecological value, the focal firm should not shift its ecological burdens to its suppliers or customers, customers should be encouraged to take responsibility for their consumption and the financial model should account for ecological and social impact of the firm. This view is supporting the position of the environment within the architecture of the business model for a company to become truly environmental friendly.

The previous mentioned ontologies for business models are predominantly designed to create economic value for entrepreneurs. In order to integrate sustainability into the core logic of a firm, companies should rethink their strategy and business model (Bocken et al. 2013; Bocken et al. 2014; Boons & Lüdeke-Freund 2013; Ludeke-Freund 2010). The value mapping tool is an adapted ontology that includes sustainability at the root of the business model by rethinking the value proposition in terms of value captured , value created, value destroyed (e.g. negative impacts on society and environment) and value missed (e.g. underutilization of resources) (Bocken et al. 2013). Moreover, it encourages a stakeholder view of the network and how value is perceived by these various stakeholders. However, through this value perspective the ontology may lack guidance to implement sustainability into all elements of the business model.

Further materializing the concept on BMfS, Bocken et al. (2014) have developed archetypes for practitioners to implement sustainable business practices (see figure 4). They are grouped according to their major innovation: technology, social or organizational innovations. The identified and developed archetypes are: maximize material and energy efficiency, create value from waste, substitute with renewables and natural processes, deliver functionality rather than ownership, adopt a stewardship role, encourage sufficiency, repurpose for society/ environment, develop scale up solutions. Depending on the industry and product or service, firms can adopt a single archetype or choose to recombine elements.

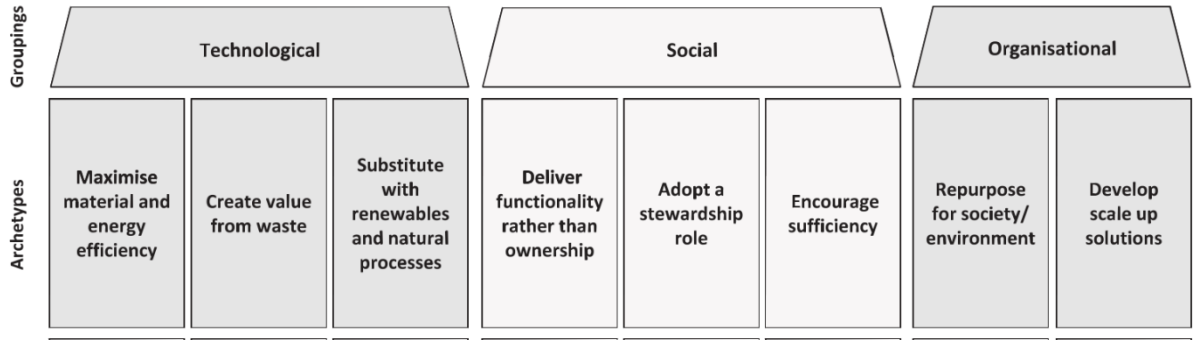

Figure 4 Archetypes for BMfS as developed by Bocken et al. (2014)

The role of sustainability in the business model is addressed from both a firm-level perspective as well as from a system-perspective (Benn & Baker 2009; Bocken et al. 2014; Stubbs & Cocklin 2008). In line with this approach, Laukkanen & Patala (2014) view the business model in the socio-technical context of the organization and state that the diffusion of BMfS hangs with the sustainability of the ecosystem. An interesting approach on business models for sustainability come from Abdelkafi & Tauscher (2016), who connect the BMfS with the values beliefs and norms (VBN) theory. It emphasizes the importance of the cognitive representations of the environment within decision makers and customers. The mental representation of the natural environment will direct their behavior (Abdelkafi & Täuscher 2016). Adding an individual-level perspective that influences the adoption of a BMfS. According to the view of Bocken et al., organizations adopting a BMfS should overcome structural and cultural barriers to achieve firm-level sustainability, whilst collaborating with key stakeholders that foster system-wide sustainability (Stubbs & Cocklin 2008).

Business model innovation can thus be used as a mean to continuously identify cost-saving opportunities (Schaltegger et al. 2012), promoting a modular update of the business model. However, to alleviate the whole business model to deliver sustainability, architectural changes are preferred. According the literature, it is possible to derive two main components of the BMfS. A stakeholder over a shareholder view is a central part as it covers the system-wide and firm-level perspective and transcends pure economic incentives; and a sustainable value proposition is essential to communicate and materialize the ecological intentions.

The different contributions and perspectives of authors are depicted in table 4. The scope of BMI has been established by the position of environmental sustainability in the decision making process for the business model innovation. When the core logic of the firm is transformed, environmental sustainability takes a position in the architecture of the business model. Is environmental sustainability achieved through short-term innovations and updates, then it is more likely that environmental sustainability has taken a position in modular BMI.

Table 4 Contribution to environmental sustainability and scope of the BMI

Author	*Contribution to sustainability*	*Scope of sustainable BMI*
Stubbs & Cocklin (2008)	Firm develops internal structural and cultural capabilities to achieve environmental sustainability	Architectural
Ludeke-Freund (2010)	Cost saving activities that enhance sufficiency, efficiency and consistency of resources	Modular
Schaltegger et al. (2012)	Firm should continuously update its business model to come up with business cases for sustainability	Modular
Bocken et al. (2013)	An adapted ontology to assess environmental value (Value Mapping Tool)	Modular/ Architectural
Boons & Ludeke-Freund (2013)	A set of normative requirements that contribute to the achievement of a BMfS, to support sustainable innovations	Architectural
Bocken et al. (2014)	Eight different archetypes of BMfS that can be adopted by a firm to achieve environmental sustainability	Architectural

Stubbs & Cocklin (2008) advocate a rigorous transformation of the core logic of the firm in order to achieve a sustainable business model. In their approach environmental sustainability is prioritized over economic incentives, the position of environmental sustainability is within the architecture of the business model. Ludeke-Freund (2010) explores where environmental sustainability meets business motivations and identifies areas of cost-saving opportunities in sufficient, efficient and consistent use of resources. The core logic or motivations of a firm do not have to be altered to achieve this environmental sustainability and the scope of business model for sustainability is therefore considered modular. The view of Schaltegger et al. (2012) is similar to that of Ludeke-Freund and advocates business cases for sustainability in order to serve business motives, equally the scope of BMI is modular. Bocken et al. (2013) have developed the value mapping tool for the development of a value proposition that takes environmental sustainability into account. In this three forms of waste are considered and stakeholders are included. This VMT is on the border of modular or architectural BMI, as it only concerns about one component of the business model but this component may alter consequent decisions on the business model. Boons & Ludeke-Freund (2013) and Bocken et al. (2014) are concerned with the entire business model, in which normative requirements are giving a foundation for BMfS and the archetypes serve as practical examples to achieve a BMfS. These BMI for sustainability are both architectural.

2.2.3. Drivers and barriers towards implementing sustainable business models

To identify factors that influence the adoption and diffusion of BMfS, the drivers and barriers identified in literature are discussed in this section. The research of Abdelkafi and Tauscher (2016) brings an interesting stance, as they examine the conceptual representation of the environment in the entrepreneur and in the customer. This representation could either be a driver for the adoption of BMfS (e.g. environmental awareness is high) or it could be a barrier towards the adoption of BMfS (e.g. environmental awareness is low).

Innovation systems can be considered as the broader institutional structures that support innovation, comprising elements as universities, governmental funding programs and regulatory frameworks. Universities can plan can a chief role in the adoption of BMfS in creating awareness and policy makers can contribute by creating a favorable regulative environment for sustainable innovations (Laukkanen & Patala 2014). These system-wide factors can count as external drivers for the adoption of a BMfS for entrepreneurs. Other external drivers that are identified in literature are changing customer demands (Girotra & Netessine 2013) and collaboration with intermediaries that foster sustainability (Klewitz et al. 2012).
Schaltegger et al. (2012) have identified internal key drivers for the business case for sustainability from literature (see figure 5). These are mainly drivers with an economic incentive, aiming to rise the profit margin whilst benefitting the natural environment. The identified drivers are: costs and cost reduction, risk and risk reduction, sales and profit margin, reputation and brand value, attractiveness as employer and innovative capabilities of the company.

Core business case drivers	*Exemplary authors*
Costs and cost reduction	e.g., Christmann (2000), Epstein and Roy (1996)
Risk and risk reduction	e.g., Schaltegger and Wagner (2006)
Sales and profit margin	e.g., Porter and van der Linde (1995a, 1995b)
Reputation and brand value	e.g., Jones and Rubin (1999), van Marrewijk (2003)
Attractiveness as employer	e.g., Ehnert (2009), Revell et al. (2010)
Innovative capabilities	e.g., Cohen and Winn (2007), Pujari (2006), Schaltegger and Wagner (2011)

Figure 5 Identified internal drivers (Schaltegger et al. 2012)

Bansal & Roth (2000) have conducted a study to reveal motivations of corporations to go green and discovered three distinct factors: competitiveness, legislation and company morale. Ethical motives of an entrepreneur may cause an evaluation the environmental position of the firm, translating this into sustainability practices because it is “the right thing to do”. They found that when a corporation implemented green behavior as a mere response to legislation, a firm would only implement what was mandated (Bansal & Roth 2000). On the other hand, a study from de Reuver et al. (2009) have examined drivers for business model innovation in general for start-ups and found that technology and market-related forces are of particular importance BM dynamics and that regulatory forces are of lesser influence.
Companies who adopt a sustainable business model are often also successful in economic terms, but a sustainable enterprise is yet to become mainstream. A locked-in situation of the external business environment can be a hurdle for a new enterprise to implement a BMfS (Boons & Lüdeke-Freund 2013). Stubbs & Cocklin are identifying structural and cultural barriers that have to be overcome in order to reach firm-level BMfS. Laukkanen & Patala have identified a range of barriers for the implementation of a BMfS, under the umbrella terms of regulatory barriers, market and financial barriers and behavioral and social barriers (see figure 6).

Regulatory barriers	Market and financial barriers	Behavioural and social barriers
• Lack of long-term strict legal regulatory frameworks • Inconsistent and overlapping regulatory mechanisms • Lack of economic incentives • Lack of encouragement to innovativeness • Lack of flexibility • Lack of involvement of stakeholders in decision making • Lack of normative rules/industrial standards	• Financial risk • Short-termism • Lack of awareness and understanding among market participants • Lack of marketing know-how	• Attitudes and values • Lack of consumer/customer acceptance • Lack of risk-taking • Enterprise culture • Leadership, management • Lack of motivation • No stakeholder pressure • Profitability of existing business models/satisfaction

Figure 6 Identified barriers (Laukkanen & Patala, 2014)

Despite past efforts to enhance the adoption of BMfS, embracement by the industry has been slow. A study taking an evolutionary economic approach towards the role of sustainable entrepreneurship show the sustainability transformation potential for sustainable entrepreneurship and necessary direction of business model innovation, as shown in figure 6 (Schaltegger et al. 2016). It illustrates the impact a sustainable small company may have when it gains more market share. Improving the [intangible] resources for start-up companies to overcome barriers towards BMfS could accelerate the diffusion.

2.2.4. Conclusion

These sections have elaborated on the past contributions on the conceptualizing of BMfS. The literature is fairly scattered and comes from different industries, with a few industry-independent approaches, but accumulated they give direction for the implementation of sustainable business models.

The different contributions of authors are classified into modular BMI or architectural BMI with regard to the position of environmental sustainability within the decision making process. A BMfS should at least articulate its ecological values and prefer a stakeholder view over a shareholder view, referring to an architectural business model innovation. It has been observed that adoption of ecologically or socially friendly business models has yet to become mainstream, drivers and barriers regarding the adoption and diffusion have been extracted from literature.

Up until this point, the first research sub question can be answered: *What is the current state of art of literature on business model innovation regarding environmental sustainability for technology management?*

The first sections of this chapter have clarified the different scopes of business model innovation: i.e. modular or architectural BMI, and elaborated upon business model ontologies that are used for the origins of the business model. However, past effort on business models has focused on environmental sustainability as well. As environmental sustainability is the central pillar that is scrutinized in the light of business model innovation, the role it plays in the decisions around the business model has been evaluated. It can either serve an architectural scope to BMI, influencing all decisions of the business model, or it can serve a modular scope to BMI, influencing only a small part of the business model, which may have a smaller or temporarily effect to benefit the environment. The different contributions on how to come to a business model for sustainability have been described and classified into the scope

of BMI regarding environmental sustainability. Moreover, there is literature concerned with the diffusion of business models for sustainability and has identified drivers and inhibitors. Drivers for business cases of sustainability are identified, but are mainly concerned about modular BMI for sustainability. Values beliefs and norms of the entrepreneurs are also addressed and may lead to more architectural changes to the business model. It also addressed the importance of the adoption by the wider innovation system in which a company operates in order to have a viable business model for sustainability. The next sections will connect these insights to entrepreneurship and sustainable business models in the perspective of technology start-ups.

2.3. Bringing sustainability into the business models of start-ups

2.3.1. Introduction

Particularly young technology firms are prospective to evoke new ways of doing business and possess the potential to unlock pioneering business models (Dmitriev et al. 2014; Morris et al. 2005; Schick 2002). BMI is fundamentally connected with entrepreneurship as every new-firm entrepreneur has to make decisions on the BM and a new business model for established firms requires an entrepreneurial view. A start-up's age and simple organization structure work in their advantage as it nurtures openness and decreases adversity to change (Schick 2002). The increased demand for environmental and social sustainability has been mentioned as an antecedent for BMI (Foss & Saebi 2017). Trends in the sharing economy have given rise to disruptive business models which focus on connecting consumers and peer to peer exchange (e.g. AirBnB, Go-Jek, Peerby). With the increase of connectedness through telecommunication improvements, these complex BMIs emerged and have been capable of restructuring rigid industries (Malhotra & Van Alstyne 2014; Zervas et al. 2017). There is potential for sustainable business models for start-ups to gain momentum and reform the paradigm as we know it (Schaltegger et al. 2016), but whether and how this diffusion will take place is ambiguous.

If a new technology firm is to benefit the natural environment with their actions and through their business model, how can they pursue these goals and leverage their potential, instead of viewing these environmental friendly practices as a barrier to their economic success? The previous two chapters have provided insights into the current state-of-art on business model innovation and business models for sustainability. It can be anticipated that the characteristics of start-up companies will affect the relevance of the identified elements (Wirtz et al. 2016). This chapter will elaborate on those characteristics, merging them with the accumulated knowledge, and propose specific ways for start-ups to implement sustainable practices in their business model.

2.3.2. Connecting the sustainability start-up literature

Looking into the specifics for small companies, regarding the sustainable innovations they can adapt, a literature stream devoted to sustainable oriented innovations for SMEs came forward (Klewitz & Hansen 2014; Klewitz et al. 2012). However, SMEs and start-ups are not the same concept, it can still give some insights on their shared characteristics. It is deemed practical to briefly touch upon this field of research for this thesis, as it can provide further insights enhancing the adoption of BMfS by start-ups. To stay within the scope this research the findings of Klewitz & Hansen (2014) are reflected, who have conducted an extensive literature review on sustainable oriented innovations on SMEs.

This literature review deals with sustainable oriented innovations on three levels (Klewitz & Hansen 2014):

1) Process innovation in which they look at cleaner production, eco-efficiency and logistic innovations. Often providing economical gain for the small enterprise.
2) Organizational innovations entail the reorganization of routines and structures within the firm and new ways of conducting management.
3) Product innovations are improvements or entirely new developments of products and services.

When those innovations are analyzed in the context of the business model of the company, they can arguably translate into a business model innovation on a modular level. The advantage, though, of taking an architectural approach to business model innovation is that it supports and uncovers the underlying values that come with the innovations.

The proposed sustainable oriented innovations may be implemented by various start-ups; an environmental sustainable vision or core value is not required. However, the extent to which sustainability is integrated with the business model is likely to moderate the impact it has on the

environment. Hall & Wagner (2012) have quantitatively analyzed the link between cross-functional based BMIs or modular based BMIs and economic performance, environmental performance and stakeholder pressures. They found that cross functional (e.g. architectural) based BMIs have in general a positive effect on the economic and environmental performance of the firm. To pursue environmental innovations to transcend business model components, core decisions of the firm should be influenced by sustainable values. Connecting these findings to the typology developed by Foss & Saebi (2017), this can drive an evolutionary BMI to an adaptive or even complex BMI. Explaining this according to strategy, Schaltegger et al. (2012) discuss the different approaches management can adopt towards sustainability, and have distinguished three strategies: 1) Defensive, in which management is rather reactive than proactive and there is no desire to gain competitive advantage with the implementation of sustainability; 2) Accommodative, in which there is a cautious modification of internal processes and modest consideration of environmental and social objectives; and 3) Proactive, where environmental and social considerations are fully integrated in the core logic of the firm (Schaltegger et al. 2012). The openness or ecological orientation to sustainable innovation of the business model will depend on the orientation of the firm's strategy (Schaltegger et al. 2012; Schick 2002).

Related to environmental sustainability, the business model is likely to consist of modular or architectural innovations advantaging the environment, depending on the innovativeness of the product or service offered by the start-up and mediated by the motivation of the management to contribute to the environment, whereof the impact is moderated by the perception on environmental sustainability and organizational values of the firm.

2.3.3. Ways of bringing sustainability into the business models of start-ups

Business model innovation may occur in two dimensions. First in the process of value proposition. Referring to business model canvas developed by Osterwalder and Pigneur (2010), this aspect may connect with key activities, key resources, key partnerships, channel and consumer relationship building blocks. In the next stage, these are called Sustainable Value Creators. Second, business model innovation also occurs on the way the company determines how to create revenue, or according to Osterwalder and Pigneur (2010) it will discuss cost structure and revenue streams, these are defined as Sustainable Revenue Creators.

There are several ways a start-up can update their business model to become more environmentally sustainable. If a product offers sustainable solutions or a start-up has an environmentally friendly attitude, it should include or even underline this in its value proposition. At the core of a sustainable business model is a **sustainable value proposition** (Bocken et al. 2013). As described by Baldassare et al. (2017), conceptualizing a sustainable value proposition is a critical task in the design of the sustainable business model as it requires the understanding and managing of several needs and objectives across a range of stakeholders in order to create and deliver shared value. Every company has a brand, whether it is B2B or B2C, incorporating sustainability into the value proposition helps the sharpening of the brand and communicates the values to the consumers. An example of a company that has included sustainability into their value proposition is Interface, as described by Stubbs & Cocklin (2008). They show that Interface regards the environment in seven fronts, among which they aim for the use of renewable resources and moreover give back what they took (Stubbs & Cocklin, 2008). By incorporating environmental values in the value proposition, the company is sharpening its brand-image and customer segment.

Sustainable value creators could be generalized through the use the concept of eco-efficiency. Eco-efficiency is the ratio between the value of the product and the impact of the activities for product creation. In other words, eco-efficiency promotes issues on how to minimize impact from production processes without reducing the quality of products (Keating et al. 2010; Klewitz et al. 2012). The impact could be minimized by optimizing the usage of energy, water and other resources. Start-ups could employ eco-efficiency by utilizing a life cycle analysis (LCA) approach to describe their business process (Behrendt et al. 2012). With the main crucial tools of LCA – inventory and impact assessment, start-ups could identify the crucial points of their production process that can minimalize energy and resource consumptions. LCA also helps start-ups to identify the potential of products, are they able to recycle or to be reused? In some cases, the by-product, particularly agricultural residual, could be used for other purposes, such as biomass (Keating et al. 2010) and use for farm feed products (Rattanapan et al. 2013).

