Master thesis:

Bridging the design-implementation gap of Sustainable Business Model Innovation

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Preface

Welcome to the thesis *"Bridging the design-implementation gap of sustainable business model innovation"*. This thesis is written to finalise the Master Innovation & Entrepreneurship, a specialization in Business Administration at the Radboud University in Nijmegen. This research was written in the period of January 2021 to June 2021.

I would like to thank my supervisor Dr. Robert Kok of the Radboud University for his feedback and support of this exciting phase of the study. Especially for his enthusiasm for innovation, start-ups, and sustainability, but more importantly for his criticism and suggestions. Furter, my gratitude goes to all informants who shared their time and interesting experiences with me. At last, I want to thank my family and friends for supporting me in this exciting period.

I wish you a delightful read!

Jesse van der Ven
Nijmegen, June 2021

Abstract

This master thesis investigates which models & tools start-ups could use to bridge the design-implementation gap of sustainable business model innovation. Start-ups are namely important actors for the transition towards a more sustainable economy and sustainable business model innovation is an important source for competitive advantage. A difference is made between activity-based models & tools, and process-based models & tools. This explorative research is conducted through eight case studies. The findings show that start-ups should make use of activity-based models like the Business Model Canvas, Triple Layered Business Model Canvas, and/or the Value Mapping tool to bridge the design-implementation gap. By using activity-based models, start-ups can attract investors, suppliers, partners, and customers. In addition, it brings focus to own values and goals. Process-based models and tools like the Value Ideation process or The Cambridge Business Model Innovation Process are also useful to bridge the design-implementation gap. However, it is industry-dependent whether to make use of prototyping, testing, and piloting. By using process-based models & tools, start-ups can better match customer needs, launch a better product, and can cause competitive advantage.

Keywords: Sustainable business model innovation, sustainability, business model, innovation, start-ups, models, processes, tools

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Chapter 1: Introduction

For decades, vital sustainability issues with their major societal and environmental effects influencing human beings and nature had not been the priorities of most business model types (Nosratabadi et al., 2019). However, to tackle the pressing challenges for a sustainable future, innovation in business models is needed (Bocken, Short, Rana, & Evans, 2014) and start-ups, with innovative business models, are key players in accelerating the transformation of businesses and society towards sustainable development (Trautwein, 2021). The capability to successfully develop and implement new business models is therefore for organisations an important source for competitive advantage and a key leverage to improve their sustainability performance (Geissdoerfer, Vladimirova, & Evans, 2018). A business model *"Represents the way firms create, deliver and capture value"* (Osterwalder & Pigneur, 2010, p. 14) whereas business model innovation refers to *"The search for new logics and new ways to create and capture value for its stakeholders; it focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers, and partners"* (Casadesus-Masanell & Zhu, 2013, p. 464). Business model innovation increases an organisation's resilience to changes in its environment and constitutes to sustainable competitive advantage (Mitchell & Coles, 2003).

Research in the field of sustainable business model innovation has started relatively recently (Geissdoerfer et al., 2018). The definition combines the business model innovation element with sustainability considerations. The process of business model innovation qualifies as a sustainable business model innovation or a business model innovation for sustainability when it aims at*: "1) sustainable development or positive, respectively reduced, negative impacts for the environment, society, and the long-term prosperity of the organisation and its stakeholders or 2) adopting solutions or characteristics that foster sustainability in its value proposition, creation, and capture elements or its value-network"* (Geissdoerfer et al., 2018, p. 406).

Four types of sustainable business model innovations

Geissdoerfer et al. (2018) concluded that there are four types of sustainable business model innovations: (1) sustainable start-ups: a new organisation with a sustainable business model is created; (2) sustainable business model transformation: the current business model is changed, resulting in a sustainable business model; (3) sustainable business model diversification: without major changes in the existing business models of the organisation, an additional, sustainable business model is established; 4) Sustainable business model acquisition: an

additional, sustainable business model is identified, acquired, and integrated into the organisation. So, sustainable business model innovation is created in 4 ways, namely, by creating sustainable start-ups, the transformation of business models, the diversification of business models, and the acquisition of sustainable business models.

Managerial relevance part 1

Business model innovation is vitally important, yet it is very difficult to achieve (Chesbrough, 2010). Geissdoerfer, Savaget, and Evans (2017) concluded that there is a design-implementation gap for sustainable business model innovation. The gap shows that there are three major problems for sustainable business model innovations: 1) many business model innovation meetings and workshops are conducted, but the ideas are not followed up, 2) even promising sustainable business model concepts are not implemented, and 3) most implemented business models, especially in the start-up context, fail in the market. So there is a set of challenges that prevent organisations from successfully innovating their business model, due to insufficient follow-up on ideas, lack of implementation of concepts, and failure of businesses in the market (Geissdoerfer et al., 2018).

Theoretical relevance part 1

All businesses, either explicitly or implicitly employ a particular business model (Teece, 2010). However, the design and management of sustainable business models is an important but yet insufficiently researched area (Boons & Lüdeke-Freund, 2013). There is ample research on the organizational barriers and facilitators for product innovation but less research is available on the barriers and facilitators for business model innovation (Chesbrough, 2010) and sustainable business model innovation (Karlsson, Hoveskog, Halila, & Mattsson, 2018). Also, the way organisations actually implement new business models is still unexplored (Chesbrough, 2007).

Problem statement

Start-ups are important for the transition towards a more sustainable economy (Trautwein, 2021). They are key market actors in the development of radical sustainable innovation, while established companies focus more on incremental innovation (Linda & Klaus, 2015). However, there is a design-implementation gap for sustainable business model innovation (Geissdoerfer et al., 2018) and the way organisations actually implement new business models remains

unexplored (Chesbrough, 2007). To accelerate this transition towards a more sustainable economy, it is, therefore, necessary that more and more start-ups succeed in the market.

Therefore, the research objective is to investigate how start-ups can bridge the design-implementation gap of sustainable business model innovation. The following research question has been formulated: *How can start-ups bridge the design-implementation gap of sustainable business model innovation?*

Theoretical relevance part 2

This research will gain insights how start-ups implement new sustainable business models and therefore it will contribute to the relatively young field of business model research in management studies (Baden-Fuller & Morgan, 2010). Besides, there is little research on the challenges that business model innovation faces and on the reasons for low success rates in implementation (Geissdoerfer et al., 2018). This research will also create insights on how start-ups can overcome these challenges for the successful implementation of sustainable business models and therefore it will contribute to the existing literature.

Managerial relevance part 2

Start-ups are important actors for the transition into a more sustainable economy (Trautwein, 2021). This research offers start-ups more understanding of how they should implement their new sustainable business model. This hopefully will lead to more successes because it is well known that most innovations/start-ups will fail. This research will also help new entrepreneurs to gain insights on how to implement sustainable business models. Therefore, this study will help organisations to bridge the design-implementation gap (Geissdoerfer et al., 2017).

Scope

Start-ups are key actors for a sustainable future, so it is important to gain more insights into the implementation process of sustainable business models and help start-ups with overcoming the associated challenges. So, this research will focus on start-ups with an innovative sustainable business model in The Netherlands.

Thesis outline

This research is structured as follows. The following and second chapter describes the theoretical background and proposed a conceptual framework. The third chapter describes and justify the methodology of this research. Chapter four shows the main results. The conclusion and discussion will be described in chapters five and six.