Klewitz et al. (2012) stated that one of strategies to increase the involvement of young business in sustainability is through collaboration initiatives with other parties crossing over their organization. Small businesses may experience difficulty to conduct initiatives by themselves due to limited resources. The collaboration could be a shared initiative to engage in social and environmental initiatives with other corporations. Collaboration could for instance emerge by doing by-product exchange or synergy, as is conducted by a sugar refinery in Guangxi Guiyang (China). The sugar refinery did an exchange with other local business of their by-product such as alcohol and sugar pulp as well as work with local authority for water treatment. The business in this areas create an industrial symbiosis to minimize environmental impact in their society (Lowe 1997).

Sustainable revenue creators

Current empirical research in small business explains that small businesses' engagement to sustainability is driven by the extent of their sustainable initiatives and their contribution to reduce the management risk and cost saving, whilst simultaneously increasing their profit (Schaltegger et al. 2012). Additionally, if start-ups can identify possible reuse and recycle issues in their business process, it can be another cost-saving opportunity.

Having sustainable initiatives, start-ups should be able to use it to enhance their brand awareness and brand image development. Start-ups should take a pensioning as environmental friendly business. Start-ups could specifically target ethical consumers with environmental concerns, as the number of these consumers nowadays significantly increase. Their intention to purchase a product depends on environmental friendly reputation of the producer of the product (Chen & Zhou 2013). Furthermore, Start-ups are able to use their sustainability practices as their consumer relationship agenda. Start-ups could generate consumer loyalty and attachment by promoting some environment-consciousness trends among their potential consumers. For example, what is conducted by body shop by promoting against animal testing to all their products (Sillanpaa 1998). Sustainable brand awareness is considered to be a sustainable revenue creator as this practice does not benefit the environment in itself, it rather facilitates the revenues of the company pursuing it.

Business Model Innovation could be implemented through designing new ways to create potential revenue streams. For example, by-product innovation could create potential income for the start-ups. Start-ups could sell their by-product to other companies that need the by-product as their raw material. Finding a possible by-product symbiosis in a nearby business could benefit both the focal business as well as the local economy. Porter (1990) mentions that synergy among local businesses could contribute to local competitive advantages.

As a general description, this study argues that business model innovation for sustainability in start-up ventures could be created at least in six building blocks of Osterwalder and Pigneur (2010)'s business model canvas. See figure 7 for the relationships between sustainable innovations and the components of the business model canvas.

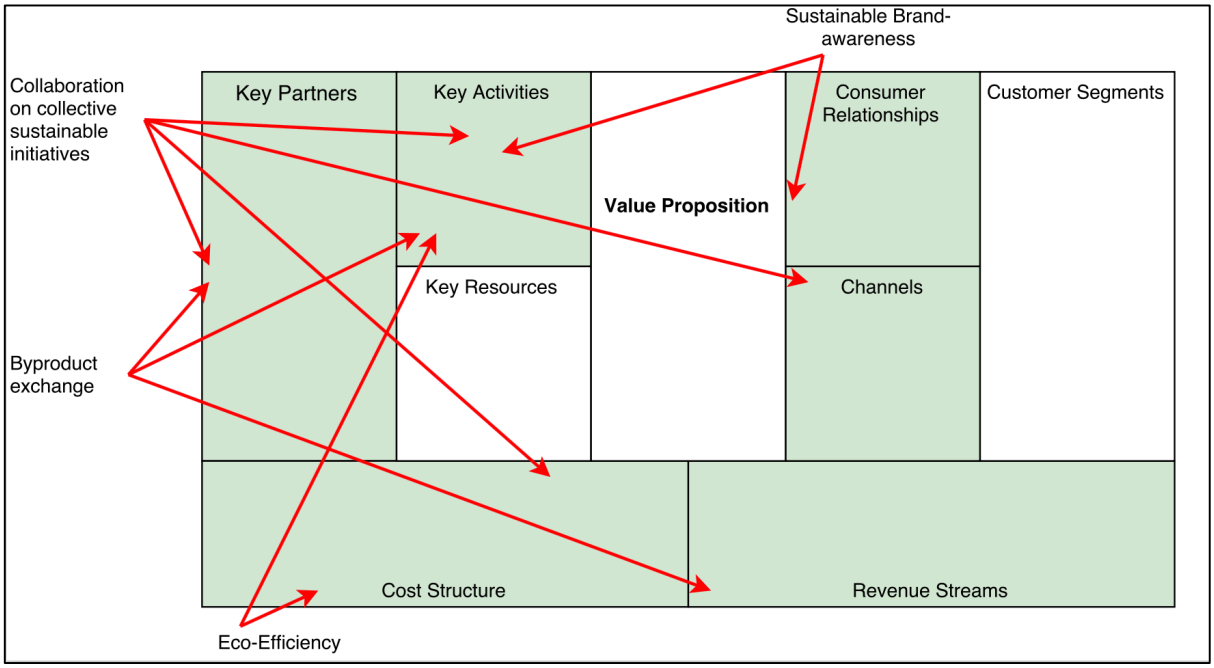

Figure 7 Ideas for the implementation of BMfS for start-ups in Indonesia

A sustainable value proposition may lead to structural changes in the decision logic of the firm concerning the business model. As is argued by Bocken et al. (2013) and Baldassare et al. (2017), the value proposition manages the stakeholder view. It should comply with the normative requirements set up by Boons & Ludeke-Freund (2013). The value proposition is a somewhat distant building block for the business model of sustainability in this sense, and therefore addressed separately. To raise sustainable brand-awareness among customers, a firm has to alter its consumer relationships. Steering the key activities of the firm to environmental friendly practices that are directly visible for the consumer alters the consumer relationships.
Collaboration on collective sustainable initiatives: A collaboration on sustainable initiatives can help to increase the brand-awareness among the customers of the start-up. To achieve such a collaboration, key partners, key activities and cost structure are altered by executing the collaboration. Additionally, the channel by which customers can become acquainted with the startup are altered through these collaborations and initiatives. By achieving eco-efficiency for the start-up the door is swinging both ways. Key-activities are altered in order to efficiently utilize resources, while simultaneously the cost structure is benefitted. Conclusively, byproduct exchange affects the key-partners (adding a party that buys the byproduct), the key activities in that this product is now actively sold as well as it is adding a revenue stream. Naturally, this list is not exclusive nor is it complete, more sustainable innovations to the business model are possible. However, it may serve as a source of inspiration to initiate sustainable business models for start-ups.

2.3.4. Conclusion

The third literature review has proposed creative ways of designing the business model in order to benefit the natural environment. Several implementation strategies have been extracted from literature and are considered to be viable for start-up companies. By this, answering the second sub question: *How can business model innovation support technology start-ups in taking sustainable practices into account in their business model according to current literature?*
Encouraging sustainability practices in start-ups is an important agenda, as the business design is still simple and easy to modify to become more environmental friendly. Moreover, literature is stating the importance to incorporate sustainability from start-up phase (Hall & Vredenburg 2003). By becoming a sustainable corporation, a start-up will have to keep updating their business practices as they have to respond quickly to global business trends and challenges. Creative business model design, as proposed in this chapter, serves several ways for start-ups to include environmental sustainable practices into their business model, with that answering the second sub-question of this research.
Nevertheless, the challenges encountered by start-ups in their early business make that they face obstacles to adopt sustainable practices. The limited resources they have to deal with make the business model an ideal target for sustainable innovation. As, if implemented cleverly, this literature review has shown that a start-up can get around the resource scarcity and create shared value. This section promotes a simple vision on how start-ups could adopt sustainable practices by doing innovation in their business model. Six business model innovations are proposed, referring to six blocks of the business model canvas (see figure 7) that try to deal with some problematic issues in start-up development.
As the business model canvas is widely educated in Indonesian context, this ontology serves the pragmatic purpose of companies to implement sustainability into their business practices. However, it is recognized that the business model canvas ontology has some flaws when it comes to ecological sustainability. It regards the value proposition in a mainly economic sense. Environmental value is complementary and inherently less attention is given to this matter. As the BMC is focusing on a single firm it inherently devaluates the importance of the ecosystem in which a company operates. It is important that companies realize that, in order to benefit the environment, the goal is to minimize the

ecological impact of the whole value chain. The company should be aware not to shift the polluting activities to elsewhere in their ecosystem. Moreover, the business model canvas is primarily designed as a brainstorm tool, but it is lacking an implementation guide nor has it a control mechanism implemented to assess the viability of the business model. Start-up companies should consider these factors and find ways to compromise for the shortcomings.

Chapter 3. Context analysis: Environmental Sustainability in Indonesia

As the cases that are studied in this research are selected in Indonesia, it is important to explain the distinctive characteristics of the nation that will influence the adoption and diffusion of sustainable business models. The relevance of sustainable businesses for Indonesia is described in this chapter as well as the cultural and legislative characteristics of the nation that shape the behavior of its incumbents.

3.1. Introduction

The previous literature reviews have provided a deep understanding of the concepts that are essential for the understanding of the practices of the selected start-ups. Most of the literature on sustainability practices has, however, drawn their scope to western nations (Boons & Lüdeke-Freund 2013; Mieg 2012; Klewitz & Hansen 2014). It is evident that the environment in which a firm operates influences its behavior. Cultural and structural elements shape the adoption of business models for sustainability (Bocken et al. 2014) as well as values, beliefs and norms play a role in the behavior of entrepreneurs or the market (Abdelkafi & Täuscher 2016). How these factors are materialized in Indonesia is described in this chapter.

Indonesia is the world's third largest population, and still growing. Its geographical location makes it rich in resources but prone to natural disasters. These environmental challenges are often given a lower priority by government officials due to the high poverty levels of the country and often demonstrate a weak, inadequate governance (Bhasin & Venkataramany 2010). Nevertheless, the major industries of Indonesia, like agriculture, mining and tourism, are depending on the wellbeing of the environment. When the environment becomes deficient, these sectors will experience economical losses. Small and medium enterprises play an important role in the Indonesian ecosystem. The SME sector of the nation is contributing to almost 58% of GDP and is employing 97% of Indonesia's workforce (REF). Finding ways for small companies to benefit the environment whilst improving their ways to make profit can be a start for Indonesia to preserve their valuable environment.

Entrepreneurship in Indonesia is a well-accepted and popular career choice, many students consider starting their own business because of the perceived benefits that come with it. In a study of 2014 it was found that 87 percent of a sample of business-students in Bandung are willing to start their own enterprise, whilst the remaining thirteen percent did not decide yet and no single student answered that they do not have any intention at all to start their own business (Setiadi & Puspitasari 2014). Especially technology start-ups are a popular workplace among the students, 91 percent mentions a willingness to work for a technology based start-up, with social media and entertainment as the most preferred sectors (Setiadi & Puspitasari 2014). A study of Kaijun & Sholihah (2015) has found that students in Indonesia are inspired by other, successful, young entrepreneurs. The favorability of a profession as entrepreneur over other employed professions comes from the perceived benefits as gained profit and flexibility (Kaijun & Ichwatus Sholihah 2015; Setiadi & Puspitasari 2014). The willingness of young Indonesians to become an entrepreneur, together with rapid technological development opportunities within the nation, demonstrate the significance exploring how start-ups can take sustainability practices into account to facilitate ecological responsible growth.

The digital consumption of Indonesia is growing at a fast pace and exists mainly through mobile devices. It is one of the fastest growing markets of the region considering the internet penetration trend(Aguiar et al. 2010). However, it is still far beyond the regional pioneer the Republic of China, which citizens spend more than double the time online than the other BRICI countries combined (Aguiar et al. 2010). This can be an indicator and motivator for Indonesia to accomplish the development goals ahead. Indonesia is seen to be particularly active on the social media platforms and one of the world's biggest smartphone users. Resourceful entrepreneurs will capture and monetize the opportunities in this market.

This chapter is structured as followed: First, studies that have addressed the environmental awareness in the area is discussed. Secondly, important parts of Indonesian culture are elaborated. Thirdly, the regulatory and institutional environment is explained and finally the entrepreneurial culture and education efforts are described.

3.2. Environmental awareness in Indonesia

Public awareness is an important issue when Indonesia's environmental conservation is under scrutiny. The natural environment of the nation comes with many challenges, from natural disaster risk management to biodiversity conservation. Conscious and informed citizens may raise voice to address certain environmental issues, contributing to community support levels. However, at community levels, environmental issues are not deeply embedded within Indonesia, leading to undervaluation of natural resources and environmental services. Recurring natural disasters (floods, landslides, fires, erosions) have stimulated greater environmental concern, but there is shortage of analyses that determine how far or deep this understanding goes outside of urban areas and what tools can be best used to expand this basic awareness.

Nevertheless, some specialized studies on solid waste management and beach environment shed a bit of light on the awareness of the community. Locally generated litter of all types of waste is a major problem everywhere in Indonesia, especially in proximity of large populated towns (Willoughby et al. 1997). A study examining the problems occurring for waste management have acknowledged a low awareness of community members towards environmental problems caused by illegal dumping (Pasang et al. 2007). This littering can be felt throughout the nation and indicates the low presence of environmental awareness among communities. People's attitude and support towards environmental conservation and sustainability practices is influenced by factors like education. A comparison between the awareness of citizens from a community group and the awareness of educated citizens showed high awareness on some environmental problems for the educated group, but a low awareness on all environmental aspects (except AIDS) for the participants from the community group (Sudarmadi et al. 2001). However, the number of educated people is still low and community citizens greatly outnumber educated citizens (Nawangpalupi et al. 2016). The low awareness of the Indonesian community means that there is no social pressure on entrepreneurs nor policy-makers for sustainable behavior. The market demand for sustainable companies is low and non-sustainable behavior is unlikely to provoke community revolt. A major transition driving society to shared environmental consciousness is yet to emerge.

Despite the importance of the natural environment and its resources for Indonesia, a low level of environmental awareness comes forward. When implemented to the conceptual model of Abdelkafi and Täuscher (2016), who state that for truly adequate BMfS you need the values beliefs and norms of the entrepreneur aligned with the values, beliefs and norms of the customer group, a low practicality of a western form of BMfS comes forward. Before common consciousness of the environment is established, environmental entrepreneurs should come up with creative business designs to attract a sufficient customer base.

3.3. Social culture

When environmental consciousness is to truly benefit the country and prolong in business actions, then this is a display of a bigger change in culture and development. A report on the viability of CSR in Indonesia from the United Nations highlights that CSR in Indonesia is, unfortunately, an image presented to a public by those working behind the screen, in other words constituting of window dressing. The complex culture of Indonesia is influencing the place of environmental consciousness within society. On one hand Indonesia is embracing modernity, as seen in its metropolitan areas, but

great aspects from its culture are still thoroughly influenced with tradition, which is flavored by the constraints of endemic corrupt authoritarianism (Kemp 2001). Moreover, a long history in colonialism left its footprints on society. Capitalism is inextricably linked with colonialism and imperialism in Indonesian consciousness. The long lasting Dutch reign made close ties with the original aristocratic court culture at the time, which was a rather exclusive social class. A divide that continues to exist between the masses and the ruling class, and economic corruption and suppression remains.

Endemic corruption and the strong divisional gap between regulators and citizens lead to egocentric decisions of regulators. Government officials have unfortunately been too often found to be involved in nepotistic acts, especially under former president Suharto's regime. During his regime, Indonesia was stated to be the third most corrupt country in the world, following Nigeria and Cameroon (King 2000). Resulting in projects that prioritized money of the (already rich) business man over environmental wellbeing (Laurance 2004). This prolonging corruptive activities have affected the environment for the worse as well as the trust and behavior of the country's residents.

Additionally, broad social culture in Indonesian tends citizens to be accepting and keep criticism for themselves. A study from Kusmawan et al. (2009) has shown that school children were embarrassed to communicate with the wider society to discuss environmental concerns about the area. This comes forward from the deeply embedded politeness of Indonesian culture, which keeps the children quiet and calm. Extended questioning, especially of older people, is mainly considered impolite. This may hamper wide-spread development and social acceptance of environmental practices that are rather neglected by some of the people.

3.4. System-wide factors: legislative and institutional environment

Indonesia has been through very turbulent developments since it gained independence in 1949. Besides environmental challenges it faces numerous other defies like alleviating poverty, controlling overpopulation, improving education and stemming endemic corruption (Bhasin & Venkataramany 2010). Due to political disturbances, the country's policies concerning development of environment and SMEs has been haphazard. However, the impact of small and medium enterprises may seem small at first sight, they constitute the majority of companies in all industrialized and developing countries.

The legislative framework for small companies to comply with environmental laws is either non-existent or hardly enforced (Kemp 2001). A very insightful citation was stated in this same UN report on CSR, from de Soto (Kemp 2001, p.35):

> *"When you step into an airplane in New York to fly to Jakarta, what you're leaving behind is not the high-tech world of fax machines and ice makers, televisions and antibiotics; many people in the Third World also have those. What you are leaving behind is the world of enforceable legal representation"*

An important instrument to raise environmental awareness is education. Environmental education is central to its future protection and must provide people to become effective members of society. Benefitting the environment requires long term thinking and vision from business managers. Educated citizens are still scarce (Nawangpalupi et al. 2016). Many business decisions of entrepreneurs reflect mainly self or family interest, and are not concerned about the wider social and environmental impacts. Indonesia has implemented a formal environmental learning program in 1972 in Padjadjaran University in Bandung. This Environmental Study Centers have multiplied to be 52 in number throughout the

country by the year 2000 (Sudarmadi et al. 2001). They conduct courses on issues related to environmental management and are part of some undergraduate and graduate programs.
Nevertheless, legislative frameworks do not seem supportive or lag behind for the emergence of environmental friendly businesses. What could benefit the development of environmental friendly attitudes (and thus businesses) would be government sponsored awareness raising campaigns and public-private partnerships, which can serve as platforms to facilitate the diffusion of sustainability management tools in SMEs (Johnson 2015). Moreover, to address the awareness of the wider community, media attention is proven to help (Sudarmadi et al. 2001). Conscious citizens can also pressure regulators to implement environmental friendly regulations.

3.5. Conclusion

Indonesia faces multiple challenges when it comes to addressing environmental conservation. Low awareness among community members and low legislative enforcement on sustainable behavior may hamper a fast transition towards a national sustainable mindset. Nevertheless, it is highly important to the well-being of their future generations and economy. Chances lie in educational programs, which have been established to address environmental managerial systems and are growing steadily throughout the country. Successful green entrepreneurs might inspire more young people to develop environmental sustainable businesses. Moreover, it has been demonstrated that this era comes with a multitude of opportunities for those entrepreneurs who succeed to fill the demands that come with digitalization trends.
It is necessary to take these factors in mind when analyzing the cases of this thesis. In western economies, emphasis on environmental sustainability may forward from customers' demand or legislative pressure. The presence of those factors may be of lesser strength in Indonesia, leading to minimal pressure on environmental sustainable practices of start-ups. Moreover, financial support for environmental beneficial practices will be lower, causing scarcer resources and incentive to take up the environmental sustainability game.

Chapter 4. Chapter 4 – Methodology

4.1. Introduction

As explained in chapter one, this research will take a qualitative approach and consists of several steps in order to come to the answers of the research questions. Both secondary and primary data are used to give an overview from the current practices of start-ups in Indonesia towards environmental sustainability. First a literature review is held and consecutively a field study is conducted to connect the literature findings to the real-life practices.

In general terms, the methodology of this thesis comprises a multiple case-study. As a research strategy, the case study may be used in many situations that are better examined within their natural context, as isolating the phenomena at stake would not provide the satisfactory outcomes. So does Yin (1984, p.13) define the case study as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident". Case study research excels at bringing an understanding of a complex topic and may add reliability to theories that are already known (Taylor et al. 2006). Case studies emphasize detailed contextual analysis of a limited number of events or conditions and their relationships. So this is true for examining business models and business model innovations. A start-up company is a product of its environment and makes decisions in order to be a good fit to its customers, therefore it is important to view their business model decisions in the light of its context.