Chapter 2: Literature study

This chapter describes the theoretical background of business models, sustainable business models, business model innovation, and sustainable business model innovation. After that, the conceptual framework of this research is proposed. Thereafter, the design-implementation gap and the models and tools of sustainable business model innovation are described.

Business model

The concept of a business model has become popular since the growth of e-commerce during the past two decades (Nosratabadi et al., 2019). However, the concept of a business model lacks theoretical groundings in business studies (Teece, 2010). Therefore, scholars have different definitions for this concept. In most definitions, there is a central role for value proposition, value creation, value delivery, and value capture (Richardson, 2008). Zott and Amit (2010) added the term of value network to this concept. As a fact, a product or a technology itself does not create value without an effective and valuable business model (Johnson, Christensen, & Kagermann, 2008). Because scholars do not agree on what a business model is (Teece, 2010; Zott, Amit, & Massa, 2011) the broad definition of Osterwalder and Pigneur (2010) has been chosen for this research. In this research, a business model *"Represents the way firms create, deliver and capture value*" (Osterwalder & Pigneur, 2010, p. 14).

Business Model Canvas

In particular, a business model is a conceptualization of an organization that includes 3 key aspects: (Chesbrough, 2010; Osterwalder, 2004)

- How key components and functions/parts are integrated to deliver value to the customers
- How those functions/parts are interconnected within the organization and throughout its supply chain and stakeholder networks
- And how the organization creates profits, or generates value, through those interconnections

In order to better understand an organizations business model, scholars and practitioners have increasingly turned to business models as a way to make these connections more explicit (Joyce & Paquin, 2016). Osterwalder and Pigneur (2010) designed the Business Model Canvas (BMC), which has been widely adopted by practitioners (Joyce & Paquin, 2016) and researchers (Massa & Tucci, 2013). This canvas visually represents the elements of a business model and the

potential interconnections and impacts on how an organization creates, delivers, and captures value (Joyce & Paquin, 2016). Because this model is widely adopted and easy to use, this canvas is a useful concept to visualise a business model.

The Business Model Canvas divided a business model into nine interconnected components on how a business creates, delivers, and captures value. The components are: Value proposition, customer segments, customer relationship, channels, key resources, key activities, key partners, costs, and revenues (Osterwalder & Pigneur, 2010).

Customer segments, value proposition, channels, and customer relations are used to deliver value. Key resources, key activities, and key partners are used to create value. Revenues and costs are used to capture value (figure 1).

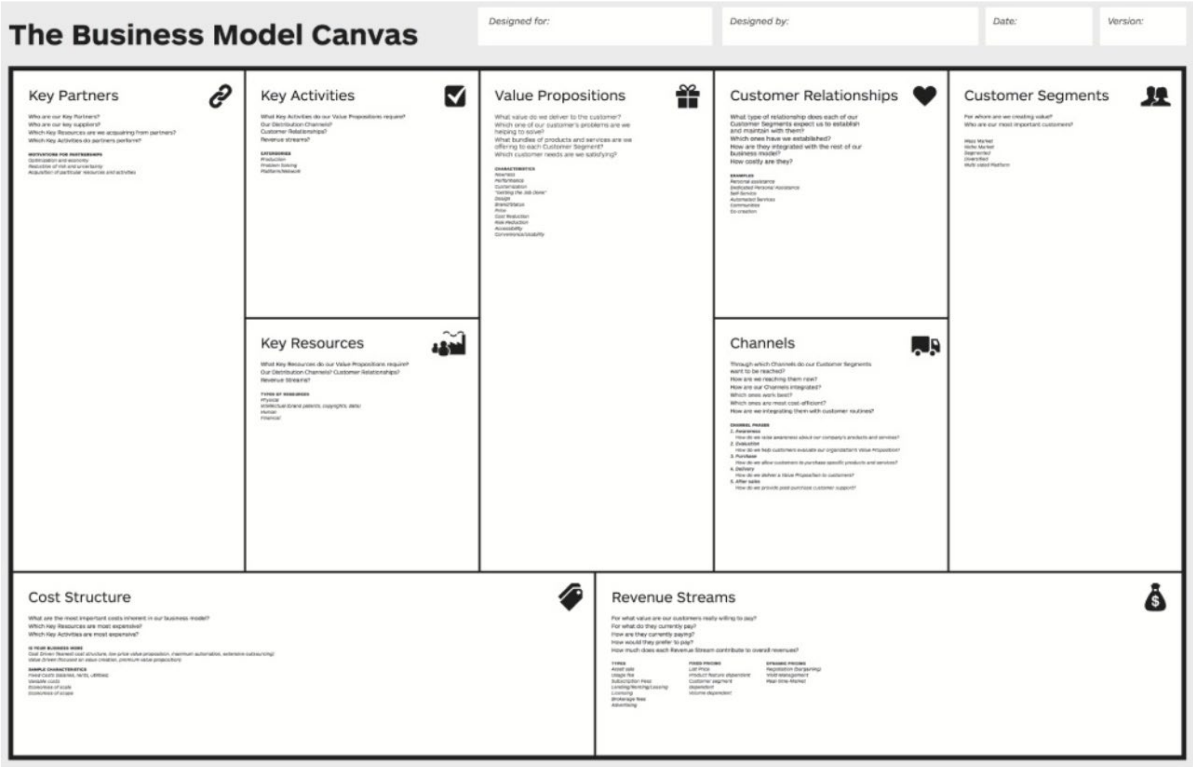

Figure 1: The Business Model Canvas (Osterwalder & Pigneur, 2010)

Sustainable business models

The interest in sustainable business models has grown rapidly for academics and practitioners in the last decade (Geissdoerfer et al., 2018). When the concept of sustainable business models was first conceived, the main purpose was to put companies into a more sustainable economic system, to achieve their sustainability ambitions, and to provide leverage for integrating sustainability considerations (Rashid, Asif, Krajnik, & Nicolescu, 2013; Stubbs & Cocklin, 2008). Nowadays, sustainable business models are increasingly seen as a source of competitive

advantage (Porter & Kramer, 2019). Definitions in the literature about sustainable business models have in common that sustainable business models are seen as a modification of the conventional business model concept, with certain characteristics and goals added to it (Geissdoerfer et al., 2018). Besides, sustainable business models 1) incorporate concepts, principles, or goals that aim at sustainability and 2) integrate sustainability into their value proposition, value creation, and delivery activities, or value capture mechanisms (Geissdoerfer et al., 2018). So, the main difference between the concept of business models and sustainable business models is the difference in terms of value. Therefore, the definition of Bocken, Short, Rana, and Evans (2013, p. 484) has been chosen in this research. *"Sustainable business models seek to go beyond delivering economic value and include a consideration of other forms of value for a broader range of stakeholders".*

Sustainable Business model archetypes

Bocken, Ritala, Huotari, Albareda, and Puumalainen (2018) have categorized different sustainable business models in the literature and practice into 9 sustainable business model archetypes. These types could be merged into three different themes like environmental archetypes, social archetypes, and economical archetypes types (figure 2).