This chapter explains the methods used for the field study in detail. The undertaken steps are presented as well as the complete framework that is used as a guideline to conduct the research.

4.2. Research design

The aim of the research is to explore how start-ups can implement sustainability practices into their business model by doing a combination of literature review and empirical data collection. The literature review is done in order to get a comprehensive overview of the current efforts of scholars and to identify targets within the business model for the implementation of sustainable practices. The empirical data collection is followed to get examples of how start-ups in Indonesia are regarding environmental sustainability practices and how they implement this into their business model. In order to follow a clear path, the different steps undertaken in this research are displayed in table 5.

Table 5 Steps undertaken in this research elaborated from step 3

	Aim	**Input**	**Result**
Step 1	Literature review	Literature reviews	Chapter 2
Step 2	Analyzing context of start-ups	Literature study on sustainability within Indonesia	Chapter 3
Step 3	Case selection	Results from step 1	Four cases to analyze the business model and practices
Step 4	Case studies	Interviews and desk research	Description of business model related with sustainability practices
Step 5	Cross-case analysis	Aggregated data from step 4	Extracting implemented sustainability practices and barriers towards implementation

The first two steps of the research are described in chapter 2 and 3 respectively, and were part of the literature review and context analysis from the research framework. The methodology in this chapter will focus deliberately on the practical study conducted for this thesis, explaining step 3 to 5. The practical study of this thesis revolves around four cases. Case studies are suitable for studying objects in their natural environment and can serve different aims like generating theory, testing theory or provide description (Eisenhardt 1989). The interest here is in the last aim, serving the objective of this thesis to describe the current practices of start-ups in Indonesia on sustainability efforts.

Step 3, Case selection:

Having identified the factors of business model innovation and sustainability and targets on where to implement them, it should be examined where this happens in current practice. This will enhance the validity and adoption of the proposed approaches.

An important aspect of cross-case analysis is that the individual cases are selected with the anticipation on either finding similar or contradicting results (Yin 1984). The cases chosen for this study have the purpose to identify the implementation of sustainable practices for start-ups with different objectives and development phases. It is expected to find different results for the different start-ups, however the aim is to find overarching patterns that will enhance the adoption of business models beneficial for the environment.

The cases chosen can be distinguished on two dimensions: 1) the development phase of the start-up: either in their initial development phase concerning first commercialization of the product or in a further phase wherein the company already achieved a certain degree of commercialization and experience on the market. The second dimension 2) regards the sustainability values of the company: either environmental sustainability is inherently embedded in the design of the service and therefore considered from the first initiation of the company or sustainability is not inherently related with the service of the company and is rather used as a way of branding facilitating the economic motivations of the firm.

The respective dimensions have been chosen to enhance the relevance of the findings for companies with different objectives and in different phases of their life, to demonstrate any opportunities and developments that may be related to the commercialization and life phase of the company. Moreover, it aims to show sustainable practices that can be adopted by companies regardless of their primary objective.

Selected companies in the disengagement phase:

Case 1: <Case 1>

This company has been selected due to their presence in the LPiK incubator and promising future within the agricultural sector in Indonesia. The company provides a smart irrigation system for greenhouse farmers, which improves the natural environment of the farm directly. Their technology is developed with environmental sustainability in mind and demonstrates to encompass the environmental sustainability value.

Case 2: <Case 2>

This start-up is also a tenant of the LPiK incubator and has the potential to grow big in the near future. Their technology is not inherently intertwined with environmental sustainability, however, they suggest environmental applications of their space aided technology service. Therefore, they can use this branding issue as a way to leverage their economic motivations and revenue streams.

Selected companies with commercialized products:

Case 3: <Case 3>

<Case 3> is providing a smart feeding system for fish farmers in Indonesia. This technology has similar characteristics to the technology of Biops Agritekno in that it improves the direct environment of the

fishes. This company has already experienced significant growth and investments, with an incumbent customer base they can respond to market demand and adjust their business model accordingly. Therefore, it is deemed interesting what they experienced and whether they have adjusted their business model accordingly.

Case 4: <Case 4>

<Case 4> is a company that tracks offline purchase behavior of consumers. This company has experienced fast national and international growth. The objectives of the company are not inherently connected with environmental sustainability, but may affect it nevertheless. Demonstrating how they view environmental sustainability and explore whether they adopt environmental friendly practices may inspire other start-ups to imitate.

Step 4, Case studies:

The data collection that was used for the case studies was a mix of desk research and interviews. For each case the interview was prepared by extracting as much information as possible from the company's website and previous published news articles. This (mostly) led to a clarification of the provided service by the company and could give a preliminary idea of the business model itself. As the desk research provided minimal information on the cases, the interviews are the major source of information on the company. These semi-structured interviews addressed the following three main topics: 1) General background information about the development of the company 2) Business model practices and business model innovations 3) vision on environmental sustainability and the translation to the business model. According to the obtained information in this step, individual case studies are drawn, identifying their business model and the implemented environmental sustainable practices. As all of the selected start-ups have worked with CANVAS to develop their business model, and as mentioned in chapter three, this is the dominant business model ontology perceived and educated within Indonesia, the business model has been drawn according to the nine business model blocks of CANVAS.

Step 5, Cross-case analysis:

Having selected and described the four start-up companies for cross-case analysis the approach towards this comparison is discussed here. The distinction on the value and development phase dimension allows for cross case comparison between various implementations of sustainability within the business model, thereby increasing the likelihood for the identification of sustainable business model innovations. This explanation building approach allows for various comparisons that are as follows: comparing <Case 1> with <Case 3> and <Case 2> with <Case 4> will provide insights into different business model adjustments that are relevant for different development phases within a start-up enterprise; comparing <Case 1> with <Case 2> and <Case 3> with <Case 4> will reveal the different approaches towards implementing sustainability practices into the business model. The cross case comparison matrix is depicted in table 6.

Table 6 Cross case matrix showing value dimension and development phase dimension for respective companies

Value dimension / Development phase	*Sustainability values*	*Economic-, brand-related values*
Initial development start-up	**5) <Case 1>**	**6) <Case 2>**
Commercialized products	**7) <Case 3>**	**8) <Case 4>**

One of the goals of this study is to build a general explanation of how start-up companies can implement environmental sustainable practices in their business model. If the data on the four cases is aggregated, affected business model components can be analyzed in relation to the motivations and practices that are identified by the start-ups. This aggregation can lead to more general insights on what drives the adoption and diffusion of business models for sustainability of particular cases of start-ups.
The steps that are undertaken in this research are presented in the above section. The literature review serves to identify the dimensions relevant for examining different business models as well as it provides specific targets start-ups can use to implement environmental sustainable practices into their business model. The practical study is set up to explore what is currently performed by start-ups in Indonesia to reach environmental sustainability objectives. Having explained the steps that are necessary for this study, the following part will discuss the data collection methods and reporting in more detail, as well as it will elaborate on the coding used for data analysis in chapter five.

4.3. Data collection and reporting of the individual case studies

The data collection for the description of the case studies is based on a mixed approach of desk research and interviews with the person responsible for the business model (e.g. CEO or founder in most cases). Whereby the desk research was the starting point for scrutinizing the cases, also as means of preparation for the interview in order to develop relevant questions for the specific start-up company.
Due to the limited documentation of some of the selected cases, desk research has not always been rewarding. Nevertheless, the following types of documentation have been used: Company's websites and previous published journalistic articles (mostly of popular press or fund raising websites). All articles that came forward with information on the development and behavior of the company has been used. Due to this limited access to (scientific) information that could be obtained, the participants were asked to fill in a questionnaire prior to the interview, so questions could be formed on the basis of these indications.
For the interview this desk research and questionnaire are of importance to develop directed questions regarding the business model and environmental sustainability. Next to the importance of the right questions it is also important that the appropriate person is selected for the interview, the one who is involved in the development of the business model. In practice this has always been a co-founder or CEO. Before the interview takes place, the interviewee should be informed about the questions it will receive, therefore the case study protocol has been send to the participants beforehand. The interviews taken place with a semi-structured approach. This means that pre-set questions and topics to be addressed are developed, but they serve as a guideline for the interview. During the interview there is room for adjustment according to the responses obtained. The case study protocol and introductory questionnaire can be found in the Appendix of this paper.

The reports of the case studies used in the main body of this paper are based on the simple structure of first describing the emergence and service of the startup, where after the general business model is explained and thirdly relates environmental sustainability vision of the company with its business model. Additionally, a case study protocol of the European research group ENVISION has been adopted to structure the findings on the individual cases. The research sheet is depicted in table 7.

Table 7 Research sheet on case studies

Responsible researcher(s)	**Anne Evita Geelhoed**
The project research period	from March 2017 until August 2017
Data collection tools used	Desk research; Questionnaire; Interviews; All interviews are recorded and transcribed. Transcription headlines included in appendix and audio files available on request.
(Kernel) theories used	Concepts with regard to Supply Chain Management, Retail, Business Intelligence, process optimization
Data-analyses	Hybrid coding, a set of a-priori codes and open coding
Transcripts of interviews	Included in appendix
Transcripts of observations	Not done
Usage of codes and coding	A list of a priori codes based on the literature review and CANVAS ontology
Coding steps	1) Looking for a priori coding 2) Open coding 3) Looking for connections within the codes and see if they are relevant for the sub questions 4) Further analysis for open coding as well as the a priori codes
Software used for analyses:	Atlas TI
Validation of interviews and results	Not yet
Review by contact person	Not yet
Review by external reviewers	No
Expert opinion requested	No
Review by co researchers	No
Business model ontology	CANVAS has been identified to be the used ontology for all four cases and is therefore used to describe the BM of the companies

4.4. Coding approach of the interviews

For the analysis and explanation of the four cases it was chosen to make use of coding. This can provide insights into the relations and relevance of the different elements addressed in the interviews (Yin, 2009). A mix of a priori coding and open coding has been used. The a priori codes were directly derived from the ontology used, CANVAS and from the in the identified targets for environmental sustainability. They serve as a way to organize the obtained data. The list of all codes used is displayed in table 8, the underlined codes indicate that they were designated a priori.

Table 8 Codes used to analyze interviews

Background	economic motivation	lack of technology	revenue stream
barriers	employee behavior	lack of trust in employees	service
business model	environmental sustainability	LCA	shared vision
business model innovation	few possessions	mission	strategy
CANVAS	geographic market	office	Sustainable branding
channel	growth	pain point in the company	time
Company timeline	high costs for farmers	pain point in the market	user engagement
conservatism	improving Indonesia	partner selection	value chain
consumer relationships	investors	Problem	value delivery
cost structure	key activities	real time data	value proposition
customer segment	key partners	reducing production	vision
eco efficiency	key resources	revenue model	

Using this approach of coding is done to identify which business model components are affected by the different sustainable practices of the start-up. Moreover, challenges and opportunities could be analyzed using this approach.

To analyze the data on an aggregated level, all interviews with the founders of the companies have been coded. For coding the data, a list of a priori codes was set-up to anticipate the findings and define the story line. This way of selective coding (for methodology and used codes see chapter four) is done to identify which environmental sustainable practices are implemented and which corresponding business model components are affected.

The objective of this study is to identify which practices are implemented to enhance environmental sustainability. Environmental sustainability is thus presented as central object of the analysis and all practices that have an impact on environmental sustainability are coded accordingly. The storyline will evolve around this concept. Environmental sustainability aspects can be achieved in a variety of more concrete actions or strategies. All quotations that were categorized with environmental sustainability were again analyzed, to identify the corresponding environmental friendly practice.

Example:

Quotation labeled as mentioning environmental sustainability:

"One of the biggest [water] polluters is the feed, if we can reduce overflow of feed in the water, then the quality of the water will improve and the fish will be better as well"

From this quotation you can extract the strategy of waste reduction to benefit the environment. In a second round this code was added to this quotation. In a third round, it was observed that waste reduction can take place in different forms too. The distinction has been made between reduction of waste of internal processes (e.g. internal waste reduction), and the reduction of waste for the supply chain, particularly for the end-consumer (external waste reduction). Accordingly, the example quotation got coded as external waste reduction.

Chapter 5. Analysis and Results

5.1. Introduction

This chapter contains the results of the data collection and involves the transition of the literature analysis to the real-life phenomena as it is observed within Indonesia. Four cases are selected based on the criteria presented in table 1 (chapter 1). It involves step four and five from the methodology and will provide data to answer the fourth and central question of the research.

The four cases are discussed, explaining their service, business model and attitude regarding the environment. Their business models are explained according to CANVAS, a table representing the decisions are provided at the end of every case. More elaborate case descriptions can be found in Appendix # until #. The case descriptions are followed by a case per case comparison, highlighting the differences and similarities on the two dimensions. The last analysis are on the aggregated data and forms the cross-case analysis, extracting to what extent sustainability practices are taken into account by start-ups in Indonesia.

5.2. Description of the cases

5.2.1. <Case 1>

<Case 1> is a small sized technology start-up, providing a solution for agriculture irrigation. It is acting as a half independent company in Bandung, as tenant of LPiK incubator of Institut Teknologi Bandung (ITB). It can be characterized as a visionary technology start-up; who's vision is to bring a new era of agriculture to Indonesia by introducing technology to agriculture in order to create simplicity. Core values are: improving the agricultural sector of Indonesia and taking responsibility for people and environment. Initially the start-up is concentrating on commercializing the first product, but the long-term mission is to provide the agricultural industry with technological innovations that are beneficial for farmer and environment. The company does not own an office, as it makes use of the facilities of the incubator for managerial operations. The founders established the company in fall 2015, and became tenant of the incubator right after. The team has been consisting of seven people from the start, a young team with students and fresh graduates. The team has different backgrounds in biology, engineering and finance. Management has meetings every week and duties are formally assigned but in practice distributed based on availability. The start-ups organization structure is very simple, as they share the final responsibility over the seven founders.

The service offered consists of a physical component that is a hydraulic pump for irrigation regulation of crops. The hardware is complemented by a software component, that is used to monitor and control the irrigation from a smartphone. This gives farmers more freedom and managerial simplicity to enhance the growth of their fruits.

It is an innovative product and new to the market, as farmers in Indonesia are using mainly traditional methods for their farming activities. Which are non-controllable and non-quantitative ways of irrigating the crops. The manual controlling of the irrigation systems makes that the environment of the farm enters a negative spiral. It results in superfluous irrigation, which results in crops receiving too much water, making the fertilizer run off into the river. This run off of nutrients does not solely pollute the nearby water systems of the village, even more, the crop appears like it is in need of more fertilizer, which nurtures an inefficient use of resources. The product of <case 1> aims to enhance the growth process of the crops and introduces technology to regulate the irrigation in a precise manner, sensing when the crops are in need of irrigation and providing the water accordingly.

<Case 1> has developed their product specifically for the irrigation of greenhouse farms and are currently operating in West-Java, however interest from other parts of Indonesia has been registered.

They provide the implementation of the product, as well as the set-up of the software and the hardware maintenance. Customers can find the product on the website of the company, and presence on national technology and agricultural fairs is employed to gain publicity for their product. Moreover, they recently started a collaboration with a CSR corporation, which buys their product to supply small farmers with low capital availability. As the start-up is still in its "disengagement" phase, the founders of the company are currently mainly engaged in developing the establishment of the company. Developing the product and managing the first sales. As of this, their main resources are the knowledge they have in-house together with the hard- and software designs. They can live up to their value proposition by receiving governmental funding and within the protection of the incubator. The company itself has not many tangible assets nor has it an office, as it is still tenant of the incubator. It is selecting its manufacturing partners on availability, price and benefits.

The vision of the company is closely intertwined with environmental sustainability. The company was set up from the vision to reduce the country's food import, by increasing the efficiency of its own agricultural resources. More efficient use of the farmlands will lead to higher production of foods, thereby reducing the need for extensive land usage and food imports. The intention of the company is to simplify farming, by offering smart controlling and smart monitoring technologies to the farmers, complemented with a smartphone application. Besides that, they aim to educate the farmers in Indonesia regarding crop growth and in what technology can mean to the farmers. Also hoping to stimulate young Indonesians to regain interest in the agricultural sector. This includes education on environmental sustainability and how technology can help to benefit the ecological system in their advantage [e.g. more harvest]. The service they offer provides eco-efficiency for the customer, as the product manages and reduces the need of fertilizer and manages the electricity of the hydraulic pump.

Table 9 Business model <Case 1>, with green blocks representing BMI for environmental sustainability

Conceptual BM dimension	CANVAS building block	Company's position
Value Proposition	Value proposition	Simplifying farming by introducing irrigation technology in the Indonesian agricultural sector, thereby benefiting the environment to stimulate healthy crop growth.
Value Delivery	Customer relationships	Maintaining of the irrigation throughout the year. Giving free training for the use of product, emphasizing the environmental sustainable component of the technology.
	Channels	Endorsement by example farm (assisted by government) Presence on conventions CSR funded diffusion
	Customer segments	Greenhouse farmers (particularly on West-Java)
Value Chain	Key partners	Government research body on agriculture Example Farm as endorsement (urokarta) CSR corporation
	Key activities	Providing the smart-technology, which manages the irrigation for the crops as well as the electricity management. Enhancing the crops for maximum harvest possibilities. Educating farmers on the possibilities of technology and the crop characteristics.
	Key resources	Skilled staff, in-house knowledge Hardware & software design
Revenue Model	Cost structure	N/A (Mainly fixed costs, minimal presence of tangible assets as still tenant of incubator)
	Revenue stream	Selling or renting out the irrigation hardware/ software package Public funding, obtained from LPiK partaking

Table 9 represents the business model decisions of <Case 1>, depicting the components of the business model that benefit the natural environment with a green background. The value proposition includes efficient use of the environment by minimizing superfluous feeding. Moreover, bigger and healthier crops will deliver more value for the farmer, requiring less land usage for similar profit. In relation to their customers, the company emphasizes on the environmental benefits, as a mean to attract more customers as well as to obtain channels. The emphasis on environmental sustainability has attracted a CSR funding program that acquires the product of the company to support low-income farmers in the region, thereby obtaining a "green" channel as well as a "green" key-partner. To live up to the value proposition, the company delivers the smart-technology to enhance crop efficiency and put time and effort in the education of farmers regarding crop growth and efficiency.

5.2.2. <Case 2>

Only 17% of the Indonesian population are connected with the internet, whilst globally this is around 40% of the population (ITU 2016). Nearly half of the Indonesian population is living in rural areas (The World Bank 2016). In these regions internet coverage is low and hardly accessible. Traditional technologies to realize internet coverage are costly and time consuming for these desolate parts of the country. The technology developed by <case 2> is providing solutions for the internet coverage in these hardly accessible areas. A helium balloon will lift a tactical air flying platform into the air, which provides the telecommunication on the desired location.

<Case 2> is a small sized technology start-up in the disengagement phase, operating in the internet technology and aerospace industry. Providing a technological solution for internet coverage through helium balloons. Active as tenant of the LPiK incubator, the company has no office, and can use of the facilities of the incubator for managerial operations. Founded in September 2014 by the CEO together with two partners. The start-up became tenant of the incubator one year after (e.g. September 2015). Nowadays, these three people are working full-time for the company, expanded to a total of six employees. The start-up's long-term strategy is to provide space aided technology in a wide array of applications, using real time data monitoring to control industries. Currently its focusing on internet coverage through a helium balloon technology. This company is currently still in its disengagement phase as they did not manage to fully commercialize the product yet. The incubation program will finalize forthcoming September (e.g. 09/2017).

The technology developed by <case 2> does not require terrestrial infrastructure adjustments. The balloons of <Case 2> are used to lift up the telecommunication devices for enhanced internet coverage, using VSAT satellite and cable as its backhaul and share internet connection through Wi-Fi in large areas. The power sources of the telecommunication devices are delivered through integrated solar panels. The balloons can be aired for different time periods and are able to enhance internet coverage in rural areas on the long term or provide a short-term solution for high density internet usage (e.g. concerts or public events).