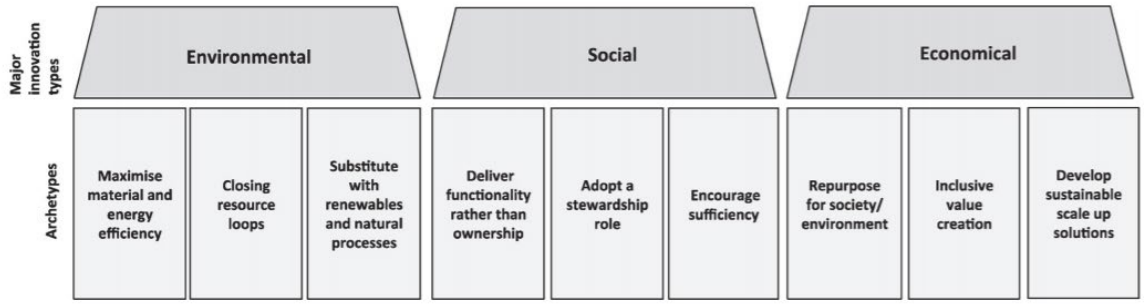

Figure 2: Sustainable business model archetypes (Bocken et al., 2018).

According to Bocken et al. (2018) the **archetypes for the environment** are *1: Maximize material and energy efficiency,* this is concerned with the optimization of used resources. *2: Closing resource loops* are concerned with reusing products and materials. *3: Substitute with renewables and natural processes* is concerned with business model innovations in renewables, like solar energy (Bocken et al., 2018).

The social archetypes focus on *4: the delivery of functionality rather than ownership*. This means that the necessity of ownership is moving into the use and functionality of products through the service type of models which is referred as products-as-service systems. *5: Adopt*

a stewardship role is about adding a stewardship and additional responsibility that a business has to take to achieve social and environmental issues. *6: encourage sufficiency* is about slow consumption as part of an business model (Bocken et al., 2018).

The economical archetypes focus on *7: the repurpose for society and/or the environment*. This is about changing the corporate structure for sustainability. *8: inclusive value creation* is about sharing resources, knowledge, ownership, and wealth creation. *9: the development of sustainable scale-up solutions* is about the delivery of sustainable alternatives at scale to maximize sustainable benefits (Bocken et al., 2018).

Business model innovation

The concept of business model innovation is a recent outgrowth of the existing business model literature and has gained an amount of attention in management research in the past 15 years (Foss & Saebi, 2017). The first concept of business model innovation was developed to understand and facilitate the analysis and planning of transformations from one business model to another (Schallmo & Brecht, 2018). Successful business model innovation can increase the organisation's resilience to changes in the environment and can lead to competitive advantage (Mitchell & Coles, 2003). In this stream of research, business model innovation refers to *"When two or more elements of a business model are reinvented to deliver value in a new way. Business model innovation can provide companies a way to break out of intense competition which product or process innovations are easily imitated"* (Lindgardt, Reeves, Stalk, & Deimler, 2012, p. 2). However, recent definitions of business model innovation refer nowadays to changes in the configuration of either the entire business model, or individual elements of it, either as a reaction to opportunities or challenges in the organisations environment or as a tool for diversification and innovation (Geissdoerfer et al., 2018). The application of the concept of business model innovation has nowadays a main field in corporate diversification, business venturing, and in start-up contexts (Geissdoerfer et al., 2018). Therefore, four generic configurations of business model innovation can be distinguished (figure 3): *Start-up:* There is no current business model, and a new business model is created. *Business model transformations*: There is a current business model that is changed into another business model. *Business model diversification*: The current business model stays in place, and an additional business model is created and *business model acquisition:* An additional business model is identified, acquired, and integrated (Geissdoerfer et al., 2018).

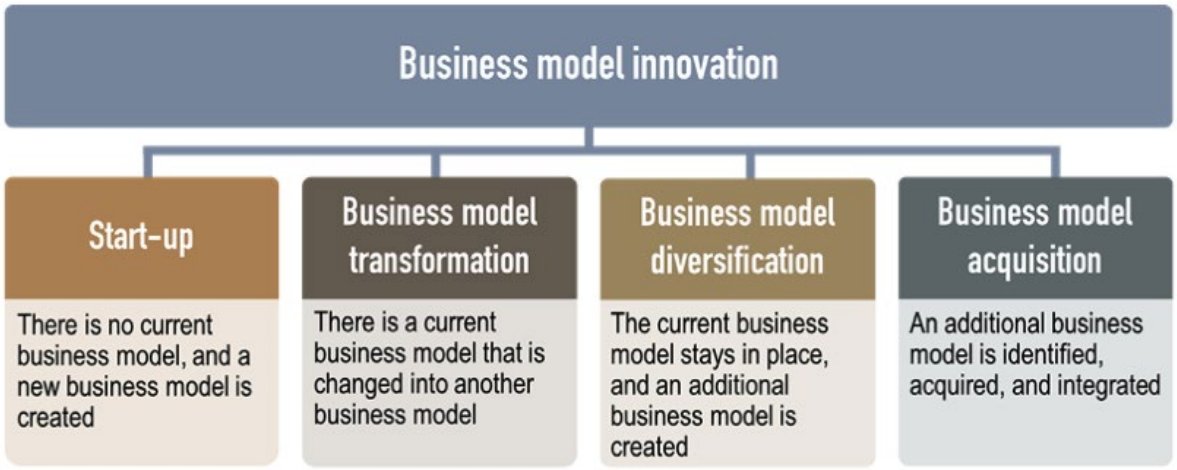

Figure 3: Business model innovation (Geissdoerfer et al., 2018).

Geissdoerfer, Bocken, and Hultink (2016, p. 1220) defined business model innovation as *"A process of transformation from one business model to another within incumbent companies or after mergers and acquisitions, or the creation of entirely new business models in start-ups"*. However, start-ups always have a new business model, because it is their first business model. Therefore, the more specific definition of Casadesus-Masanell and Zhu (2013, p. 464) is central in this research: *"Business model innovation refers to the search for new logics and new ways to create and capture value for its stakeholders; it focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers, and partners"*.

Sustainable business model innovation

Research in sustainable business model innovation has started relatively recently and is a subset in the sustainable business model field (Geissdoerfer et al., 2018). Changes in business models are recognized as a fundamental approach to realize sustainable innovations (Evans et al., 2017) and to improve the sustainability performance of organisations (Yang, Evans, Vladimirova, & Rana, 2017). Geissdoerfer et al. (2018) has developed four types of sustainable business model innovations: "*(1): sustainable start-ups: A new organisation with a sustainable business model is created. (2) Sustainable business model transformation: the current business model is changed, resulting in a sustainable business model. (3) Sustainable business model diversification: without major changes in the existing business models of the organisations, an additional, sustainable business model is established. (4) Sustainable business model acquisition: an additional, sustainable business model is identified, acquired, and integrated into the organisation"* (Geissdoerfer et al., 2018, p. 406). These four innovations are expected to aim at implementing a certain sustainable archetype of Bocken et al. (2018). The archetypes

are (1) maximise material and energy efficiency, (2) closing resource loops, (3) substitute with renewables and natural processes, (4) deliver functionality rather than ownership, (5) adopt a stewardship role, (6) encourage sufficiency, (7) repurpose for society or the environment, (8) inclusive value creation, and (9) develop sustainable scale-up solutions (Bocken et al., 2018). The archetypes are presented in figure 2.

So, the definition of sustainable business model innovation combines a business model innovation element with sustainability considerations. Therefore, the definition of Bocken et al. (2014, p. 44) of sustainable business model innovation is central in this research: *"Sustainable business model innovation is defined as innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organisation and its value-network create, deliver, and capture value (i.e. create economic value) or change their value propositions"*. Important for this research is that this definition is in the context of start-ups.

The Cambridge Business Model Innovation Process

The Cambridge Business Model Innovation Process (CBMIP) has been developed to addresses all the different stages of business model generation, from the conceptualization to the implementation. The CBMIP is the first framework to guide organisations to all the business model innovation efforts and to map the necessary activities (Geissdoerfer et al., 2017). This model covers the challenges arising in the business model innovation process that prevent the successful and sustainable implementation of business models (Geissdoerfer et al., 2017). This framework has been developed in 2017 and has to be further tested with companies with different characteristics, sizes, and sectors.

This framework is both descriptive and prescriptive. It is showing how business model innovation happens in practice (descriptive) and the model provides guidance on how business modelling should be ideally carried out in organisations (prescriptive) (Geissdoerfer et al., 2017). The process is typically cyclical or repetitive which means that most organisations will repeat or adapt to changes in the industry or environment, once completed. The steps are also sequential but iterative steps, which means that the steps have to be followed step by step, but it can also go back and forth.

The process consists of 8 different steps: Ideation, concept design, virtual prototyping, experimenting, detail design, piloting, launch, and adjustment & diversification. These steps are almost in line with the stage-gate model of Cooper (1990). However, the stage-gate model

is designed for new product development instead of business model innovation. Also, the stage-gate model has a set of deliverables specified for each gate as it is a set of quality criteria that the product must pass before moving to the next working station (Cooper, 1990) and the steps of CBMIP are sequential and iterative.

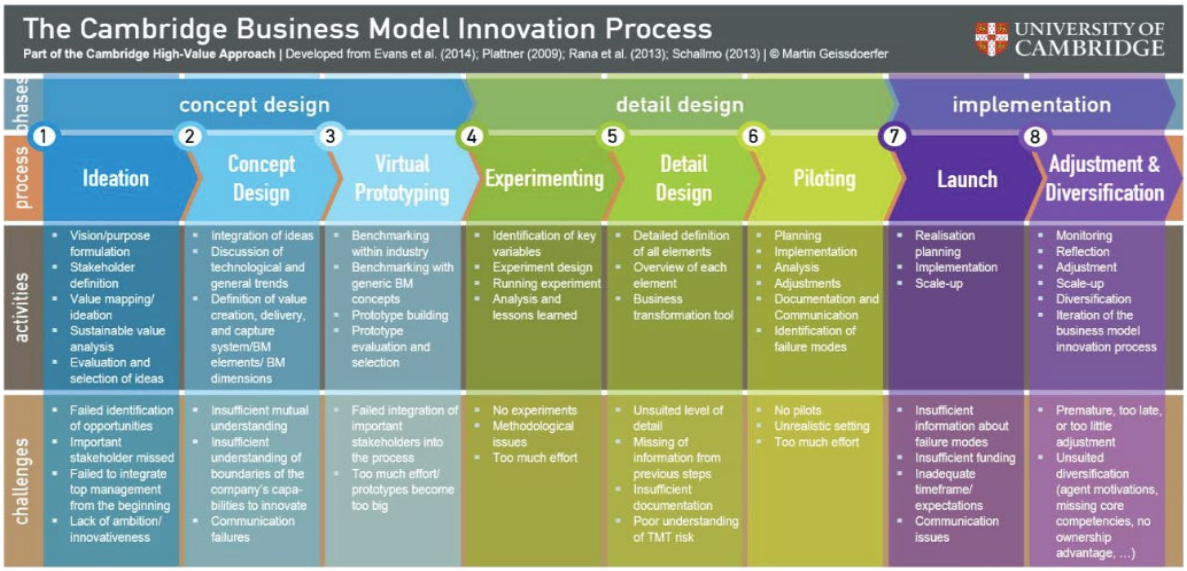

Figure 4: The Cambridge Business Model Innovation Process (Geissdoerfer et al., 2017)

This process is showing how business model innovations happen in practice, and how it should ideally be carried out in organisations (Geissdoerfer et al., 2017). According to Geissdoerfer et al. (2017) the steps of the Cambridge Business Model Innovation Process (CBMIP) are as following:

1: Ideation: The first step is to develop the purpose of the business model innovation and to define the key stakeholders. Also, the value proposition and first conceptual ideas are ideated. The main activities are: vision/purpose formulation, stakeholder definition, value mapping/ideation, sustainable value analysis and evaluation, and selection of ideas. The tools that could be used are the Value Mapping / Ideation Tool (Bocken et al., 2013; Geissdoerfer et al., 2016) and the Sustainable Value analysis (Yang, Vladimirova, & Evans, 2017).

2: Concept design: The second step is to develop and document a first rough conceptualisation of the key business model elements. The business model concept comprising the value proposition, value creation, delivery, and value capture elements. The main activities are: integration of ideas, discussion of technological and general trends, definition of value creation, delivery, and capture system/BM elements/dimensions. The tools that could be used are for instance the Triple Layer Business Model Canvas (Joyce & Paquin, 2016).

3: Virtual prototyping: The third step is to generate a range of prototypes. The main activities are: benchmarking within the industry and generic BM concepts, prototype building, prototype evaluation, and selection.

4: Experimenting: The fourth step is to test the key assumptions and variables of the concept in simulations and field experiments. The main activities are: identification of key variables, experiment design, running experiment and analysis, and lessons learned. Tools are for instance Business Model Experimentation tool (Bocken, Boons, & Baldassarre, 2019).

5: Detail design: The fifth step is to do an in-depth analysis and detailing of all the elements of the business model and interactions between these elements are conducted. The main activities are: detailed definition of all the elements, an overview of each element, business transformation tool.

6: Piloting: The sixth step is to test the entire concept by running a first version of the business model in a subsection of the target market. The main activities are: planning, implementation, analysis, adjustments, documentation and communication, identification of all failure modes.

7: Launch: The seventh step is to roll out the business model across all responsible organisational units and target markets. The main activities are realisation planning, implementation, and scale-up.

8: Adjustment and diversification: The eighth step is to revised the business model according to initial plans, expectations, and strategic fit. Based on the evaluation, adjustments and diversifications are made, and depending on the comprehensiveness of the necessary changes, the entire business model innovation process may be repeated. The main activities are monitoring, reflection, adjustment, scale-up, diversification, iteration of the business model innovation process.