The start-up's value proposition is to provide the market a system with a fast deployment time at a relative low cost The technology has a high potential to complement the performance of satellite and terrestrial infrastructure for internet coverage (e.g. cable, BTS and optic fiber). To compensate for unfair advantage, the company has submitted for international and local patents to protect the technology. There is a strong partnership with local industries and government, and with UK Satellite Business Hub as an international partner. The technology is offered to potential business partners, that are internet providers (TELKOM), the Indonesian Internet association (APJII), and the government. Thereby it is supporting the government initiative to enhance internet penetration, showing a thin line between the key partners and customer segment. The revenue stream of the company emerges from leasing the full product to internet providers or based on the number of subscribers to the internet services during a particular duration of internet connection. For the procurement and development of the product the company will lease facilities, and mobilize resources that enhance the life time of their products.

Environmental sustainability is not naturally embedded in the product of the company nor is it part of their main strategy. During the interview, nevertheless, they state to use life cycle analysis in order to enhance the life time of the product, analyzing the trajectory from raw materials until decomposition, benefiting the company as well as the environment. Moreover, renewable energy (solar panels) are used to accommodate the technology with energy whilst let up in the air. However, it was stated that, before they go further into environmental sustainability issues, there are more pressing issues to deal with first. Survival and scaling up receive currently most attention.

Table 10 Business model of <Case 2>, with green blocks representing BMI for environmental sustainability

Conceptual BM dimension	CANVAS building block	Company's position
Value Proposition	Value proposition	Enhancing Indonesian internet penetration. Providing the low cost internet coverage system and fast deploying time.
Value Delivery	Customer relationships	Close collaboration, as the customers are at the same time key-partners. There is a high degree co-creation of the service with the customers.
	Channels	Direct offering to potential business partners.
	Customer segments	Internet providers (B2B) Government (enhance internet in rural area or high dense areas)
Value Chain	Key partners	Indonesian internet association Suppliers of materials and technology
	Key activities	Selling the service Developing the product (assembly)
	Key resources	Skilled staff with knowledge on the technology (intangible assets) Patents Sustainable energy components
Revenue Model	Cost structure	Procurement, Patents, Marketing, Consultation
	Revenue stream	Leasing the Helion product for internet providers

Table 10 represents the business model decisions of <Case 2>, where the green blocks represent the components of the business model that contain environmental conscious decisions. As this company is using life cycle analysis to endure the lifetime of the product that they are selling, the environmental conscious decisions are visible in the value chain of the business model. Essential components are selected based on their lifetime and performance (i.e. key partners, key activities and key resources). Moreover, they include sustainable energy technology, solar panels, to keep the technology on the helium balloons working.

5.2.3. <Case 3>

Fish in Indonesian farms are mainly handfed by employees of the responsible farmer. This is quite problematic, as there is a big probability of overfeeding the fish. Moreover, it happens quite regularly that employees of the fish farms steel the fish-feed and sell it to other farmers. <Case 3> is providing technology smart fish feed solutions for small to medium sized fish farmers. The product developed by <Case 3> is using technology to feed the fish the right amounts of food on a pre-set time schedule. The hardware provided is complemented with a smartphone application to monitor. Resulting in more freedom of fish farmers as they do not have to be present in person to check the situation. Additional value from the product comes from the data analytics that are embedded in the software, enabling farmers to improve their business and start knowledge-based farming.

The company established in 2013 and launched its first product mid 2014. It started off as a small company with seven employees but gained traction and attracted national and international investors, operating now in its "growth" phase. The company has over 60 employees and are hiring to keep up

with demand. The market potential for the aquaculture industry in Indonesia is large, containing over one million businesses and an estimated market size of roughly four billion.
The growth of the start-up has evolved multiple value propositions, but the first and main value proposition is to reduce the feed conversion ratio, which represents how much fish feed you need to produce one kilogram of fish. Sometimes the aim is to reduce the feeding cost and sometimes to increase fish production. Both ways increasing the profit margin for the fish farmers. Additionally, farmers can remotely control the business anytime and can get real time data while they don't have to be there in person. To obtain these values, the farmers have to either rent or buy the hardware. Two "packages" are made: the first one is that the farmer buys the hardware for 750 dollars and that includes a subscription for the software for two years. The second is that the farmer rents the hardware and pays a software subscription fee of 30 dollars each month.
On a small scale the company also monetizes the data they gather from farmers who gave permission. They analyze the credit worthiness of the fish farm and connect that data with a financial institution (e.g. bank or other investors), to enhance sustainable business growth in the economic sense.
Most activities of the company are centralized. On a daily basis the employees are occupied with various activities. Engineers are developing and maintaining the software, a field-team doing the sales and at the manufacturing site they *used to* assemble the product themselves, but are currently shifting up to assembling by using contract manufacturers. Additionally, they handle the aftersales, do the maintenance, replacement and repair of the product. Initially, <Case 3> works with suppliers and vendors. For the assembling activities, one product consists of 160 parts and assembling all of the small parts themselves means activities of solder, mechanics, painting packaging and quality checking. This requires a lot of skills and it is out of the core-expertise of the company. So it is decided to select partners that can do the manufacturing for them and grow with them.

> Selecting the partners
> A selected partner has to meet the criteria that the start-up deems important. For <Case 3> this means that partners have to understand the business; they have to know where <Case 3> wants to go in the future. It is important for them to find a long-term partner. When discussions with the potential partner are held, it will go about what they [e.g. <Case 3>] wants to accomplish in the forthcoming three to five years, and if the partner is willing to be a part of that and whether they are willing to take investment on their own for them to grow in a mutual way. That is the initial and basic criteria that they take. If they share a vision and they believe in <Case 3>'s activities, then that becomes the basic. Secondary, is of course the expertise, their portfolio is scrutinized and about expertise in building similar products is assessed. There is due diligence as well, seeing their factory, their employees and their partners. This is done to assess whether they have a strong expertise. Another criterion is the networks that they have. We want to scale up and if we need some other parts, then networks or suppliers are also important. The whole supply chain is under consideration.

Environmental wellbeing is inherently important to the company. If the environment is doing good, the fishes are doing better and that means more business for <Case 3>. They mention environmental sustainability on a global scale. As they produce food from the environment and if the quality of the environment decreases it will affect the waters of the fish. Environmental sustainability is also aligned with their vision on company expansion. The environment must remain of good quality if they want to grow, to keep the business going. As one of the biggest polluters of the waters is the fish feed, reducing the superfluous feeding is enhancing the water quality, increasing the quality of the fish, which means increasing the profit for the farmers. If the profit will increase, they can sell their product. On the other

side, to obtain funds and investors, the environmental sustainability aspect is used as a way of branding. Investors are more receptive for environmental incentives. Investors value environmental sustainability and thus makes it sense for the company to use it as a branding component. On the sales side of the company, the fish farmers, only care about profits, so ecological branding towards these farmers would not have the desired effect.

"What we are trying to do, one of the biggest polluters is the feed, if we can reduce overflow of feed in the water, then the quality of the water will improve and the fish will be better as well, so it becomes more profitable. If it is more profitable we can sell that to the farmers."

"The environmental sustainability is embedded in the growth and future growth of the company."

Table 11 Business model components <Case 3>, with green blocks representing BMI for environmental sustainability

Conceptual BM dimension	**CANVAS building block**	**Company's position**
Value Proposition	Value proposition	Reduce feed conversion ratio, increasing the profit margin for farmers by enhancing feeding efficiency
Value Delivery	Customer relationships	Emphasizing the money-value of the product they offer
	Channels	Online Physical distribution channels
	Customer segments	Small and medium fish farmers
Value Chain	Key partners	Government, distributors, investors, [big fish-feed manufacturers], (future) manufacturers
	Key activities	Software development, assembly of the hardware, sales & marketing On-farm: reducing feeding or increasing the production
	Key resources	Hardware-software package, skilled staff
Revenue Model	Cost structure	Components, staff, distribution
	Revenue stream	Sales of hardware + software/ Rental of hardware + software

Table 11 represents the decisions of <Case 3> on the business model. The blocks in green represent the components of the business model that contain decisions that are beneficial for the environment. Peculiar to this company is that they do not make use of environmental sustainable branding, because there is no resonation for that aspect within the customer base. However, they are concerned about the environment, as comes forward by the value proposition in which they encourage and enhance efficient usage of fish feed. For branding towards investors at the establishment of the company, environmental sustainability has been used as a way of branding, as these parties are more engaged in environmental sustainability. Their key partners are in this sense influenced by the environmental sustainability factor. The key activities of the company include the reduction of feeding, which benefits the environment as less feed production is stimulated.

5.2.4. <Case 4>

<Case 4> is founded in 2015 and launched a cash-back application to track offline consumer purchase data, in which retail customers can upload their daily/weekly paper data receipts. Aggregated data of a solid and loyal customer base is analyzed and sold to their customers, which are big brand-related companies. The incentive used for retail customers is that they get an amount of cash back, relative to the purchases they have done. From the paper receipts data there is a lot of information to obtain, that otherwise remains unknown or obsolete. The tracking of a smartphone enables the visualization of shopping behavior: where do they shop, do they multisource to different retailers, what is the content of their basket, and whether they are switching between different brands. Before the emergence of <Case 4>, conventional offline tracking consisted of manual door-to-door questionnaires and surveys as well as the physical visiting of stores to see what consumers buy. The involvement of technologies as smartphone and smart algorithms provides a more scalable data gathering. The company has gained significant traction over the past two years, and fastly moved to its "growth" phase. It began with seven employees in 2015 they now have around 65 employees FTE together with offices in three countries.

<Case 4> is aiming to provide brand-related businesses with real-time data, by tracking the purchase behavior of a scalable sample of offline shoppers. The focus is on the B2B market. On the front-end they develop a cash-back application, but monetizing is done by extracting the information from the retail consumers, analyzing the data they extract and then selling the data in different packages to brand-related businesses.

The company is innovative both on services as on the business model. The initial service the developed has been the cash-back application described above, but this has been extended over time with targeted surveys and questionnaires, expanding the value for the brand-related businesses, creating a platform for offline marketing research. Brand-related businesses make the questionnaires and surveys and can then target their consumer segment of interest. Moreover, new products for traditional Asian stores are developed, in which a store-owner can use an application to manage their inventory and register sales, this data surves the same purpose as the data extracted from end-consumers.

The managing team has origins in Indonesia, Syria and the Philippines. The firm was never intended to penetrate just one geographical area (e.g. Indonesia), as expansion to multiple markets has been part of their initial vision. Currently, the application is running in Indonesia and the Philippines and they own an office in Singapore for clientele relationships.

Environmental sustainability is not inherently embedded in the vision or mission of the company. However, they try, whether or not with economical motivations, to reduce waste and move to a predominantly electronic way of working. Several choices the management makes are arguably beneficial for the environment. As so, they do not require their employees to be in the office at pre-set times, or at the office at all. Employees are working on contract-based assignments; specific goals they have to achieve within a certain time period. The offices they have in use are energy efficient buildings, which already have the essential systems in place, in this way environmental sustainability *is not affected*. Nevertheless, they mention that it is necessary for them to comply with the wishes of their customers (the brand related corporations). If they require a paper printed contract, <Case 4> cannot enforce an electronic way of signing. This can be explained as a barrier towards further implementation or adoption of sustainable practices. Table 12 represents the choices that comprise the business model. Key activities is displayed in a light green color; as environmental sustainability has been mentioned in this field. However, it was not clear whether this decision was made with environmental sustainability in mind beforehand or whether it was taken as a nice bonus.

Table 12 Business model of <Case 4>

Conceptual BM dimension	CANVAS building block	Company's position
Value Proposition	Value proposition	Providing real-time data on offline shopping behavior
Value Delivery	Customer relationships	Close connection of service development with needs of the market. Keeping close and personal relations with their clients.
	Channels	To consumer: smart-phone application To clients: a platform where they can buy pre-analyzed packages of consumer data
	Customer segments	Big brand-related corporations
Value Chain	Key partners	Clients as well as application users
	Key activities	Tracking offline consumer data through smartphone application Building software that reads buyer's receipts
	Key resources	Consumer uploads of offline purchasing receipts
Revenue Model	Cost structure	Mainly fixed costs as software development costs and staff
	Revenue stream	Selling the data they obtain from consumer's through the application to brand-related clients, which can buy different packages depending on their needs.

5.3. Cross-case analysis, comparison on both axes

A comparison on the value dimension (x-axis) is made to see whether there are profound differences in the business model innovations regarding sustainability practices of start-ups in similar development phases. The direct comparison on the development phase (y-axis) is omitted, as it is more insightful to evaluate the start-ups in the disengagement phase in a later stage of their life, to see how far sustainability practices prolonged in their business model. Rather than comparing the progression among two unrelated companies.

However, it is observed on the y-axis that the business models of the cases on the growth phase are more developed and are adjusted to customers' demand. From <Case 3> came forward that sustainable branding towards the customer was not successful as there was no support from the customer base, whilst <Case 1> still has to experience whether their customer base is interested about the specific sustainable element of their brand. The comparison between <Case 2> and <Case 4> is peculiar as the business model of <Case 4> is more defined according to customers' demand, however, the fact that they do not intrinsically value environmental sustainability made that the development of the position of environmental sustainability within the business model was not affected. In fact, it is observed that <Case 2> embeds environmental sustainability into its business model to a greater extend regarding the use of resources, whilst <Case 4> puts environmental efforts mainly in its prolongation of electronic business.

For comparison on the x-axis: Comparison between start-ups with inherent environmental values: <Case 1> and <Case 3>. These two cases have been selected on the basis of their value dimension, both have regarded environmental sustainability from the initiation of their company. This comparison allows the search for similar patterns. As these start-ups are concerned with environmental sustainability since initiation, the business model is expected have an architectural approach for the inclusion of sustainability factors. In table 13 the results for both of the companies are depicted next to

each other and it is shown that their environmental approach affects the same number of different components. An architectural approach of business model innovation towards environmental sustainability, however, transcends an effect on components alone. An architectural business model innovation will affect the intra-relationships of the business model components and may give rise to radical new business models. Though, such a radical innovation to benefit the environment is not observed in both cases.

Comparison between start-ups with mainly economic, brand-related values: <Case 2> and <Case 4>: These two cases have been selected by the characteristic that environmental sustainability is not inherently embedded in the company's values. However, they might use it as an add-on or as a form of branding to reach their economic objectives. When the business model comparison table 13 is observed, it shows that, as expected, less components of the business model are affected than in the sustainability values dimension. <Case 2> has mentioned LCA for the development of its hardware. The company <Case 4> has mentioned strategic office location and employee behavior as sustainability practices, minimally affecting key activities of the firm.

Table 13 Comparison business model of <Case 1> and <Case 3>, with green blocks representing BMI for environmental sustainability

Conceptual BM dimension	CANVAS building block	<Case 1>	<Case 3>
Value Proposition	Value proposition	Simplifying farming by introducing irrigation technology in the Indonesian agricultural sector, thereby benefiting the environment to stimulate healthy crop growth.	Reduce feed conversion ratio, increasing the profit margin for farmers
Value Delivery	Customer relationships	Giving the regular maintaining of the irrigation throughout the whole year. Giving free training for the use of product, emphasizing the environmental sustainable component of the technology.	Emphasizing the money-value of the product they offer
	Channels	Endorsement by example farm (assisted by government) Presence on conventions CSR funded diffusion	Website Physical distribution channels
	Customer segments	Greenhouse farmers (particularly on West-Java)	Small and medium farmers
Value Chain	Key partners	Government research body on agriculture Example Farm as endorsement CSR corporation	Government, distributors, investors, [big fish-feed manufacturers], (future) manufacturers
	Key activities	Providing the smart-technology, which manages the irrigation for the crops as well as the electricity management. Enhancing the crops for maximum harvest possibilities. Educating farmers on the possibilities of technology and the crop characteristics.	Software development, assembly of the hardware, sales & marketing On-farm: reducing feeding or increasing the production
	Key resources	Skilled staff, in-house knowledge Hardware & software design	Hardware-software package, skilled staff
Revenue Model	Cost structure	N/A (Mainly fixed costs, minimal presence of tangible assets as still tenant of incubator)	Components, Staff & Distribution Costs
	Revenue stream	Selling or renting out the irrigation hardware/ software package Public funding, obtained from LPiK partaking	Sales of hardware + software/ Rental of hardware + software

Table 13 continued, Comparison of business model <Case 2> and <Case 4>, with green blocks representing BMI for environmental sustainability

Conceptual BM dimension	CANVAS building block	<Case 2>	<Case 4>
Value Proposition	Value proposition	Enhancing Indonesian internet penetration. Providing the low cost internet coverage system and fast deploying time.	Providing real-time data on offline shopping behavior
Value Delivery	Customer relationships	Close collaboration, as the customers are at the same time key-partners. There is a high degree co-creation of the service with the customers.	Close connection of service development with needs of the market. Keeping close and personal relations with their clients.
	Channels	Direct offering to potential business partners.	To consumer: application <Case 4>. To clients: a platform where they can buy pre-analyzed packages of consumer data
	Customer segments	Internet providers (B2B), Government (enhance internet in rural area or high dense areas)	Big brand-related corporations
Value Chain	Key partners	Indonesian internet association Suppliers of materials and technology	Clients as well as application users
	Key activities	Selling the service Developing the product (assembly)	Tracking offline consumer data through smartphone application Building software that reads buyer's receipts
	Key resources	Skilled staff with knowledge on the technology (intangible assets), Patents, Components	Consumer uploads of offline purchasing receipts
Revenue Model	Cost structure	Procurement, Patents, Marketing, Consultation	Mainly fixed costs as software development costs and staff
	Revenue stream	Leasing the Helion product for internet providers	Selling analyzed data packages to brand-related clients

5.3.1. Analyzing the aggregated data

In this section the focus is decoupled from the single case and zooms out to the aggregated data. First, all identified environmental practices are discussed in their context and linked to the business model components that are affected. Second, the barriers mentioned by the cases are briefly discussed. This chapter will conclude with an intermezzo on the four cases.

The coding has exposed practices with beneficial effect on environmental sustainability. The concrete actions performed by the start-ups are several forms of eco-efficiency: waste reduction, life cycle analysis, usage of renewable energies and strategic office location. Additionally, encouraging sustainable employee behavior and using the environmental characteristics as a way of sustainable branding are observed. The words spent on each topic are depicted in table 14. The reason that amount of words on eco-efficiency and/or total words addressed on environmental sustainability may exceed the sum of the parts emerges because topics about possibilities and challenges were addressed. Noteworthy, it is not implicated that word count represents the relative effort on the topics addressed, rather that the matter has been given thought.

Table 14 Words spoken by each company about environmental friendly practices

	<Case 1>	**<Case 2>**	**<Case 3>**	**<Case 4>**
Eco-efficiency	25	53	57	136
External waste reduction	*15*	*0*	*57*	*0*
Internal waste reduction	*0*	*0*	*0*	*83*
Life Cycle Analysis (LCA)	*0*	*40*	*0*	*0*
Strategic office location	*0*	*0*	*0*	*23*
Renewable energy	*0*	*13*	*0*	*0*
Employee behavior	0	0	0	16
Sustainable branding	39	0	108	0
Total words on environmental sustainability	230	53	258	152

What can be observed from table 14 is that all start-ups incorporate or at least consider environmental practices to a certain degree. For the cases that include environmental sustainability from the beginning, more time has been spend on the discussion on environmental sustainability. It is interesting that all cases do this through eco-efficiency. Curiosity was directed to the differences between the companies on the value dimension. It is observed that the two companies <Case 1> and <Case 3> are delivering sustainability with their product and do this by minimizing external waste. <Case 4> is mainly considered about going electronic and reducing internal waste and choosing a strategic office location. <Case 2> has implemented life cycle analysis for the procurement of their technology, which is a form of waste reduction that affects product endurance. Therefore, transcending internal waste reduction to become a combination of internal and external waste reduction. Sustainable branding is only discussed by the two cases that incorporate external waste reduction. How the different sustainable practices relate with each other is depicted in figure 8.