Conceptual framework

This research will focus on which models and tools for sustainable business model innovation could be used by start-ups to bridge the design-implementation gap. First, the design-implementation gap will be described. After that, the models and tools for sustainable business model innovation will be described. This results in the following conceptual framework:

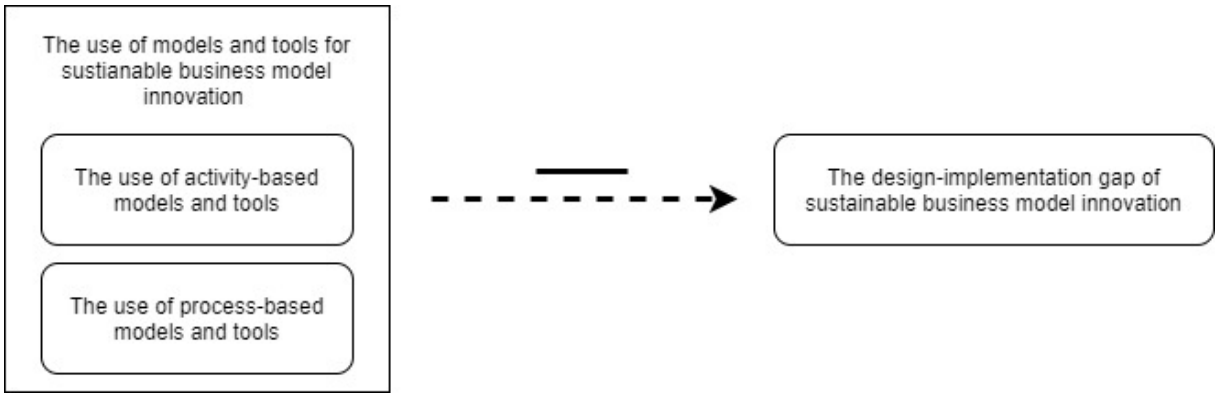

Figure 5: Conceptual framework

The design-implementation gap for sustainable business model innovation

According to Geissdoerfer et al. (2018), there is a three-fold problem in sustainable business model innovations: (1) many business model innovation meetings and workshops are conducted, but the ideas are not followed up, (2) even promising sustainable business model concepts are not implemented, (3) most implemented business models fail in the market, especially in the start-up context. These problems are caused by some challenges for innovation towards sustainable business models (Evans et al., 2017, p. 599).

***Triple Bottom Line**:* The co-creation of profits, social and environmental benefits and the balance among them are challenging for moving towards new sustainable business models (Hart, Milstein, & Caggiano, 2003; Schaltegger, Lüdeke-Freund, & Hansen, 2011; Stubbs & Cocklin, 2008).

Mindset: Business rules, guidelines, behavioural norms, and performance metrics prevail over the mindset of firms and inhibit the introduction of new sustainable business models (Boons & Lüdeke-Freund, 2013; Johnson et al., 2008; Yu & Hang, 2010).

Resources: Reluctance to allocate resources to business model innovation and reconfigure resources and processes for new sustainable business models (Bjorkdahl & Holmen, 2013; Chesbrough, 2010; Zott et al., 2011).

Technology innovation: Integrating technology innovation like clean technology, with business model innovation, is multidimensional and complex (Hart et al., 2003; Yu & Hang, 2010; Zott et al., 2011).

External relations: Engaging extensive interaction with external stakeholders and the business environment requires some extra efforts (Boons & Lüdeke-Freund, 2013; Stubbs & Cocklin, 2008).

Methods and tools: Existing business modelling methods and tools like (Osterwalder & Pigneur, 2010) are few and rarely sustainability driven (Bjorkdahl & Holmen, 2013; Girotra & Netessine, 2013; M. Yang, Vladimirova, Rana, & Evans, 2014).

These challenges are confirmed by different authors in the business model innovation, change management, and strategic management literature (Geissdoerfer et al., 2018).

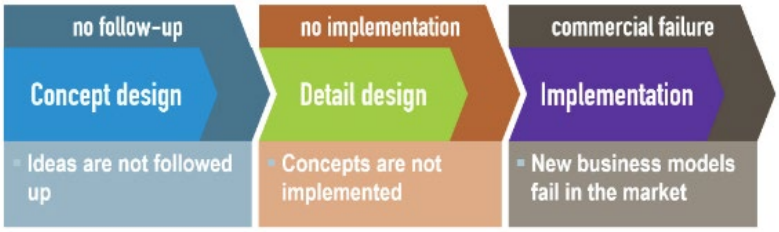

Figure 6: The design-implementation gap (Geissdoerfer et al., 2017)

In this paper, the design implementation gap is defined as *"The set of challenges that prevent organisations from successfully innovating their business model, due to insufficient follow-up on ideas, lack of implementation of concepts, and failure of businesses in the market"* (Geissdoerfer et al., 2018, p. 408).

Models & tools for sustainable business model innovation

To facilitate the design of business models and assist innovative endeavours, several tools and models have been developed (Geissdoerfer et al., 2017). Tool development for sustainability is a relatively recent phenomenon and has primarily focused on products or eco-innovation (Baumann, Boons, & Bragd, 2002; Bocken, Allwood, Willey, & King, 2011). The development of tools that aims at using business model innovation as leverage to help companies to meet their sustainability ambitions is even more recent, for instance, the Triple-Layered Business Model Canvas (Joyce & Paquin, 2016), Value Mapping Tool (Bocken et al., 2013) and Value Ideation Concept (Geissdoerfer et al., 2016). However, these approaches are focusing on only single phases of sustainable business model innovation (Geissdoerfer et al., 2017).

The Triple-Layered Business Model Canvas is a tool that extends the original Business Model Canvas with two layers: an environmental layer that is based on a lifecycle perspective and a social layer that is based on a stakeholder perspective (Joyce & Paquin, 2016). The three layers make it more explicit how a business generates economic, environmental, and social value.

The Value Mapping Tool adopts a multiple stakeholder view of value and is based on a network rather than a firm perspective (Bocken et al., 2013). This tool added three forms of value: value captured, value missed/destroyed, and value opportunity for four stakeholders groups: environment, society, customer, and network actors (Bocken et al., 2013). This tool was made to support organisations to better understand their overall value proposition (positive and negative) for all relevant stakeholders in their value network (Bocken et al., 2013).

The Value Ideation concept comprises value ideation, value opportunity selection, and value proposition prototyping (Geissdoerfer et al., 2016). This concept helps organisations to create additional forms of value for a wider range of stakeholders and stimulates the ideation process (Geissdoerfer et al., 2016).

These tools have helped with the design of some business model concepts, but offer little guidance through most of the remaining business model innovation process (Geissdoerfer et al., 2017). However, the visualisation and use of tools and processes can support firms in generating and developing new business model ideas and in overcoming the organizational innovation barriers (Eppler & Hoffmann, 2011).

Therefore, the use of these models & tools could lead to a reduction of the design-implementation gap. This will be investigated in this research (Figure 5). Specific characteristics of these models will be examined. Therefore, there are two different groups of models & tools, namely activity-based models and tools, and process-based models and tools.

Activity-based models and tools are supporting tools to visualise and represent key features of an organisation. In addition, it serves as a communication tool for stakeholders and as a handhold. Examples are the Business Model Canvas (Osterwalder & Pigneur, 2010), The Triple-Layered Business Model Canvas (Joyce & Paquin, 2016), and the Value Mapping Tool (Bocken et al., 2013).

Process-based models and tools consist of different phases and stages. This can be different phases with decision-making (Go/No Go) moments. These process-based models could be sequential or iterative. Examples are the Value ideation process (Geissdoerfer et al., 2016) and The Cambridge Business Model Innovation Process (Geissdoerfer et al., 2017).

Chapter 3: Methods

This chapter describes and justifies the methodology of this research. First, the research method will be justified. After that, the operationalisation, case selection, data collection, and data analysis will be described.