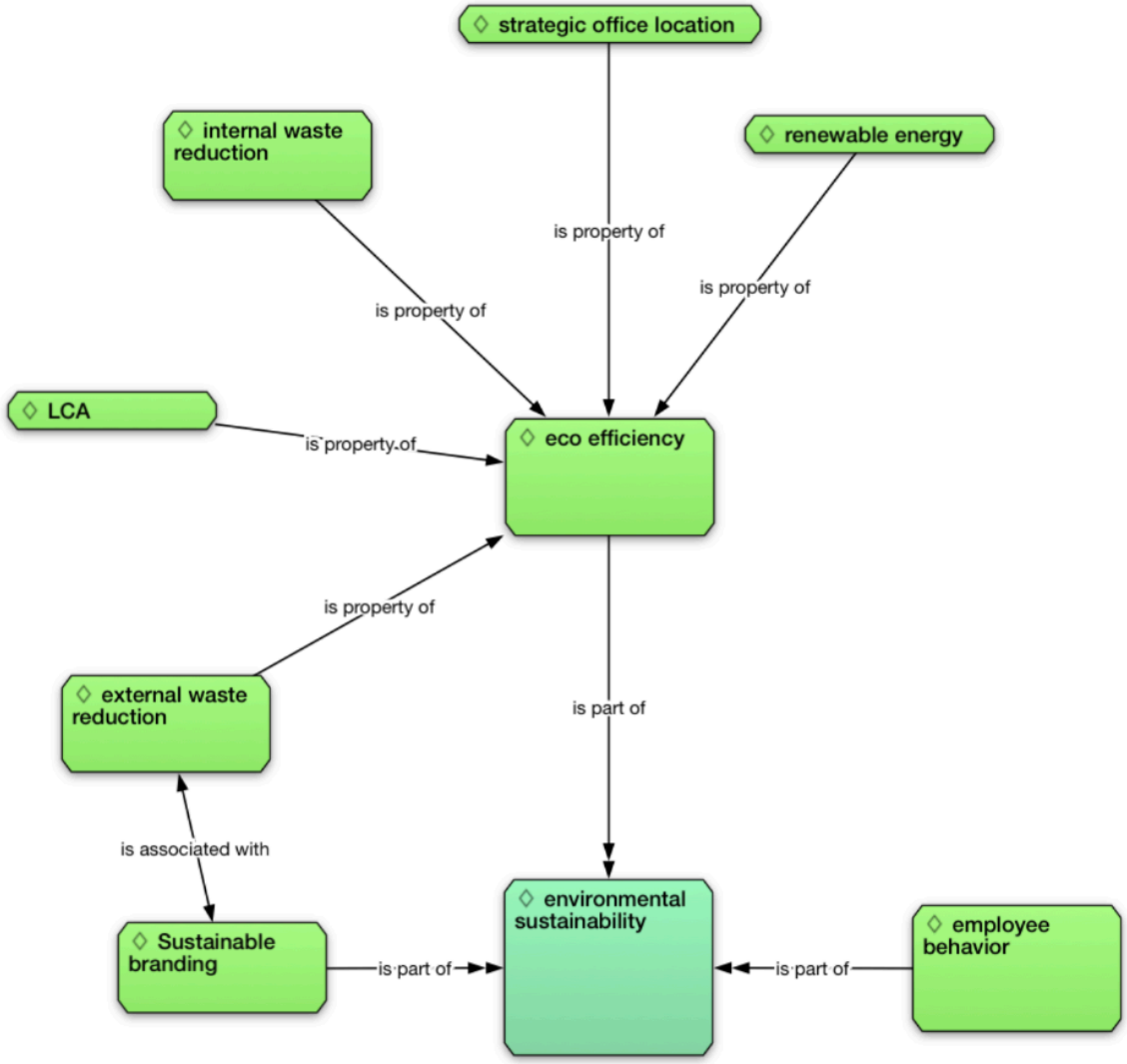

Figure 8 Relationships between identified sustainable practices and their relationships (LCA: Life Cycle Analysis)

Five forms of eco efficiency are mentioned by the cases, i.e.: life cycle analysis, internal waste reduction, choosing a strategic office location, the usage of renewable energy for equipment and external waste reduction. These practices are therefore property of eco efficiency. As sustainable branding is only performed by cases that conduct external waste reduction, an association is drawn in the figure. Additionally, encouraging employees to engage in behavior that is beneficial for the environment is depicted under employee behavior. Eco-efficiency, sustainable branding and employee behavior are all three part of environmental sustainability practices.

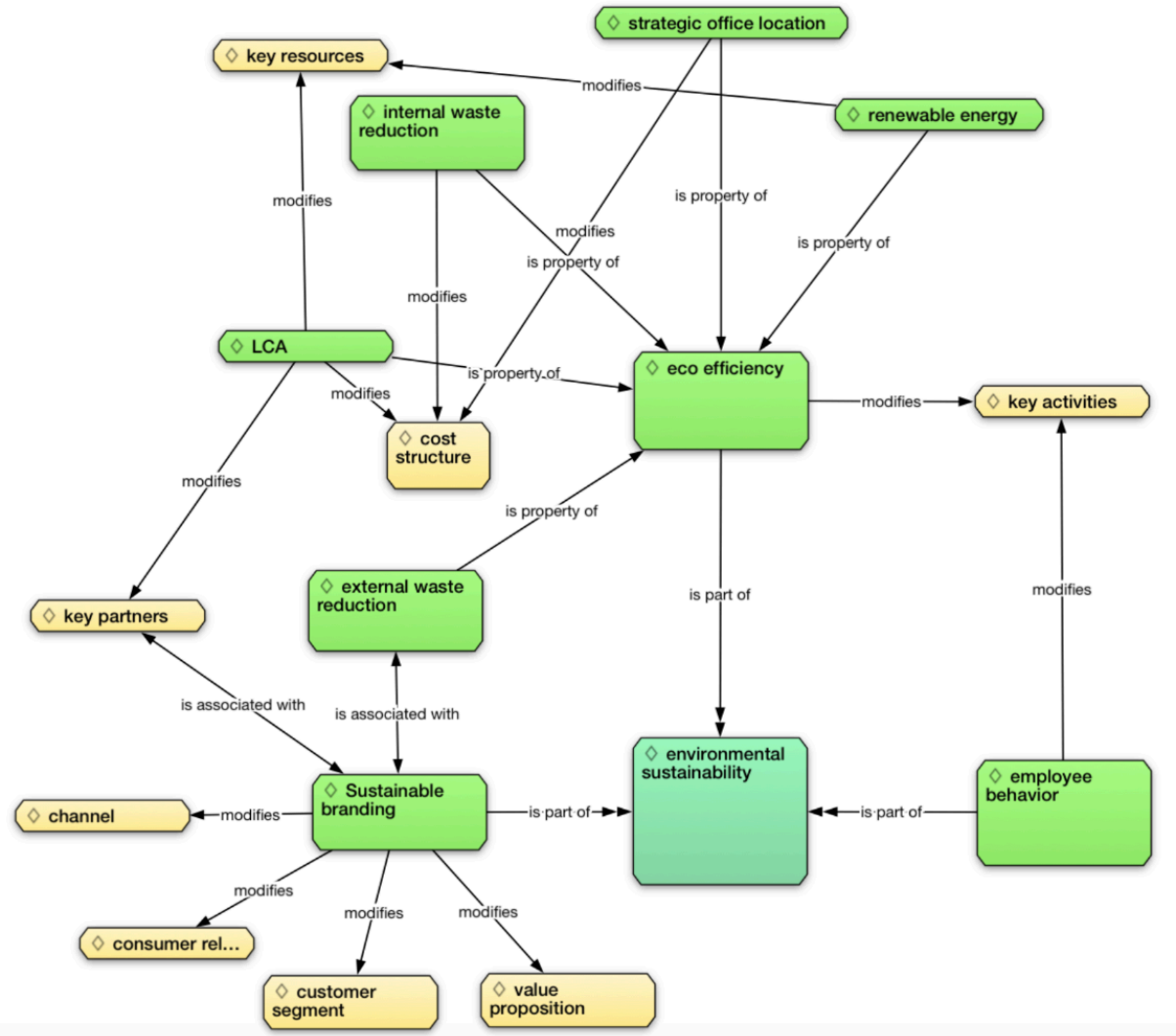

Figure 9 Identified sustainable practices linked with business model components over four cases (LCA: Life Cycle Analysis)

In figure 9 it is depicted how the identified sustainable practices of the start-ups relate to different building blocks of the business model. The identified practices all relate to environmental sustainability, as those are aiming to improve environmental impact. All identified sustainable practices can be linked to one or several components of the business model, which connections are discussed next.
Stimulating ecological conscious *employee behavior* was discussed with <Case 4>, who do not require their employees to come to the office during pre-set times, adjusting the key activities of the firm.

> *"We do not require our employees to be in the office on a 9 – 5 basis. They work on an assignment basis in which they have to complete certain parts of work within a pre-set period of time."*

All forms of *eco-efficiency* alternate the key-activities of the firm. *Internal and external waste reduction* will alter the usage of resources of the company or its supply chain. *Life cycle analysis* modifies the assembly of the product. *The office location* modifies, among others, how employees will get to the office and what resources are used, whether new land is used for the building. When a start-up decides to make use of *renewable energies*, it will modify the key activities as well as the key resources.

Internal waste refers to physical production and office waste. Reduction hereof is associated with economic motivation and can be regarded as a form of eco efficiency, that will alternate the cost structure of the firm.

> *CEO <Case 4>: "As we want everything to be electronic, we try to reduce as much waste as possible. When we sign documents, [we ask ourselves] can we change it into an electronic way of doing this."*

Internal waste reduction refers to the effect the business has on the waste of the whole supply chain. In the cases of Biops and <Case 3>, this means that they are significantly reducing the resource utilization of their direct customers. This is tightly interconnected with their service, modifying the value proposition. Additionally, this may open the opportunity for *sustainable branding*.
Sustainable branding encompasses the activity of the start-up using their environmental friendly characteristics to attract more customers or investors. When it is used to attract customers, as is intended by <Case 1>, it modifies the value proposition, customer segment and customer relationships. <Case 3>, however, mentions their customer segment as a barrier towards sustainable branding. Their customer segment consists of conservative thinkers who are dominantly, if not only, concerned about money value.

> *CEO <Case 3>: "It should be noted that we deal with a very conservative market, when we think of a low value product. Farmers only understand the value of a product in "money-language", how much money can they save or make."*

Nevertheless, environmental friendly characteristics are used as mean to attract more investors. Investors care about preservation of the environment and may share the vision of the company that aims to enhance the healthy conservation of the waters for the fish, as well as the reduction of feed production. This shared vision is important for investors to comply with a company and when the company is selecting their key partners, it is called upon as an essential characteristic.
Another form of eco-efficiency is *life cycle analysis (LCA)*, practiced by the start-up <Case 2>. This, however, affects the value chain of the business model as key partners and resources should be modified to prolong the life cycle of the technology, or, when assembled in-house it will modify the key activities of the company.

It should be noted that environmental sustainability is preferably embedded within the vision of the company (e.g. <Case 3>, Biops), to transcend the mere add-on variants of sustainable behavior. This vision on its turn is associated with the value proposition and likely to affect other business model components or affect components of the business model in the future. See figure 10 for all elements included.

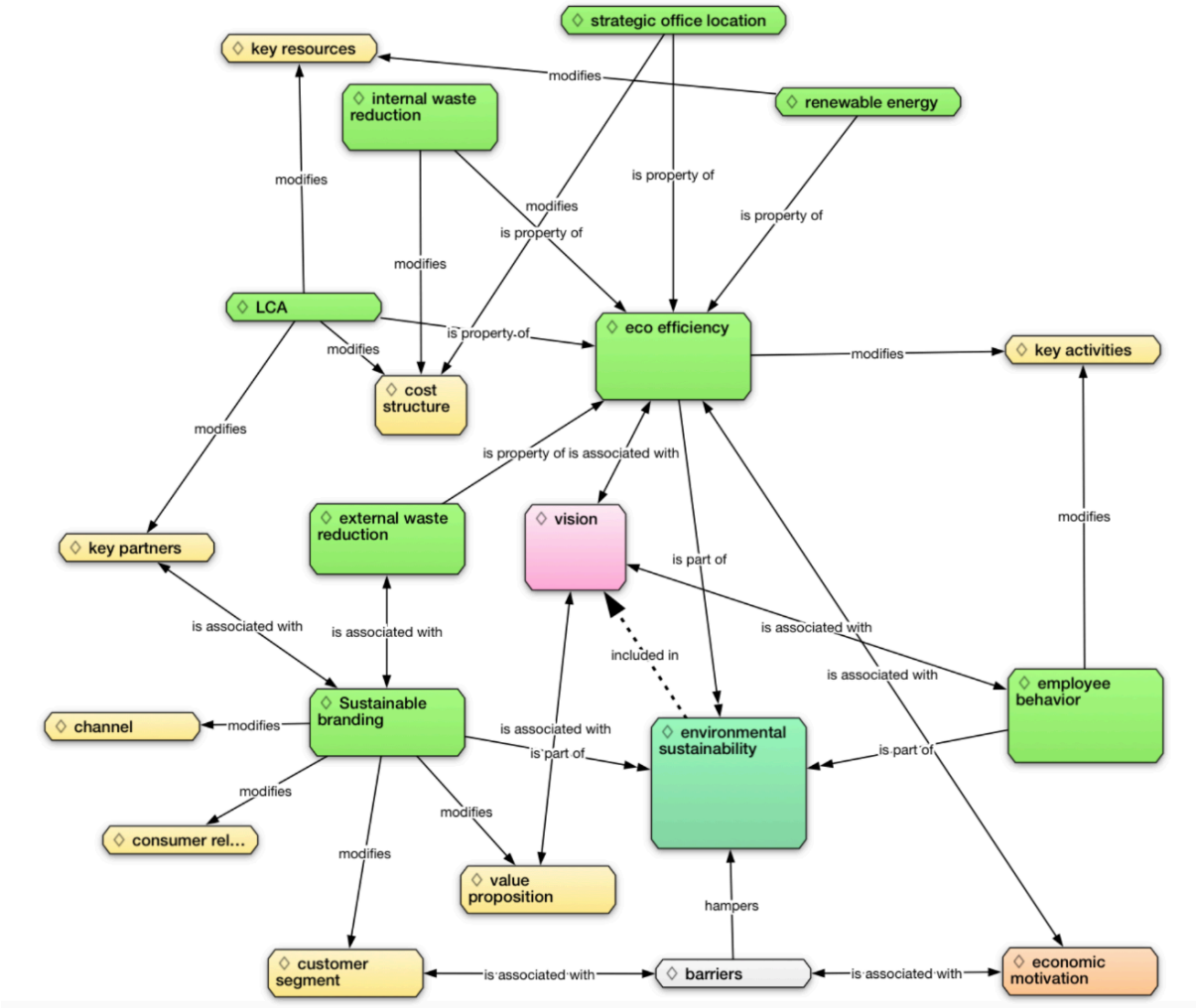

Figure 10 Relationships between sustainable practices, business model components and opportunities and challenges (LCA: Life Cycle Analysis)

The added components in figure 10 are vision, economic motivation and barriers. Eco-efficiency has been mentioned to be driven by economic motivation as well as by environmental sustainable values, the cost-effectiveness that comes with eco-efficiency means that economic motivations are triggered. Nevertheless, this economic motivation is also associated with barriers, as the cheaper choice does not inherently encompass the environmental sustainable choice. Moreover, the customer segment has been mentioned as a barrier for achieving environmental sustainability, as the demand of customers for environmental sustainable practices are low. Customers seem mainly considered about the economic value of products. From interviews came forward that when environmental sustainability is included in the vision of the company, it is associated with the value proposition of the company as well as with the eco efficiency and employee behavior.

How is environmental sustainability perceived in Indonesia and what are specific challenges for start-ups within this (developing) economy?

For the practical analysis of the third sub-question, the same general coding steps are taken as described in the methodology in chapter four.

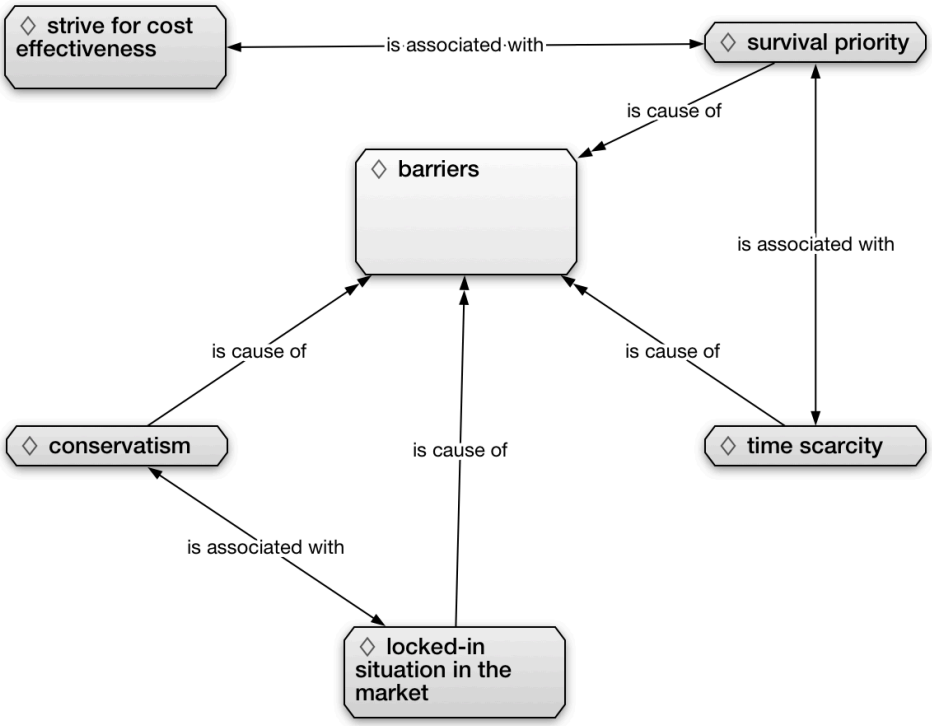

Figure 11 Barriers identified by start-ups

To answer the third sub-question of this research, which serves an explanatory purpose, the barriers and challenges that the startups experienced for implementing sustainable practices were discussed within the first interviews. The topics that came out of this have been depicted in figure 11. Five barriers came forward from the case study: survival priority, time scarcity, conservatism and a locked-in situation of the market. Those are causes of barriers. Survival priority is associated with time scarcity as economic matters take the forehand while time is limited. Conservatism of the market is a cause of the locked-in situation of the market mentioned by <Case 3> and the strive for cost-effectiveness is associated with survival priority, but not a direct cause of a barrier as it may be an enhancer in the eco-efficiency strategy in which the company may engage.

A locked in situation of the market was addressed by three of the start-ups. For the two cases within the agri-/aquaculture sector, they mention that they have to deal with a very conservative market. There is low education for farmers in Indonesia and mostly they only care about value of money. <Case 4> mentioned the habits and requirements of their clients (big offices) as practices they should comply with. For the two companies in the disengagement phase there was more emphasis on the time scarcity they had to deal with and the survival property. In order to survive, the business has to become profitable.