Research method

A qualitative research approach is used to research the sustainable business model innovation process in start-ups in order to bridge the design-implementation gap. This is a complex process and it remains unclear how start-ups actually implement their sustainable business model. It is also important to investigate which methods and tools the start-ups have used, and how they used them. Therefore, answering the main question requires an in-depth analysis of the process of sustainable business model innovation, and an explorative research is best suited. Qualitative research is preferred over quantitative research when doing explorative research (Yin, 2012). Also, a qualitative approach is best suitable because the research phenomenon takes place within complex and uncontrolled natures (Yin, 2012). Therefore, it can be concluded that a quantitative research design like surveys is inappropriate. Also, an experiment is not suitable because the phenomena is unable to be explored in real life. Thus, this research will follow a qualitative approach and will use multiple case studies. The case study method allows in-depth exploration of a phenomenon that is not yet well described, comparing to a survey (Yin, 2012). According to (Yin, 1994) a case study is "*An empirical inquiry that investigates a contemporary phenomenon in depth and within real-life context, especially when the boundaries between phenomenon and context are not clearly evident"*. Multiple cases increase rigour by *"strengthening the precision, the validity and stability of the findings"* (Miles & Huberman, 1994, p. 29), and that will lead to more compelling evidence (Yin, 1994).

Operationalisation

The following table presents the operationalisation of the theory. The use of models & tools is divided into the dimensions of the use of process-based models/tools and activity-based models/tools. Interviews will be held to investigate which tools & methods start-ups have used, and how they have used them.

The Design-Implementation gap is divided into three dimensions: Ideas are not followed up, concepts are not implemented and new business models will fail. The interviews will also investigate if the tools and methods have helped to bridge this gap.

Construct	Dimensions	Items	Source
The use of tools & methods	Activity based model	- Tool - Supporting - Visualizing - Representing - Key features - Communication (for stakeholders) - Handhold	Business model canvas (Osterwalder & Pigneur, 2010) Triple layered business model canvas (Joyce & Paquin, 2016) Value mapping process (Bocken et al., 2013)
	Process based model	- Stages - Processes - Phases - Workshops - Sequential - Iterative - Prototyping - Testing - Piloting	Design thinking / value ideation process (Geissdoerfer et al., 2016) CBMIP (Geissdoerfer et al., 2017)

Construct	Dimensions	Items	Source
The design - implementation gap	Ideas are not followed up	- Failed identification of opportunities - Important stake-holders missed - Lack of ambition / innovativeness - Vague vision - No appropriate business model for the idea's	Geissdoerfer et al. (2018) Geissdoerfer et al. (2017)
	Concepts are not implemented	- No experiments - Too much effort - Insufficient documentation - Methodological issues	Geissdoerfer et al. (2018) Geissdoerfer et al. (2017)

		- No pilots - Conflict with organisational logic	
	New business models fail in the market	- Misallocation of resources - Higher gross margins of the incumbent technology in the crucial early phases - Required changes in the current configurations of assets - Leaving short-term successes up to change - Failing to score successes early enough - Declaring victory too soon - Premature, too late or too little adjustments - Organisational debts	Geissdoerfer et al. (2018) Geissdoerfer et al. (2017)

Table 1: Operationalisation

Case selection

This research will focus on 8 start-ups that have a sustainable business model according to the archetypes of (Bocken et al., 2018). It is necessary that the start-ups have implemented the business model yet or that they are almost there, in order to investigate the total sustainable business model innovation process. The definition of a start-up is based on the criteria of the European Start-up Monitor (Kollmann, Stoeckmann, Hensellek, & Kensbock, 2016). A venture qualifies as a start-up when 1) it is younger than 10 years, 2) features innovative technologies and/or business models and 3) that have or strive for significant employee and/or sales growth. The European Start-Up Monitor qualifies a venture as a start-up when the first point of definition is met, along with one or both of the other two definitions points. The selected start-ups have a fictitious name. The informant overview with their real names can be found in Appendix B.

Start up Fictitious name	**CircuPastry**	**Circular Houses**	**Algae Foodz**	**Wooding**	**Sustainbikes**	**Human Robotics**	**Mobysustain**	**Sustalocal**
Product / Service	Cakes and pies from food that would be thrown away	Sustainable & circular houses	Nutrition on Algae base	Recycling food waste into compost	Rebuild your own bike to a tricycle	Using robotics in healthcare to improve life	Sustainable mobility advice	Emission-free delivery service
Founded	2017	2015 (first house build this year)	2015	2018	2018	2014	2018	2020
Archetypes of Bocken et al. (2018)	Closing resource loops Inclusive value creation	Maximize material and energy efficiency Closing resource loops	Substitute with renewables and natural processes	Closing resource loops	Encourage sufficiency	Inclusive value creation	Substitute with renewables and natural processes	Substitute with renewables and natural processes

Table 2: Case selection

Data collection

The data of this explorative research is gathered through semi-structured interviews. Interviews generate primary data that adds more reliability and richness for a specific purpose (Myers, 2020). Semi-structured interviews are chosen because there is room for additional questions to gain additional, new, and valuable information (Symon & Cassell, 2012). The interview questions were derived from the variables of the conceptual model and are based on the operationalization of the theory. The interview protocol is shown in Appendix A. Before the actual interviews, the questions will be tested with two test informants. Testing the interview protocol could lead to more in-depth information and therefore it will strengthen the data collection. Each interview will follow the structure of the interview protocol, but there is enough space for discussion to retrieve more additional data. All the interviews will be recorded. The interviews will be online, according to the Covid-19 rules. Because of this, no observations could be made. Triangulation will strengthen the trustworthiness of the conclusions of this research (Yin, 2012), and therefore, firm documents will also be used. Informant overview can be found in Appendix B.

Data analysis

All interviews will be recorded and transcribed. The transcripts will be sent to the informants in order to check if the interviews were perceived and interpreted correctly. The transcripts can be found in Appendix C. As suggested by Yin (2012), the interviews are analysed one by one and then compared to identify common patterns. The technique that is used to analyse the data

and to compare the patterns is a template analysis. A template analysis is chosen because it gives the researcher a combination of both flexibility and structure in working with textual data (Symon & Cassell, 2012). Also, a template analysis follows combined approaches of bottom-up and top-down (Symon & Cassell, 2012). Within the template analysis there is no fixed number of levels of coding hierarchy. As suggested by King and Brooks (2017), a priori codes are defined and after that, the codes are clustered into high order concepts and the templates are produced. The coded transcripts can be found in Appendix D. The final interpretation will be based on these templates.

Research ethics

This thesis is written according to the ethical guidelines as described in the Master Thesis handbook of Business Administration of Nijmegen School of Management. This is necessary to ensure research integrity. This handbook has been followed to ensure that there is no plagiarism, fabrication of data, manipulation of data, misrepresentation of data or mismanagement of data.

Chapter 4: Results

This chapter presents the results of this research. First, the design-implementation gap of sustainable business model innovation will be analysed. Then it will show how start-ups make use of activity-based, and process-based models & tools. Also, the effect of the use of activity-based models and process-based models & tools on the design-implementation gap will be presented.

Design-implementation gap of sustainable business model innovation

Based on the results, the following table shows to what extent the start-ups have faced the design-implementation gap. Important to mention is that all start-ups still exist. A high for "New business models fail in the market" means that the start-ups had the most challenges on this concept compared to the other two concepts.

	Case 1 Circupastry	Case 2 Circular Houses	Case 3 Algae foodz	Case 4 Wooding	Case 5 Sustainbikes	Case 6 Human Robotics	Case 7 Mobysustain	Case 8 Sustalocal
Ideas not followed up	Low	Low	Low	Low	Low	Low	Low	Low
Concepts not implemented	Low	Low	Medium	Medium	Low	Low	Low	High
New business models fail in the market	High	High	High	High	High	High	High	High

Table 3: The extent to which the start-ups faced the design-implementation gap

Many meetings & workshops are conducted, but the ideas are not followed up

The CEOs of the start-ups have different ways how they have generated their idea. Three CEOs have generated their idea from a sort of competition and brainstorm:

"I once participated in a brainstorm about how young people want to shape the circular economy. There I started to come up with the idea".
CEO of CircuPastry (I:1)

"Well uhm it started with some kind of core value brainstorming. I had a vision of, if I want to contribute something, then it has to be something in the field of self-sufficiency".
CEO of Wooding (I:4)

"Prior to July last year we entered a competition. Was a 24-hour game, a hackathon. And uhm yes to our surprise we were declared the winner in our category".
CEO of Sustalocal (I:8)

Other ideas came up from experiences from working in other companies (I:2), experiences and interests in their background & study (I:3, I:7), market demands (I:5, I:6), and developments of suppliers (I:6).

Several business models and products were based on their first idea, but this has been developed over time, as the CEO of Algae Foodz (I:3) has mentioned: *"Well how did the idea come about? That grows, of course. Uhm started with what I said from those protein substitutes. Found out pretty quickly that it was a dead end. Then we looked at whether we could experiment with animal feed, and later with human food […] Yes, it is always a matter of trial and error. As I said, you are looking for applications. […] The first approach was how can we start doing something from algae. The base was always the algae".* This is also stated by the CEO of SustainBikes (I:5) *"Yes, that was the first idea. Of course, there have been some technical adjustments, but I think you always have that with a product that you make. We are just continuously developing".*

So, despite some changes in their business models and products, all start-ups have followed up their ideas. No start-up has started something completely different.

Promising sustainable business model concepts are not implemented

Seven start-ups are generating revenues right now. However, Sustalocal (I:8) is still struggling with its implementation. It won a competition that was organized by the municipality. The municipality also provided the jury, so they were convinced that the municipality wanted to do something with this idea. In practice, this is very disappointing because they are not live yet, even it is a promising concept, which has been mentioned by the CEO of Sustalocal (I:8): *"We have been in it for almost 10 months, but we still do not earn any money. The municipality devised the question for the competition, provided the jury chairman, and has chosen us as winners. So we thought the municipality would like to do something with this idea. In practice this is disappointing, we are still busy with talking. So yes, the concept after such a hackathon is there, but the practice is disappointing. Everyone is enthusiastic and there is good energy, but when it comes to reality, everyone is busy with something else. So yes, it is difficult to implement the concept. It stands or falls with the 4 partners to what extent we put time and energy in. And in the end, you just need cooperation partners who want to support that for some reason".*

This is the only start-up that is struggling with its concept. The CEO of Sustalocal (I:8) stated that maybe they have to shift from their sustainable aspirations: "*By really achieving that*

sustainable social impact than you really need a lot more than, yes, than you really have to reach 50% of the market, so we struggle a lot with that. So, are we going to uphold those principles and ideals of the concept? Or are we going to let it go of them anyway, so we are able to start at least? So yes, that is the dilemma we are in now". So, this start-up is really struggling with its sustainable business model and is thinking of moving away from sustainable values. This is a typical example of the design-implementation gap.

Wooding (I:4) has other ideas that have not been implemented yet "*I have more ideas about that platform. Those ideas are there, but they have not yet been implemented. And why not? So actually the first reason because it takes too much time".* This is also a promising concept but is still not implemented because it takes too much effort. However, the plan is still for the future: *"Now let's say I started very small and it can grow towards that. The idea is still there, but uhm yes that takes a lot of time. But uhm yes it can grow towards that".*

Algae Foodz (I:3) has developed several products, but some are not implemented because they are focusing on products with the most value in the short term, which has been mentioned by the CEO: *"Well, some ideas of products are in the closet right now. At some point, we have to make choices. We have developed quite a variety of products. But you also have to look at where the possibilities lie".*

The CEOs of these two start-ups have decided to wait before they will implement these concepts because it takes too much effort right now. The CEOs are busy with their current concepts, but they expect to implement these concepts in the future. Because of this, these two start-ups score a medium for the concept "concepts not implemented" in table 3.

Most implemented business models, especially in the start-up context, fail in the market

The CEOs of all start-ups have experienced different challenges for not failing in the market. The most important reason is that new products and business models are new and unknown to the customers.

"Unknown makes unloved".
CEO's of Algae Foodz (I:3), Sustainbikes (I:5) & Sustalocal (I:8)

Similar words have been used by the CEOs of Circular Houses (I:2) and Human Robotics (I:6). As a result, customers need time to get familiar with the new business model and the products before they will like and buy them. The following quotes illustrate this:

"It is especially difficult because a new product is unknown. If you are a new brand, but the product does exist, you can easily link to the USP of those other products. So yes, if you really bring a new product to the market that nobody knows yet, it is difficult to create awareness among the consumer".
CEO of SustainBikes (I:5)

"But what the farmer doesn't know, he doesn't eat".
CEO of Algae Foodz (I:3)

In addition, to the challenge to create awareness by their customers, some start-ups with a sustainable business model forget to focus on the financial aspects of the business model. Some entrepreneurs are focussing too much on the sustainable aspirations of their start-up, which has been mentioned by the CEO of SustainBikes (I:5) *"If someone starts a company and it is in a sustainable context in any atmosphere, then the focus is mainly on the sustainable element. In the end, you just have to establish a healthy company. Some people are super focused on the social or environmentally friendly goal, but in addition, you always have a financial goal that must also be guaranteed. You must ensure that your finances must be in order. And well, if your finances are not in order, then well, you cannot achieve anything social or sustainable".* This is also stated by the CEO of Algae Foodz (I:3): *"No matter how sustainable you are, you also need a good commercial and revenue model, because otherwise, it will fail quickly",* and by the CEO of Sustalocal (I:8) *"If you have a sustainable business model or a sustainable start-up then uhm yes it is all well and good but money has to come from somewhere"*. Therefore, it is very important to have a good revenue model.

Another challenge for not failing in the market is dependent on the developments in the industry. Some industries are at the forefront of sustainability, and others in the early stages. The following quotes illustrate this:

"In the beginning, I don't think we had the image with it, for both sustainable goals. Nowadays, people recognize the problem of waste, so we don't have to tell the story anymore",
CEO of CircuPastry (I:1)

"*On the other hand you see, especially in the market where we are in, that the more local, healthy and without uhm preservatives will play an increasingly important role, then we are on the good side of the market. But it just takes a lot of time to eventually conquer that market"*
CEO of Algae Foodz (I:3)

"But the challenge is that they always think of the traditional means. Way too conservative and traditional".
CEO of Circular Houses (I:2)

So, timing and developments in the industry are also very important for not failing in the market. Other challenges that the start-ups are facing for not failing in the market are: (The misunderstanding that I:2) Sustainable products are more expensive (I:3), not the right suppliers (I:4), way of convincing and knowing your customers (I:7), technical skills (I:5), scarcity of parts (I:5), competition / no partners (I:8) investment risks (I:6) and cultural differences (I:1).