5.3.2. Intermezzo on the four cases

The analyzed sustainable practices within the four selected start-ups are: life cycle analysis (e.g. <Case 2>), sustainable branding (e.g. <Case 1> and <Case 3>), improving eco-efficiency (e.g. all cases) and stimulating ecological employee behavior (e.g. <Case 4>). All of these identified sustainable practices can be linked with the business model. However, it may comprehend modular updates or artifacts that complement the economic business model, or the activities may transcend the components and affect the relationships within the business model (e.g. architectural updates). Therefore, the position of environmental sustainability within the business model will be assessed in this intermezzo.

It is observed that the companies which are selected to inherently embed environmental sustainability into their product or service, include environmental sustainability in their vision. For <Case 1>, who is still in the development phase of its business, this sustainability aspect comes back in their value proposition as well as they use it as a way of branding towards their customers and investors. However, they (still) neglect it in their value chain. For the company that is a little more mature and has commercialized its product, <Case 3>, it is observed that they take the sustainability issues into account for their growth plan. That is, in selecting (future) partners to assemble their product, also affecting the value chain with environmentally friendly practices. Moreover, it is in sustainable branding is used by both companies but in different business areas. <Case 1> uses it to target their customers and adjust their customer relationships accordingly. <Case 3> mentions no sensitivity of their customer segment for sustainable branding and consequently omits it to their customer segment. Nevertheless, they have used it as a way to find potential investors, to gain traction for their business, affecting their key partners and value proposition in this sense.

It is arguable whether these business model innovations are architectural in nature as a change in one component does not necessarily reflect changes in the other component. However, sustainable practices are performed by taking a stakeholder perspective, altering multiple business model components and affecting future decisions. The important question to pose is whether the position of environmental sustainability is within the architecture of the business model or whether it is on the outside of the business model, used as an add-on to complement the economic motivations. <Case 1> values the environment dearly, as came forward from the interviews, and prolongs this in their decisions of the business model. It can be stated that, at least for now, environmental sustainability is at the core of their business and taking an architectural position. Also <Case 3> values the environment dearly, however, it has encountered several hurdles and a lack of direct customers' support regarding the environmental sustainability issue. Economic incentives may come first, but the impact on the environment appears to be minimized by the business decisions. As so, also for <Case 3> environmental sustainability is positioned within the architecture of the business, affecting all business model decisions. When also assessing the novelty of the business model innovation (Foss & Saebi 2017), it is nonetheless debatable whether these business model innovations are to be classified adaptive or complex business model innovations. Whereas their technical innovations are the first of their kind within the Indonesian market, they can be considered pioneers in that sense. However, the business model itself remains a fairly simple combination of existing business models like direct sales, productization of services and the subscription model. Ample improvement may occur to other, non- adjusted, components of the business model and also to generate creative ways of bringing the product to the market.

It was expected that companies on the economic, brand related values dimension would demonstrate sustainable branding to enhance their image and improve their revenues, this has not been observed. Rather, this sustainability practice is being implemented or rejected by the companies on the sustainability value dimension. As described above, this strategy did not create the expected revenues so far and has thus been rejected by <Case 3>. The rejection of sustainable branding does not worsen the environmental impact of the company, and is thus not a necessary component of a BMfS.

Scrutinizing the dimension that does not inherently regard environmental sustainable practices, there are still ways they show ecological beneficial characteristics. <Case 2> is performing LCA to enhance the life-time of its hardware and accommodates the hardware with solar panels for power supply. <Case 4> has mentioned particular employee related activities that benefit the environment in that employees do not have to be in the office to work for them, however the real benefit for the environment is ambiguous as the office is always open for them to work. Additionally, it was emphasized that they aim to reduce office waste as much as possible by becoming a dominantly electronic enterprise. However, these practices are emerging from dominant economic intentions. Important to notice is that these two

companies do not take the natural environment into account for future growth. These identified practices are more viewed as an add-on to the daily behaviors of the firm and notably called to have a subordinate importance (e.g. <case 2>).

5.4. Conclusion

This chapter has provided an overview of the case studies performed on the business models of four companies selected on basis of their values and development phase. These cases are separately analyzed, with special attention on the sustainability practices they perform. Seven distinct sustainable practices have been identified and linked to the business model components to visualize where impact has been observed. Start-ups with environmental sustainable values embedded in their service have shown to include the environment in the architecture of the business model, affecting the interdependencies of the subsystems. Start-ups on the economic, brand related dimension have shown modular updates regarding the implementation of sustainability practices.

All sustainability practices have been linked to business model components, clarifying current sustainable practices taken into account by technology start-ups in Indonesia. Thereby accomplishing the first objective of the practical part of this study. Moreover, barriers and experiences by the young companies have been discussed to evaluate theoretical findings of chapter three and accomplishing the second objective of the practical part of this study.

Upon this point, the steps four and five of this study have been completed and data for the answering of the sub questions has been presented. The next chapter will provide the answer to each sub question and will elaborate further on the findings to place them in context of the previous findings in literature.

Chapter 6. Findings and discussion

6.1. Introduction

Despite the fact that to implement sustainability the importance of business models is recognized, the connection with start-ups is insufficiently explored. This study complements existing literature by addressing this issue for start-up companies in emerging economies, by taking Indonesia as an example for developing economies of the South East Asian region. This study contributes to this field by connecting the literature on three academic fields and has explored ways that sustainability practices are currently taken into account by start-ups in Indonesia, so as to assess the role environmental sustainability can take-up in the relative new field of business model innovation and also to provide examples for start-up companies to adopt.

This research has started with an extensive literature review in order to identify ways technological start-ups can take sustainability practices into account, for young companies situated in Indonesia. This was followed by an empirical study, examining technology start-ups in different development phases and on a different value dimension, to enhance the generalizability of the findings. The main research question to be answered is:

How do technological start-up businesses in Indonesia apply business model innovation in order to regard environmental sustainability, and what are the challenges they encounter?

The main research question has been divided into four sub questions, which are answered separately in the next section. Next, a discussion on the findings is presented. Followed by the practical implications and limitations of this study, a concluding section will discuss introductions for future research.

6.2. Findings

SQ1. What is the current state of sustainability within the business model regarding business models that serve innovation and technology management?

The first sub question has been formulated with the goal to present the current knowledge on business model innovation regarding innovation and technology management and deemed necessary to provide the knowledge required to answer the main question. The business model has been linked with emergence and success of technology companies, essential to unlock the value potential of the technology. Foss & Saebi (2017) have developed a business model innovation technology in which they differentiate a business model innovation based on novelty: 1) New to firm; 2) new to industry, and scope: 1) modular; 2) architectural. This typology allowed for predictions based on the value dimension of the case selection. Previous literature has shown potential for technology firms to come up with radical new business models, shaping the business environment in which they operate. If a technology start-up has environmental sustainability in their core value, the scope of their business model innovations regarding environmental sustainability is more likely to be architectural, affecting the connections between business model components. Contrary, start-ups that use environmental sustainability as a mean to support their economic, brand-related values will more likely to stick with modular updates regarding their business model.

Moreover, literature addressing business models for sustainability have been evaluated and different factors that a BMfS should contain have been extracted. A true BMfS is considered to embed environmental sustainable practices central to its architecture. A stakeholder view is emphasized as it encompasses a system-wide and firm-level perspective on sustainable practices. Moreover, a sustainable value proposition is regarded essential to communicate and materialize ecological intentions. Without these prerequisites, sustainability practices embedded in the business model are

considered a modular BMI, resulting in reactive sustainability practices rather than proactively solution oriented innovative sustainable practices.

SQ2. How can creative business model design support technology start-ups in taking sustainability practices into account in their business model?

The second sub question has built on the results of the first sub question. This question is posed to reveal what is currently known about environmental sustainability and the business model of start-ups in literature. Combining the results of the literature resulting from the first sub question with literature directed to sustainability considering start-ups characteristics has led to several ways for start-ups to implement sustainability practices in their business models.

Two approaches are evaluated: 1) sustainable value creators, which describe practices with a direct positive impact on the environment. Eco-efficiency, by-product exchange and collaboration on sustainable initiatives are examples. 2) sustainable revenue creators focus on the way that environmental friendly practices can enhance the revenues for start-ups. Cost-saving opportunities, sustainable brand awareness, and new potential revenue streams are proposed. However, by employing one of the proposed practices the start-up is not likely to make a major impact. It is most likely that a combination of the two approaches will lead to the best results for both environment and company, contemplating with positioning environmental sustainability within the architecture of the business model rather than using modular business model innovations to reach a beneficial impact on the environment.

SQ3. How is environmental sustainability perceived in Indonesia and what are specific challenges for start-ups within this (developing) economy?

The goal of the third sub question was to provide context for the selected cases. The answer to this question comes from different parts of the literature study as well as the practical study. The first contextual factors are described in *section 2.2.3* "drivers and barriers towards implementing sustainable business models". Previous identified drivers for both modular and architectural business model innovations have been described. Modular innovations are mainly driven by economic incentives, whilst architectural innovations are more likely to arise from the values, beliefs and norms within the business ecosystem (e.g. entrepreneur and/ or customer segment).

The abundance of literature on BMfS comes from western academics and have been studied in western countries. Sustainable initiatives in emerging economies have to deal with a very different environment, as economic growth and welfare are yet to be developed in many ways. Several influencing factors have been identified to influence the adoption of sustainable practices in Indonesia. Environmental awareness is on a low level among a big part of society, especially those without education. Education seems to play a big role in raising environmental awareness, but only a minority of students will eventually receive environmental education. Moreover, Indonesia specifically had to deal with major corruption in recent history prolonging to the present, which affects the trust of society in regulatory forces.

Several of these barriers have been experienced by the cases. A conservative market, locked-in situations of the market, survival priority and time scarcity are mentioned as inhibitors for the realization or further implementation of sustainable practices.

SQ4. What sustainability practices are currently taken into account in the business model of technology start-ups in Indonesia?

The fourth and last sub question of this thesis serves the identification of current sustainable practices taken into account by technological start-ups. This may serve as an initial step towards the encouragement and further research towards sustainable practices by new firm entrepreneurs. Seven sustainable practices have been identified to be performed by the cases affecting most of the business model components.

The cases with environmental sustainable values embedded in the core of the business logic drive certain business decisions from this value. Many business model components are affected for <case 1> and <case 3>. Both <case 1> and <case 3> reduce resource utilization of their customers with their service. <Case 1> uses this for sustainable branding towards the customers and <Case 3> uses this for sustainable branding towards potential investors. Moreover, from their decisions and development it is shown that then environment is seen as a stakeholder. Both companies show to take sustainability practices into their account in their business model and for their business model innovations, indicating an architectural approach. Innovations in the business models observed are solely new to the firm and can thus be classified as adaptive BMI regarding sustainability practices.
The cases with brand, economic related values also take sustainability practices into account for their business decisions, but have only implemented sustainable practices in business model components of the value chain. <Case 2> deploys LCA for the production of its hardware and uses solar panels to accommodate it with energy. This is not seen in their industry field so far, classifying their BMI for sustainability practices. <Case 4> striving for minimal waste production from its operations and has chosen a strategic office for its activities. However, these sustainable practices are considered isolated actions, in a modular approach to sustainable business model innovation, either consisting evolutionary BMI regarding sustainability practices (e.g. <Case 4>) or focused BMI regarding sustainability practices (e.g. <Case 2>.
Besides different barriers towards the implementation of sustainable practices, no major differences are observed between the cases in different development phases.

How do technological start-up businesses in Indonesia apply business model innovation in order to regard environmental sustainability, and what are the challenges they encounter?

The four sub questions have been posed to support an in depth answer for the main research question. The first question helped clarifying the concepts of business model innovations and business models for sustainability, providing understanding on the unit of analysis, giving directions towards different perspectives on the implementation of sustainability practices (e.g. modular or architectural) and identifying sustainable practices in literature. These findings were combined with specific start-up characteristics to propose sustainable practices to be adopted. Previous literature has mainly been performed in developed economies and will have fairly different environments than those start-ups in emerging countries. The third sub question has provided the contextual factors that either drive or inhibit the adoption of sustainability practices into the business models of start-ups in Indonesia. Finally, the fourth question has addressed current attitudes towards the environment by technology start-ups in Indonesia. Four case studies demonstrate how sustainability practices of Indonesian start-ups in different development phases are taken into account in the business model.
All four companies have mentioned sustainability practices they perform in order to run their business. From literature, four types of sustainability practices were proposed of which two have been observed in the cases (among which eco-efficiency, which counts for multiple distinctive practices). Moreover, the difference between modular business model innovations and architectural business model innovations for sustainability practices have been observed in practice. The two cases with sustainability values from the emergence of the company have shown to take a stakeholder view of the firm and take sustainability practices into account with the growth of their company. Resulting in positive effects on the environment as well as positively influencing the behavior of the business environment (e.g. key partners and customer segment). The two companies with brand, economic related values have also demonstrated incorporation of sustainability practices. However, the decisions

come from an economic incentive and do not affect the other business model components, therefore remaining modular add-ons to the business model.

6.3. Discussion

The findings of this study are based upon in depth qualitative research, using both primary and secondary data. Triangulation of the data was the aim from the start, but proved difficult as little information on the start-ups exist, next to their own website and interviews with popular press. Therefore, internal validity might be low and any causal implications should be taken with cautiousness. External validity, however, is improved by studying objects in their natural environment. This improves ecological validity. Cautiousness, nevertheless, is sought in generalizing any causal relationships implied the study. Since this study was set up to explore the current sustainability practices of technological start-ups in Indonesia, explaining causal relationships was never within the scope of this paper. An overview of the findings per research questions has been given in the previous section, this section will discuss the findings with respect to literature described in chapter two and three.

The identified sustainability practices can be regarded as business model innovations as an outcome. Business model innovation may be characterized by novelty and scope of the innovations, according to the typology developed by Foss & Saebi (2017). This thesis has used this typology to assess the position of environmental sustainability within the business model of start-ups in Indonesia. It can position itself within the architecture of the business model, affecting all decisions and further modifications of the business model, or it may take position outside the architecture of the business model, allowing modular BMI regarding environmental sustainability. Together with the conceptualization of Stubbs & Cocklin (2008) who advocate a stakeholder view and value driven approach to business models for sustainability, the anticipation has arisen that start-ups on expressing inherent sustainability values are likely to benefit from architectural business model innovations regarding sustainability practices. Start-ups expressing mainly economic and brand related values are anticipated to demonstrate modular business model innovations regarding sustainability practices.

It was expected that the cases with sustainability values would demonstrate a more radical BMI taking sustainability practices into account. This is observed, both <case 1> and <case 3> are deliberately concerning the environment as a stakeholder of their company. Without a healthy environment, their business will deteriorate. The business models that are scrutinized for this study did not reveal an adaptive BMI regarding sustainability practices and <Case 1> could even be argued to be a modular approach. It is, nevertheless, classified as an architectural approach due to the chances that emerge for them following their environmental friendly service. The collaboration with a local CSR company is offering their product to low-income farmers, a collaboration due to the environmental value of the start-up. An adaptive BMI means that the innovation is not only architectural of nature, it should also be new to the industry. <Case 1> and <Case 3> are demonstrating to take environmental sustainability into account for multiple business model subsystems, for both cases, the environmental sustainability value is embedded and achieved through the service they deliver. Nevertheless, the orientation of the start-ups towards ecology may still be characterized as eco-open rather than eco-dedicated (Schick 2002), advances towards environmental sustainability and BMI may be achieved by transforming the ecological orientation of the start-ups, possibly resulting in more innovative business models. The need to efficiently utilize environmental resources has led to innovative technologies, leveraging market potential. The business model in the case of <Case 1> and <Case 3> is complementary to the product. Boons & Lüdeke-Freund (2013) have described business models as market devices supporting innovative technologies, but linking dimensions of the business model to be aligned with the sustainable development mindset. Likewise, a start-up in Indonesia that was without the reach of this study has been noticed to promote adaptive BMI regarding sustainability practices. This start-up operating in the

agricultural sector, connects farmers with investors through a smartphone based platform. This platform allows investors to buy seeds, which will be planted and nurtured by the farmers, after which the farmers, investors and start-up share the profit. Introducing ways of conducting business that have not been present before in the country.

The two cases that have been examined on the "brand, economic- related values" dimension were expected to demonstrate modular BMI with regard to environmental sustainability. In the reach of their BMI for environmental sustainability it can be confirmed that this is the case. The innovations of their business model in this sense do not emerge from the intrinsic value to practice environmental sustainable, nor does it affect their business when they are not. The ecological orientation according to Schick (2002) of those cases are located somewhere on the spectrum between eco-open and eco-reluctant, with <Case 2> located slightly more to eco-open and <Case 4> located slightly more towards eco-reluctant.

The cases have been selected with respect to two dimensions, the value dimension and the development dimension. Comparing the companies on the development dimension has not revealed any major difference in approach to BMI. It might be expected that the start-ups who have their products commercialized and are yet in the growth phase have a better view of the market and are prone to have adjusted their business model in response to market demand. It is, however, interesting what was observed. What comes forward from the case of <Case 3> is quite interesting: their market does not seem to require sustainable practices regarding the environment, whilst it would be expected to be especially relevant for the agriculture industry. However, one should realize that farmers in Indonesia are working in fairly traditional fashion, are generally not familiar with technology and care dominantly about increasing profit for their low-value products. Neither did any of the other cases mention an increased customer demand for sustainability practices by the company. This passive attitude regarding the environment is likely to be a result from the low perceived environmental awareness in Indonesia. <Case 1> is serving a similar customer segment as <Case 3>. <Case 1> performs sustainable branding in order to reach its customers, it could be the case of course, that longer presence on the market will encourage the firm to withdraw from sustainable branding for its customer segment.

Additional to the main objective of exploring the ways start-ups incorporate sustainability practices in their business model, several barriers have been identified. Next to time scarcity and survival priority inhibiting attention for sustainability practices, conservatism in the market has been mentioned as a barrier towards sustainable branding for environmental friendly innovations. The investors that are attracted to the platform of the additional start-up described above are mainly international urban investors, like the investors of <case 3>. It may be argued that this is a result of the low awareness and concern about environmental issues within Indonesia. Moreover, the conservative market in the agri- and aquaculture also demonstrates a long way for Indonesia to persuade environmental awareness in all layers of society.

6.4. Practical implications

This study has been executed in order to provide guidelines for other firms in similar situations and to enhance the adoption of sustainable business models of start-ups. Various examples from previous published literature have been presented and additional sustainable practices have been developed that suit the specific characteristics of technology start-ups. Founders of technology start-ups should consider their motivation to become an environmental friendly enterprise and may be inspired to adopt some of the mentioned practices as came forward in the third literature review of chapter 2. In *section 2.2.2* and *figure 4* the business model archetypes of Bocken et al. (2014) are presented that provide guidelines for enterprises to adopt sustainable business models. These guidelines are evaluated and extended for start-up companies in *section 2.3* and *figure 7*, which proposes environmental sustainable

practices to be employed by start-up companies. Moreover, start-up founders in developing economies like Indonesia may take notice of the practices that are currently performed by the cases presented in this study, which are extensively presented in *Chapter 5*. Also they may reflect on their ecological orientation as described by Schick (2002), in order to advance their progression towards sustainable practices.

An important stance that comes forward from this research is that the position of environmental sustainability within the business model is essential to transform the business into an environmental friendly enterprise. Many ways of including environmental sustainability in the business model are possible, modular updates to the business model do not require a one hundred eighty degree turn around of the business logic and are still beneficial for the environment. Nevertheless, allowing environmental sustainability to take place in the architecture of the business model will affect all facets of the business. Founders of start-ups should be encouraged to be creative on their business model designs in order to monetize the environmental sustainable attitude.

From a nation-wide perspective there is a lot to gain on the perception of environmental sustainability as well as on the regulatory framework to support sustainable developments in the country. Regulatory frameworks to enhance the adoption of sustainable practices will stimulate or even enforce enterprises to take action. It was beyond the scope of this thesis to give an in-depth analysis into this area, but it nevertheless has drawn the attention.

6.5. Limitations

As described in the methodology in *chapter 4*, the research has been conducted in five steps. The first step involved a literature research on business models, business model innovation, business models for sustainability and start-up related sustainability practices. The extensive body of literature has served as a means for proposing sustainability practices to be adopted by technology start-ups and provided insights regarding the characterization of business model innovations concerning sustainability practices in the business model. However, due to bounded rationality it might be the case that relevant literature has been missed.

The second step involved the analysis of the context of the cases. As the cases were selected in Indonesia, it was important to sketch the structural, cultural and political environment. However, this analysis has solely been conducted by desk research and data sources were fairly limited. Moreover, it has given only a brief outline of several factors perceived important by the researcher.

The third step involved the case selection. Prior to the field study, a list of requirements to distinct the cases on the different dimensions has been set up to assure theoretical sampling. However, obtaining a pool of start-ups to choose from was absent. Eventually, the two cases in the disengagement phase were brought forward by the incubator of ITB and the two cases in the growth phase were the only two cases that replied to my proposal. Three out of four cases have proven to fit the study very well, however <Case 4> is somewhat deviant in the sense that they do not state environmental practices in their business model nor branding position. Nevertheless, it provided insights in sustainable practices that start-ups can effectuate, and is therefore chosen to remain in the study. Moreover, if there would have been more time to approach companies in the time spent in Indonesia, other start-ups who employ sustainability practices in their business model could have been approached to enrich the data.

The fourth and fifth step of the study involved the case studies and cross case analysis. For the case studies, the initial plan was to conduct interviews in two person teams. This proved, however, not feasible and might have affected the knowledge obtained during the interviews. Getting in touch with the right person of the start-up was not too difficult, all CEOs or co-founders that replied have shown great collaboration and willingness to talk at the moment of interview. However, establishing an interview at the first place proved to be difficult as well as the chance to ask follow-up questions.

Therefore, most of the data used in this study comes from the first interview with the start-ups, whilst follow-up interviews would have provided a wider variety of factors and a deeper insight to the motivations for certain decisions.
For the data analysis, the business models of all cases have been described in the ontology of CANVAS. This ontology was chosen to enhance the practical usage of this study for Indonesian entrepreneurs, as this is the most adopted ontology in Indonesia. However, this ontology is mainly focusing on economic gains and how to penetrate the market. The firm-centered perspective of this ontology is neglecting stakeholder values and the wider effect on the business ecosystem. This neglect leaves little room for evaluation of sustainability practices. The emphasis of Doganova & Eyquem-Renault (2009) on the business model as a market device, demonstrate that it is not always makes sense to pin all elements of a business model onto a rigid frame. The ambiguity of some parts of the business model may be rather intangible and are benefiting from multiple interpretations. "When a business model serves to build linkages among actors that are necessary to successfully market a sustainable product or service, various elements being open to multiple interpretations is an asset rather than a problem" (Boons & Lüdeke-Freund 2013, p.17).

6.6. Future research

Without doubt, business model innovations to enhance the adoption of sustainable practices by new firms is an important, yet insufficiently researched area. Therefore, the main contribution of this paper is to address this gap and to provide an overview of sustainability practices taken into account. The context of Indonesia has been a very interesting work field; however, it may be enchanting to explore the practices of start-up companies within a developed economy. Juxtaposition of the two studies may provide valuable insights in how to incorporate sustainability practices in the business model.
Thus, a first guiding question is:

> . *To what extent do technological start-up companies from different backgrounds accomplish to deliver sustainability through business model innovation?*

In part this question is taken into account by the design of this study, a complementary study in another context may reveal interesting antecedents or inhibitors towards sustainable development. This comes from some of the limitations in this research and leads to another field of interest for future researchers: academics may look into the structural, cultural and political contextual factors influence the adoption and diffusion of sustainability practices by new firms, taking an innovation-system perspective, namely in developing economies in the South East Asian region. In this field researchers should take notice of the theory developed by Stubbs & Cocklin (2008). An interesting guiding question that may lead future research is:

> *What leading factors emerging from the national business system influence the adoption of business models for sustainability within a nation of the South East Asian region?*

It may be wise to select a country to analyze these factors to clarify the scope of the paper, while the research may serve as a rough example for other nations in the region. A more system-wide perspective may lead to policy recommendations for universities or governments.
Another interesting approach may be to quantitatively assess the impact on the environment of different business model innovation types for delivering sustainability, according to the typology of Foss & Saebi (2017). A third guiding question that is proposed is:

To what extend can business model innovation improve the impact on the environment of innovative start-up companies, and how does this relate to business success?

In particular scholar can quantitatively assess the performance of start-ups employing sustainable business models, employing environmental impact assessment techniques as described by Canter (1996) and Glasson et al. (2013). This may reveal which identified practices lead to the desired environmental outcomes, and which do not.

Chapter 7. References

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APPENDICES

APPENDIX A – Tables on the contribution of literature to business models of sustainability

Author	Article	Theoretical Outcome	Key Findings related to sustainable BM concepts
(Stubbs & Cocklin 2008)	Case-studies on two idealized sustainable business models: Bendigo Bank & Interface Inc.	Organizations adopting a SBM must develop internal structural and cultural capabilities to achieve firm-level sustainability and collaborate with key stakeholders to achieve sustainability for the system that an organization is part of.	(1) Sustainability should be a strategy in itself (2) A stakeholder view of the firm over a shareholder view (3) A SBM treats nature as a stakeholder (4) Leaders drive the necessary changes (5) SBM is system-wide and firm-specific
(Ludeke-Freund 2010)	Literature review on the efforts on business models for sustainability.	"A conceptual framework is developed that combines transformational sustainability strategies, eco-innovation, the role of business models and pivotal ideas about value creation with regard to discrepancies between private and public benefits from business activities." (p. 23)	(1) Combining imperatives for ecological sustainability with imperatives of business development to come up with "sufficiency" "efficiency" and "consistency" strategies at the intersection (2) Extended customer value will lead to a market pull for ecological innovations
(Hall & Wagner 2012)	Integrating Sustainability into Firms' Processes: Performance Effects and the Moderating Role of Business Models and Innovation	Quantitative approach to assess the link between cross functional or modular based BMI and economic performance, environmental performance and stakeholder pressures	Cross-functional based BMI have in general an improving effect on the economic and environmental performance of the firm.
(Schaltegger et al. 2012)	Explore the opportunities of BMI for implementing business cases for sustainability	A framework for business model innovation is proposed as a means to strategically create business cases for sustainability on a regular basis as an inherent, deeply integrated element of business activities	Key drivers that economically justify a business case for sustainability: costs and cost reduction, sales and profit margin, risk and risk reduction, reputation and brand value, attractiveness as employer, and innovative capabilities
(Bocken et al. 2013)	Development of value mapping tool for sustainable business models	An adapted ontology that includes sustainability at the root of the business model by rethinking the value proposition in terms of value created, value destroyed and value missed.	"The value mapping tool assists companies in embedding sustainability into the core of the business model through an improved understanding of the value proposition. It supports an iterative process for analysing sustainable value creation opportunities from a multi-stakeholder perspective." (p. 493)

(Boons & Lüdeke-Freund 2013)	Combining literature on business models with sustainable innovations	Normative factors that contribute to unfold the sustainable potential of sustainable innovations.	1) Value proposition should provide measurable ecological value. Business-society dialogs must balance trade-offs between performance and improved social and environmental effects. 2) The focal firm must not shift its ecological burdens to its suppliers or customers 3) Customers are encouraged to take responsibility for their consumption 4) Financial model should account for ecological and social impact
(Girotra & Netessine 2013)	Emphasize the need to combine new technologies with business models that facilitate sustainability	Conceptual framework that encourages firms to think about BMI to foster ecological sustainability	
(Bocken et al. 2014)	A literature and practice-based review on mechanisms enhancing sustainable business model innovation	Eight archetypes that emerged from the triple bottom line and enhance the implementation of sustainable BMs by practitioners	Eight archetypes: Maximise material and energy efficiency; Create value from 'waste'; Substitute with renewables and natural processes; Deliver functionality rather than ownership; Adopt a stewardship role; Encourage sufficiency; Re-purpose the business for society/ environment; and Develop scale-up solutions.
(LAUKKANEN & PATALA 2014)	Analysing Barriers To Sustainable Business Model Innovations: Innovation Systems Approach	Highlighting the effect of the innovation system on the success of business model innovations for sustainability and identifying the barriers that hinder implementation	Identified barriers to SBMI: • Lack of strict legislative pressure • Lack of economic incentives • Lack of awareness and understanding • Lack of customer acceptance • Attitudes and values • Short-term profit maximization
(Abdelkafi & Täuscher 2016)	Conceptual model of BMfS that describes the interdependencies between firm, natural environment, customer and decision maker	Explains the relationship between a BMfS and the drivers for business cases.	(1) Connecting the perception of the natural environment to business model decisions (2) Highlights the importance of the perception of the natural environment for customer and decision maker

APPENDIX B – Questionnaire

It is very much appreciated if you are taking the time to complete the following questionnaire. This questionnaire should take approximately 15 to 20 minutes of your time. Your responses will be used for an in-depth case-study analysis and provide insights on the development and innovation of business models for starting companies. None of the data will be shared among third parties without your explicit permission.

Section A: Business model design target

To target the right person for the questionnaire.

A1. Are you responsible for Business Model Innovation within your organization?

The core of a company is its business model. Business models describe the core logic of how to deliver value to customers and create revenues.

Most businesses have a plan on how they earn money and create value for customers, we call this its business model. Such plan might be decided from the beginning or changed over time. Would you be involved with (responsible for) developing this business model in your company?

Yes ☐

No ☐

A2. The core of a company is its business model. Business models describe the core logic of how to deliver value to customers and create revenues. Sometimes, companies change their business model.

Did your company make this change during the last 24 months/ or did your company make deliberate choices whilst designing the business model?

Yes ☐

No ☐

A3. Comments on this section

APPENDIX C – Interview protocol

Explanation of study

Sustainability in business is of increasing importance. International and national governmental pressures as well as the changing consumers' demand are requesting more effort from companies regarding environmental impact. Therefore, it is meaningful to assess how companies are dealing with this issue. This is especially interesting for starting companies, as they often lack an abundance of resources and therefore have to be creative on this matter. This is why incorporating sustainability into the business model might give a fruitful solution for these companies.

The business model is the core of the company, business models describe the core logic of how to deliver value to customers and how to create revenues. Designing the business model with sustainable values in mind can provide a holistic solution to the business' sustainable ethics. Business model innovation means the alteration of one of more of the components of the business model that changes the way the firm conducts its business. A relative new body of literature is examining business models and business model innovation regarding sustainability. Various frameworks are suggested and also archetypes for sustainability within business enterprises have been developed.

This study is designed to gain insight into the current practices of young companies regarding environmental sustainability, where and how do they incorporate sustainability into their business practices and how can business model innovation help companies assessing sustainability. Naturally, regarding the scarcity of resources and the potential of increasing their competitive advantage. Therefore, four case-studies are conducted. Four different young companies are examined regarding their business model design or innovation.

For this research we will select two start-ups that are in the process of designing their initial BM, one company that explicitly pays attention to sustainability, and one that is focused on other, mainly economic brand related, values to promote sustainability. We will also look into two start-ups that have already an established BM and are innovating their business model. Again, one company wanting to innovate their BM to take sustainable values into account, the other company is focused on other, mainly economic brand related, values to promote sustainability. By this 2x2 design, depicted in table 15, we are able to compare different practices to identify similarities and differences, opportunities and barriers towards environmental sustainability.

Table 15: 2x2 matrix for case selection

	Sustainability values	*Economic, brand related values*
BM design	Case 1	Case 2
BM innovation	Case 3	Case 4

Criteria for selection of cases (smart sampling)

In order to select appropriate cases, we have to ensure that the outcome interviews and observations provide us with information that matches the research objectives of this study.

It is hard to define start-ups by numbers and profits, as the culture of the company is considered an important factor for start-ups. In essence, a start-up is a new founded company that is designed to gain a rapid growth (the aspiration to conquer the world with your company). Due to the small amount of employees, they all have a significant impact on the performance and course of the company. So as it is hard to define a start-up, it is also hard to pinpoint the moment when a company ceases to be a start-up. However, every extra employee and every additional year will alter the original culture of the company.

As the objective is to get insight into the drivers for sustainability for start-ups during the development and innovation phase of their business model, the following criteria are obeyed:

To distinguish between the BM design phase and BM innovation phase, the next criteria have been set:

Criteria for BM innovation cases (AND):

- Made changes to BM in the last year
- Not older than 8 years
- Product/service should be on the market
- Technology related product/ service
- Experienced growth in market

Criteria for BM design cases (AND):

- Not more than one year on the market
- Technology related product/ service
- Still experimenting/ implementing components of business model

To determine if a company lives up to environmental sustainable values, the following indicators are used for selection (list might expand, expansion still possible after observations within the company). If a company does not have any, or not sufficient indicators for sustainability, it is classified as the "economic, brand related values for sustainability" dimension.

Sustainability values indicators (AND/OR):

- Product made from sustainable resources
- Stated sustainability in their vision/mission
- Energy-efficient office/ flexible workplaces/ no office at all
- Considering partners on the basis of their influence on environment
- Separating waste
- Supporting employees in environmental friendly practices

Confidentiality statement

From template (discuss with supervisors what you have to include):

Date: **[Insert Date]**
Project Title: **[Insert Title]**

Principal Investigator (PI): **[Insert name, status/role e.g. professor]**
Department of **[Insert Department Name]**
Delft University of Technology
[Phone number and extension; email address]

Faculty Supervisor **(if different from PI)**:
[Insert name, status/role]
Department of **[Insert Department Name]**
Institute Teknologi Bandung
[Insert phone number and email]

Student Principal Investigator (SPI) **(optional)**:
[Insert name, status/role]
Department of **[Insert Department Name]**
Institute Teknologi Bandung

CONFIDENTIALITY

[Insert a statement describing the extent, if any, to which confidentiality of records identifying the participant will be maintained. See options provided under sample confidentiality statements]

Data collected during this study will be stored **[insert details about how/where data will be stored].** Data will be kept for **[insert length of time data will be retained]** after which time **[provide details about the final destruction/disposal of data].**

Access to this data will be restricted to **[provide the names of those who will have access to data].**

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time and may do so without any penalty or loss of benefits to which you are entitled.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. Feedback about this study will be available **[include information about whom to contact, how to contact them and when feedback will be available].**

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact **[insert Principal Investigator's name or the Student Principal Investigator's name and the Faculty Supervisor's name (if different from PI)]** using the contact information provided above.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

CONSENT FORM

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: _____

Signature: _____ Date: _____

Interview Guideline

An interview is an intelligent conversation between an interviewee and an interviewer. The objective of the interview is to acquire information of the case and (personal) views of the interviewee. Interviewees are often the owners or managers of the start-up/ SME, preferably they should be involved in business model development and innovation. The interview doesn't need to follow the guideline in detail or in a prescribed order but the guideline functions as a check-list to see if the most relevant topics have been discussed. An open interview check-list offers the opportunity to delve deeper in some issues, while other might be marginally touched upon.

In this interview guideline we present topics that might be subject of the interview. Be aware that this list not exhaustive and also it might be possible that not all topics can be dealt with or discussed in one interview or with a specific interviewee. Also the order can be dependent on how an interview develops. So don't try to go the interview question by question but take care that there is an open conversation and that only after a topic is exhaustively discussed use the interview topic list to address the next topic. The topics follow the order of background information of the company and on the interviewee, a discussion of the business model, and business model innovation, business performance.

At the end of the interview always ask if an additional interview can be done, either with this specific interviewee of with another relevant, informed employee or manager. These interviews can also take place via telephone, Skype or otherwise.

Remember to explain the objective of the research and the way we deal with informed consent (see Deliverable 5.5. for details and the forms). With regard to informed consent make clear that we deal with data in a confidential. Also at the end make clear that

- The transcript of the interview will be sent for validation.
- Together with the transcript there is a form for permission for usage of data for research and/or for public communication (with disclosure or non-disclosure of the company name).

Topics to be addressed during interview.

Company background & environment (you can get much of this information in beforehand from the web)

- Can you tell us a bit about your company?
    - When started? Who are the owners? How many employees? Management structure? Family business? Female managers?
    - The formal position of the interviewee
    - What industry? What markets (local, regional, national, international)? Who are the main competitors?
    - How does the company deal with changes in business (innovation) in general?
    - Does the company have a strategy or a long-term vision?
    - Why is the company valuable to the owner? Why is (s)he in this business?

Business Model

Can you explain how your business model looks like? Be aware that most entrepreneurs will not be familiar with the concept of Business Model so try to ask this in an understandable way. For instance, what is your daily business, how do you make money, what are your key activities?

- More specifically the following topics can be addressed
    - What are the core products, services? What value do they have for customers? Market segmentation? When the product was introduced to markets?

- What are the core target groups? How are customer relations managed? Which channels are used for communication with clients?
- How is the company position in the supply chain, value network? Who are the core suppliers? How does the eco-system/ value network looks like?
- How do internal processes look like? Are they formalized and described? Are they aligned with external processes?
- What core technologies are used, if any?
- How is the product priced? how about the costs?

Performance of the company

- Is the company profitable, doing well?
- How is performance measured within the company?

Business Model innovation/ development & effects

- Has the business model changed recently? What was the reason for this? What was the driver behind the BM Innovation?
- Was (or will) the change in business model or business operation visible for the customers? Did it change the value proposition to customer or customer related processes?
- What was changed? How did this affect the impact on the environment?
- How was the Business Model change managed? Was use being made of Business Model methods (CANVAS and the like) or tools?
  - Tools can be anything that the interviewee mention from spread sheets to consultants that advised on usage of for instance Blue Ocean strategy tooling.
- In what phase is the BM Innovation/ development process at the time of the interview?
- Did the Business Model Innovation deliver the expected results? Was it successful? How was the effect of BMI assessed?
- Did the BMI process lead to improved understanding or communication of BM?

Specify and direct interview towards environmental sustainability issues

- Discuss relation strategy and Business Model
  - Keywords; environmental dynamism, entrepreneurial orientation, market orientation
- Discuss the sustainable practices of the firm which relate to the business model
  - Keywords: sustainable initiatives, key-activities (day-to-day activities which involve consciousness about the environment), partnerships in environmental sustainability
- The role of knowledge in BM innovation and sustainability
  - Learning orientation, creativity
- Discuss relation of Business Model and IT (process, applications, IT infrastructure) and its impact on the environment

Closure

- Ask for available and relevant documentation if available
- Thanks for the interview
- Arrange for the validation of the transcript
- Explain the rules and guidelines with regard to informed consent.
- Follow up interviews if necessary

APPENDIX D – Headlines of Interviews

<Case 1>

Interview with CEO and CMO.

The company is called *anonymized* and is operating in the agro-technical technologies development. The company is established in October 2015 to develop the product to enhance the production of farmers in Indonesia.

The product we are offering is called *anonymized*, the acronym of environmental control of monitor plantation. The product is enhanced by a smart controlling system. It is one product but comprises of a hardware and software system and a smartphone application. We are focusing on the controlling of irrigation for the farmers. The controlling system is focused on a smart irrigation system. In Indonesia, farmers use irrigation in a non-controllable, non-quantitative way. This means that the plants get more water than they need and this excess of water causes a run-off of nutrition of the fertilizer. This fertilizer than runs off to the village and pollutes their water. By using our irrigation system, we hope that farmers will give the fertilizer in an effective way, so the nutrition does not run off and will be absorbed by the plant more effectively. This will also make that the plant produces more fruits.

The focus of the business of *anonymized* is at this moment in *anonymized*, mainly in *anonymized*. However, there has been interest from areas as *anonymized*.

Greenhouse farmers can directly buy the product from *anonymized,* or, if it suits them better, a farmer can rent the hardware from the company.

It has so far been sold to the *anonymized* in *anonymized* (an area close to *anonymized*), which is a government funded eco village. In here the technology could serve educational purposes. In here the product is in its implementation process. *anonymized* is providing the whole package of selling and instalment of the product as well as the service.

Concerning the competition, there are two or three other companies that are offering similar products, but they do not offer the full package to the farmer. They only have the monitoring system or just have the controlling system [*anonymized*]. However, in a competition for funding for start-ups, *anonymized* got funding where the competitor did not receive any funding.

The vision of the company is to bring a new era of agriculture into Indonesia. As farmers in Indonesia still use conventional technologies only. This is not very useful, both for production and for the environment. Conventional technology uses many chemical fertilizers and the irrigation is not monitored. This often overflow of irrigation makes the nutrition running off to the river and makes it look like the plants need more fertilizer. Thus farmers will give more fertilizer. Farmers need more education. We hope that our company can help them to understand how the plant works, how they produce fruit and also help the environment to be more productive for the next harvest. The environmental issue is included in the product itself. Moreover, we are concerning to make the new generation of farmers more interested in technology. We want to attract the young generation to start farming by using technology.

Nowadays, farmers mainly emerge from family's that are already farming. They learn from their parents how to do the job, and the problem is that when the children go to school, they [the children] don't want to be a farmer anymore. The company wants to show that farmers do not only work in the field with the dirty work but it can also include technology.

BUSINESS MODEL

As we are incubated in the LPiK incubator, we are educated to use the business model canvas to design our business model. The customer segment is the farmers in *anonymized* who are using greenhouses for their harvest.

The value proposition is to bring the new era of farming to Indonesia. Environmental sustainability is included into the value proposition by this, also because they concern about water management and

electricity management. The product will turn of the hydraulic pump that is used for the irrigation system automatically, where the old habit was to turn it off manually, this way saving energy and water.
We engage in partnerships with other farmers in *anonymized*, a government research body in agriculture and we are planning to make one of the organizations a role model to show other farmers our product. [Like endorsement]. Moreover, we have a partnership with a store in Bandung to obtain the hardware, selected on basis of price/quality.
Regarding consumer relationships, we try to endorse the customers that they save water and energy by usage of the product, we use it as a source for branding as well. The product is cost effective and benefitting for them.
We put the issue of sustainability into our business model after research, it is a kind of innovation that emerged after researching the business model. It was after the research that we defined the value proposition.

INTRINSIC MOTIVATIONS
CEO founded the company because of his academic background, which motivated him to enhance the [often poor] production of farmers in Indonesia. He saw that there was a lot of room for improvement, as farmers use mainly traditional approaches and technology is not implemented yet.
CMO went into company because of the challenges that come with start-up businesses.

<Case 2>

Interview with founder and CEO *anonymized*, *anonymized*

anonymized established the company since September 2014 and the project took off in September 2015. It got rewarded by the minister of research and technology with a grand on Tech Business Incubation. This is a two-year programme facilitated by LPiK, the incubator of ITB. That is how we became a tenant of LPiK. During that project, we submitted some patents. Not only for local one, but also for international patents. We submitted the UK design and utilities patent, and for Indonesia we filed for design and innovation patent. The grand takes a two-year process and we are still in that trajectory.
We have six people including me working for the company. I am an aeronautics engineer and there is also a mechanical engineer [research assistant of ITB], furthermore we have someone on the telecommunication, electrical and a person from Jakarta on the operational support who is more concerned about the practical issues of the company.
From a formal perspective, there are three phases of a business. The first one is the R&D phase, including patents and the designs. The second phase is the manufacturing phase. The third phase is about sales and marketing. Some businesses don't care about patents and go straight into manufacturing. We consider ourselves a bit crazy as we have to go through these three phases. We are now more or less in the second phase. We hope to commercialize our first product several months from now.
Our business model is to provide a solution of the lowest cost, easier to use, and quicker to deploy the internet infrastructure.
We offer a helium balloon for internet and our long-term strategy is to provide an array of solutions from space technology, but for that we need a bigger capital as it is highly intensive in terms of technology and terms. We start with the helium balloon system which will enhance the internet and telecommunications infrastructure that will be provided from the internet association. We also have a contract with the Indonesian Internet association

BUSINESS MODEL
For the key partners, we have the Indonesian internet association and also the suppliers. At the moment we only have intangible assets, rather than tangible assets. That is why our key partners are consisting of suppliers of our materials and technology. Also the government is a key partner for us, as we are lucky

enough to receive supports from the ministry of informatics and they are also one of the stakeholders of our business.
For the key activities, our consideration is the providing of hardware solutions. We are developing the product ourselves, assembling everything ourselves, but for the components we have suppliers.
The key resources we get from the suppliers and also from the collaboration with ITB LPiK. We want to leverage our collaborations through the triple helix concept.
For the value proposition we have a vision to be considered as the provider of the lower cost and the quicker, faster deployment and easier to use of the internet helium balloons.
We have a matrix of a potential solution. For providing the coverage of telecommunication for internet there are balloons aircrafts and drones. We believe that the helium balloons have some advantages over other potential solutions.
We target the B2B market. That is why our customers are also our partners. The APJII Indonesian internet association is included in discussions to sharpen the business model on a weekly basis. We are speaking about budgeting of our product deployment.
As we will offer the helium balloons to some cities, the government is also our customer.
The supply chain and the transportation is one of the biggest consideration points at this moment and gets a lot of attention.
The customer segment is business to business. Telkomsel (Indonesia's biggest telecommunications provider) could be a potential customer, as well as the internet association. Not only for the internet to deploy and improve the connectivity in rural areas, the product can also be used for high density areas.
The costs we bear are mainly for the hardware, the team, the patents and the legality.
Our key-activity is the design of the hardware, we pick potential suppliers and potential manufacturers and they will provide us with the product. At the moment we are still doing this ourselves.

VISION
Indonesian internet connectivity is below the 50% of the total Indonesian population. We first want to deploy more internet connectivity and improve that infrastructure. After that we have some ideas about the hardware and software solution. When the balloons are in the sky, it can open opportunities for cameras or sensors on the balloons that can provide the city with more information.
We almost finish the second and final year of the reachtech incubation and have to find a way to commercialize the product after that. That is why we have a meeting every week to sharpen the business model. What we are considering in that discussion is how to do the budgeting and the technical issues. The customer segment is the segment of the business model that changed over time, the helium will be a solution for the government as a sort of smart city programme. That is why we deploy cheap internet access.
Key activities (designing the helium balloon), value proposition (providing cheap and quick internet solutions) and revenue streams stayed the same over time.

SUSTAINABILITY
Regarding environmental sustainability, our company is considering it in how to compose the product and in how to enhance the lifetime of the product, but to be honest there are many problems we have to tackle first. Probably we will regard it in how we produce the product, which materials will we use, and see the product from start of the manufacturing to the decomposition of the product.However, even the patents have some struggles. Also in the manufacturing we have to see how to scale up and how to make it effective. For the sales and marketing we have to figure out how to generate cash-flows. Probably after we got some investment of the helium balloons and after we scale up the problems will be different. For now, survival and scaling is the most important.

<Case 3>
Interview with CEO, *anonymized*

BACKGROUND

The company was established in 2013 and had the first commercialization mid 2014.

The founder studied biology and started a business in catfish in his second year of college. It was the time that he realized that the fish farming industry had a huge problem, which was the feeding cost. The feeding cost is the biggest cost in agriculture for fish farmers and is mainly done by labour force. Labourers feed the fish by hand and it is totally uncontrolled. You can stick to processes, develop procedures and standardize the process, but it is still depended on mankind. Sometimes it happens that the labourers steal the food and sell it to the other farm and you can't keep being there for 24 hours. In the whole agriculture sector there is not much done with technology, while in the other sectors there is a lot of adoption of technology. There has been a fast technology adoption rate in the past two decades, and I think that in agriculture we keep doing what we did in the last century and it is time we catch up with this.

The founder came up with the idea of maintaining the feeding remotely from your phone. The basic idea of *anonymized* is just SMS-based feeding. So you send a message to the machine and the machine will feed the fishers. But along the way they saw that the SMS system is not scalable. If you have hundred farms and you need to send the message to all hundred farms, it is not really efficient. This was actually in the time that the application business started to take off. Than we built the *anonymized*, which is the machine built by *anonymized* that can feed the fishes remotely, we can control it by the application from the smartphone. It also sends all of the information to a cloud, so you can monitor your feeding amount and feeding time from the cloud. Along the way, eFishery has also built a sensor, the m-sense fishery appetite and it monitors the fish's appetite.

BUSINESS MODEL

We have used the business model canvas in the beginning. The main value proposition is to improve the feed efficiency. We call it the feed conversion ratio. How much feed do you need to produce one kilogram of fish, that is the ratio? Our value proposition is to reduce this feed conversion ratio. If you need less food to produce the same amount of fish. To do that, we sometimes reduce the feeding cost and sometimes we are increasing the production [key activities]. By reducing the ratio, we are increasing the [profit] margin for the fish farmers. Additionally, we provide the value proposition of remotely controlling your business anytime and you can get the real time data while you don't have to be there. That is mainly data monitoring, but if it is something that the fish farmers can make more money from that then that is the idea. It should be noted that we deal with a very conservative market, when we think of a low value product. Farmers only understand the value of a product in "money-language", how much money can they save or make. So that is also part of our value proposition.

For the revenue streams we have two pricing alternatives. The first one is to sell it, so we have customers who buy it for 750 dollars including the fee subscription for the software for two years. The second is to rent the hardware, we have a rental system in which the farmer only pays 30 dollars per month, we call it some kind of software package in which they rent the hardware as well.

On the long-term we also gather the data from the farmers, so we are trying to find a way to monetize that dat. Let's say we can get the data and we can analyse the credit worthiness of the fish far, we can connect the data with a financial institution. We then charge the transaction and transcription fee for access to the data to the other customers like banks. We are currently doing that on a small scale.

What we are doing on daily basis is developing our software. We have in-house engineers to maintain the software. We have a field sales team and we work with distributors. Most of our work is centralized. In the manufacturing site we used to assemble the product ourselves, but we are shifting up to assemble it by using contract manufacturers. We also handle the aftersales, we do the maintenance, replacement and repair the product.

SHIFT FROM IN-HOUSE TO OUTSOURCE

Initially we work with suppliers and vendors. We have lots of projects to do to complete a product. We need 160 parts to assemble the product, so we deal with lots of vendors and suppliers to ship it to us. Then all of the small parts were assembled by us, we do the electricity parts, we do the solder, the mechanical part and the painting, then we package it and do the quality check. Obviously it is hard work and we are not good at it, it is not our core expertise. We don't have mechanical engineers, so typically the lead-time was too long and we cannot scale as fast as we can scale up in other parts of the business, which is using the sales and the software. The assembling keeps lagging and holding back the business. it was a bottle neck in our operation. We decided that we need a good partner, one who is understanding what they are doing and then they will have a good network in which they can find the good suppliers to them, giving them the capabilities to develop the product.

SELECTING OF PARTNERS

The partners have to understand the business; they have to know where we want to go. It is important for us to find a long-term partner. When discussions with the potential partner are held, it will go about what we want to do in the future 3-5 year, and if they are willing to be a part in that and willing to take investment on their own for them to grow with us. That is the initial and basic criteria that we have. If they buy our vision and they believe in what we are doing, then that is the basic. Secondary, is of course the expertise, we see their portfolio about how they work and about their expertise in building similar products. We do due diligence as well, seeing their factory, their employees and their partners. So basically we do that to see whether they have a strong expertise. The other criteria is the networks that they have. We want to scale up and if we need some other parts, then networks or suppliers are also important. We are considering the whole supply chain.

CUSTOMERS

We target small and medium farmers because their adoption rate is high and in terms of market size they are the biggest. They comprise 80 % of the market. We also deal with big corporations, who own a company arm in agriculture, they are strategic partners; they are the biggest feed manufactures in Indonesia. If they take up the product, then they can be a partner in the future as well. This will build on our network. Also we sell to the government.

ENVIRONMENTAL SUSTAINABILITY

We see environmental sustainability on a global scale; clearly we produce food from the environment. If the environment goes bad, the water goes bad and the fish goes bad. When the fishes go bad, we don't have any business. basically the environmental sustainability is aligned with what we are doing, what is good for the environment is good for the business. That's why even in our value, sustainability is embedded and for us that is aligned with environmental sustainability. What we are trying to do, one of the biggest polluters is the feed, if we can reduce overflow of feed in the water, then the quality of the water will improve and the fish will be better as well, so it becomes more profitable. If it is more profitable we can sell that to the farmers. The environmental sustainability is embedded in the growth and future growth of the company.
Moreover, we have received investments from companies as *anonymized* and *anonymized*. To obtain these investments we make use of environmental friendly branding. These investors find this important and thus it makes sense to use it as a branding component. On the sales side of our company, the fish farmers, they only care about profits, so we are not using it as a way of branding to sell our product.

<Case 4>

The CEO, which is a graduate from ITB on industrial engineering and has extensive experience in the fast moving consumer goods business, founded the company SnapCart in 2015. It then started off with 7 employees, launching in Indonesia, they are now physically present in three countries and have around 65 employees.

anonymized is focussing on B2B, with the larger part focusing on enterprise B2B. It looks like we are running an app, which is basically the cashback app. It gives you cashback if you upload your receipt. But that's not how the company monetizes, the way they monetize is in extracting the information from the shopping consumers directly, crowdsource data that we extract and then they sell the data to brand related businesses like Unilever, P&G. L'Oréal etcetera. From the receipts data there is a lot of information they can get. If you have a smartphone you can follow the individual: what is the shopping behaviour, where do they shop, are they actually multisource to different retailers, what is the content of their basket, are they switching between different brands? If we aggregate the level, we can communicate what's going on in the market. The advantage of this way of getting data is that you can get the data in a much more real time matter.
The biggest competitor in their field is *anonymized*, whom get their data in the conventional way, which tends to be manual: from house to house to interview people, use surveys, going to the pantry and see the stuff consumers are buying. This is not scalable enough, they can only get to a number of households and it takes time to get this data back to the brands. The real time data provision for the client is what really sets us apart and gives us advantage. That's basically the model of SnapCart. The fact that it is b2b it is a much more profitable way of getting the business in, you can make sure that is not burning too much, but then you can already monetize from the data from a sufficient sample to represent the market.
There are offices in Indonesia, the Philippines and a representation office in Singapore. We are looking into expanding into other markets in South East Asia as well as markets outside of Asia.
anonymized is a company that has never been set up to stay within one country, Indonesia. The nature of the business as it is, is to expand to multiple markets. The expectation for us is to be present in many countries, as well as for our customers which are mainly multinationals. They expect us to represent a big part of Asia.
We look into market expansion based on three things, so one is the market size of research. What is the size of the market research business? Second is accessibility, how well are we familiar with the market, hence we can actually get the business running. Third is the technology factor. We develop our own technical tools to read the receipt. Launching in brazil would be easier than launching in Japan, as japan has a way different alphabet where it's not yet in our library.
Many data science capabilities are centralized in Manilla. The chief data officer is of Philippine origin and based in Manilla. The chief technical officer is Syrian and based in Jakarta, but works with a team of developers in eastern Europe, because of the skills that are available there [and not yet in Indonesia].
BUSINESS MODEL [INNOVATION]
So I think what is important to note, we have a very clear product pipe line of what products we want to launch. However, the business model stays true, which is we are focusing on real time data. When we launch we only have two clients, and then we focus on delivering modules. If you look into our webpage, then you see the services which we provide. One is called *anonymized*, which stands for customer analysis and retail tracking. So it serves as an online dashboard to which the clients get access to. Depending on the modules they want to see and the modules that they pay they have full access to that data and their performance. So it can be ranging from just simple brand share performance to the most complex one would be price analytics or price sensitivity, so you would see the movement of prices of different brands and how that correlates with brand performance. From the own brand and competitor.
After a while a new service was introduced, but the source is still from the app and the receipts that we collect. The second service is called *anonymized*: targeted audience-based surveys and questionnaires. Not all of the insights that the clients want can be answered by just the receipts data. For example, if I get your receipt, right now you are using Pantene and then you change to sunsilk, I don't know yet why you change. I still need to ask you a question of why you are having this behavior. That's why we allow brands to target you as a part of a larger customer segment to address for a questionnaire to ask questions specifically why you change that behavior. It is more ad-hoc and there are specific questions brands would like to see answered. It is a survey within the application.

This year one more app and one more service will be launched. The new service is called *anonymized* and stands for offline purchase tracking and insights. A lot of brands invest in a lot of media, especially social media and OPTI is giving insights in the purchase impact factor of the digital advertisements.
The new application is to complete *anonymized*. 60% of the trade transactions are happening in traditional trade, not using any receipts. The question is how can we extract data from these traditional stores. This new app is going to track that information. It will be giving a pre-set system for storeowners to use a smartphone based app for free. They can use it to actually record transaction, so they can record the inventories coming in. When they have a transaction they can scan barcodes and can record this as well. For the storeowners it will give them benefits as they can record and manage their inventory. The benefit for *anonymized* is that the company can track all the transactions that are being done in that store. It is going to communicate to the cash-back app that we have. These two platforms will communicate to each other, so the store owners can also use the cashback feature of the application while they don't have real receipts.
The customers are also the key partners, that is why it is twofold as well. Our key partners are the users in a way but at the same time the brands are our partners. For example, from an acquisition point of view the brands helping us to acquire users as well. They do advertising on their products to communicate with customers that they can get a cashback through the application. That helps us to acquire users. But there are other key partners that are specific for example the google and Facebook publishers can be our clients as well. So those are the key partners that we see. Our competition can be our partners as well. *anonymized* as that they are the market research company because they are very strong in TV ratings, all of the data comes from *anonymized*. We can cooperate with market research agencies as well because we see possible cooperation in specific fields we need help in. we compete from the purchase information site, but for media we can collaborate with them.

SUSTAINABILITY
We are working with big established companies who have that already. They have this kind of perspective; in a way we are driven to that as well. The good thing of technology driven companies is that we are not creating products, we are not manufacturing anything. That sustainability part is not going to be an integral part of the business anyway. But we always look into the future, for example let's say receipts is going to be the core of our business, can this paper based receipts be transformed into something that is more non-paper like electronics, which can be something like an angle we are drawn to. So for example, we want the store owners to use our app, because we don't want them to actually go acquire a system which requires them to print receipts. So that's something what we are trying to do, we believe that the future is going to something like that anyways. Everything is going to be electronic and we are trying to also drive that thing.
One of the things is that it is driven by the environment of clients we are working with, we choose to not rent a house and then build our office there. We choose to have a grade A building where they have the right system in place anyway to ensure that sustainability is affected. So I am not saying that we are not focusing on it, we believe that because of the bm requires us to be similar with the companies we are working with. Basically it forces us to kind of have that same thinking.
We do not require our employees to be in the office on a 9 – 5 basis. They work on an assignment basis in which they have to complete certain parts of work within a pre-set period of time. If they want to work from the office or from their homes is up to them. The office is always open and provides the speed of internet that is often required for the proceedings of our employees, but if they want to work from home or wherever that is fine.
As we want everything to be electronic, we try to reduce as much waste as possible. When we sign documents, can we change it into an electronic way of doing this. The barrier that comes from the clients, not from our side. There is a platform called DocuSign, people don't have to sign on paper, they can use the electronic platform. The problem is that certain clients require us to use paper based signing. That is something we cannot enforce, because that is what the clients want. Internally it is not an issue, because it is hitting two birds with one stone, cost saving and also benefitting the environment.