The use of models & tools

Table 4 is showing which cases show characteristics of activity-based and process-based models and tools:

	Case 1 Circupastry	Case 2 Circular Houses	Case 3 Algae Foodz	Case 4 Wooding	Case 5 Sustainbikes	Case 6 Human Robotics	Case 7 Mobysustain	Case 8 Sustalocal
Activity based models / tools	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Process based models / tools	No	Yes	Yes	No	Yes	Yes	No	No

Table 4: The use of activity-based models / tools and process-based models / tools by all cases

The use of activity-based models & tools

In the following section, the findings are discussed which CEO has used activity-based models and what the effect is on the design-implementation gap.

The Business Model Canvas is most known and used by the CEOs (I:1, I:2, I:4, I:5, I:7, I:8). However, the CEOs of Algae Foodz and Human Robotics did not use this model.

"Yes, yes, we used it. So we also give a course in that, of how it should be"
CEO of Circular Houses (I:2)

"Yes, business model canvas of course"
CEO of Wooding (I:4)

"Yes business model canvas we have used, and the value proposition canvas"
CEO of SustainBikes (I:5)

"Yes, BMC we have used a lot"
CEO of Mobysustain (I:7)

The CEO of Algae Foodz does not know and use this model because he is not familiar with these types of models (I:3) *"No, we didn't use that […] I think too unknown to be honest. I think because we are actually not purebred entrepreneurs or something, but mainly a passion from the field".* The CEO of Human Robotics (I:6) does not use the Business Model Canvas because he mentioned that their market is rapidly and continuously changing. As a result, they continuously have different customers, which means they create different values for each customer, which has been mentioned by the CEO of Human Robotics (I:6) *"Well that just changes very quickly. Yes, that is also because that technology is just so fast. At the time of writing it is almost outdated".*

The CEOs of the start-ups that have used the Business Model Canvas has different reasons why they have used this canvas: For communication to stakeholders (I:1), to convince partners (I:2), knowing your customers (I:5), focus (I:6), and for your own values and goals (I:1).

Other activity-based models & tools that some CEOs have used are: Impact analysis (I:1), Value Strategy (Product leadership, Operational Excellence & Customer intimacy) of Treacy and Wiersema (I:4), Value Proposition Canvas (I:5), and cost-benefit analysis (I:8).

All CEOs of the start-ups are not familiar with sustainable tools like the Triple-Layered Business Model Canvas or the Value Mapping Tool. However, when showing them the models, the CEOs recognize the aspects of these models, which has been mentioned by the CEO of Circular Houses (I:2) *"But I can immediately see at a glance what we are doing, for example. Yes I can fill that in like this",* and by the CEO of Circupastry (I:1) *"I can see that I subconsciously filled it in nicely"* and that these types of models become more and more important nowadays, which has been mentioned by the CEO of Human Robotics (I:6) *"Well you can see that it is becoming more and more important. You see that people are becoming more and more sensitive to that".*

Personal interest is also an important aspect of why and how they used these types of models, which has been mentioned by the CEO of Circupastry (I:1) *"It really differs a lot in terms of the type of entrepreneur. I don't like it that much, but I do know that others like it",* and by the CEO of Mobysustain (I:7) *"I am not very fond of filling in the models, you only find out if something works when you have tried it out, you better fill it in afterward".*

The effect of activity-based models & tools on the design-implementation gap

Based on the findings, the use of activity-based models has mainly an effect regarding new business models for not failing in the market. Activity-based models are or could be, important

for attracting investors, which has been mentioned by the CEOs of Circupastry (I:1), Algae Foodz (I:3), Wooding (I:4), Sustainbikes (I:5), and Sustalocal (I:8). Investors are / or could be needed for growth capital and therefore the start-ups have a greater chance of survival because they can also guarantee any debts. Organizational debts are namely an important reason why start-ups fail. The following quotes illustrate how activity-based models could attract investors:

"Eventually you write such things for e.g. fund grants to qualify. So for investors. So to communicate clearly and concretely of what you are doing".
CEO of CircuPastry (I:1)

"I have not yet been in contact with investors myself, but uhm yes, I can imagine that it can be very useful. And yes, of course it easily shows the values of the company".
CEO of Wooding (I:4)

Even Algae Foodz (I:3), who has not used the business model canvas, believes that it can help to attract investors, which has been mentioned by the CEO: *"For investors who look at sustainability and social aspects, then this does play a very important role".*

Despite the fact that the CEOs of all start-ups are not familiar with the Triple-Layered Business Model Canvas, they believe that this could be a useful model. The social and environmental value is becoming more and more important for investors instead of only the economic value, which has been mentioned by the CEO of SustainBikes (I:5) "*I do notice that investors are more concerned with investing in the social domain. So yes in the social application or sustainable application […] If you could add value in multiple ways, you can convince an investor more and more that you have a product that actually adds value".* However, a revenue model is still very important (I:5) "*If your finances are not in order, then well, you can't achieve anything social or sustainable".*

In addition to investors, activity-based models are also important for attracting suppliers & other partners, which has been mentioned by the CEOs of Circular Houses (I:2), Wooding (I:4), SustainBikes (I:5), Mobysustain (I:7), and Sustalocal (I:8). By bringing in the best partners and suppliers, the start-ups have a better chance for survival, exemplified by the following:

"Yes I do use this for my suppliers and customers for example"
CEO of Wooding (I:4)

"You can show the outside world what you are doing. So it also helps for a better chance for survival".
CEO of SustainBikes (I:5)

The CEO of Circular Houses (I:2) has shown their Business Model Canvas to a partner. This resulted in the fact that they were convinced and immediately started a partnership *"Yes for a*

lot of parties it remains unbelievable [...] We also sat around the table with them a few times and this has had an effect on them […] It did speed up the process, that helped us a lot".

Except activity-based models affect investors, partners & suppliers, it has also a positive internal effect, which has been mentioned by the CEO's of CircuPastry (I:1), Circular Houses (I:2), Algae Foodz (I:3), SustainBikes (I:5), Mobysustain (I:7), and Sustalocal (I:8). It helped the CEOs to stay focused and to stay close to their own values and goals which is illustrated by the following quotes.

"This has helped me to determine my values and goals and stick to them"
CEO of CircuPastry (I:1)

"It helps to gain insight into your own company, your own market and your own added value".
CEO of SustainBikes (I:5)

So, activity-based models have helped the CEO's to keep believing in their own goals and values and to keep going with their business despite setbacks, which has been mentioned by the CEO of Circular Houses (I:2)*"Of course keep believing into yourself. A lot of entrepreneurs give up because they have a number of setbacks".*

As a result, the use of activity-based models & tools leads to the attraction of investors, partners, and suppliers and therefore to a larger negative effect on failing in the market. The activity-based models and tools have helped the start-ups to tackle this challenge. It has helped for the attraction of investors, partners, and suppliers and, in addition, for their own focus, values, and goals. This is perfectly summarized by the CEO of Sustalocal (I:8): *"Yes, if you are working with a sustainable social movement then it is very important to stay close to it and uhm yes such overviews can certainly help. Also to stay alert and converse with potential partners, investors, uhm cooperation parties and uhm yes customers, so yes also to grow and uhm yes to stay alert about what is it really about. So yes, such overviews could be really useful".* So, activity-based models could help for the growth potential of the start-up. In addition, activity-based models have helped the start-ups to stay focused and to stick to their own goals and values. Because of this, they believed in themselves and they kept going despite several setbacks. However, it is necessary to get the right balance (I:7) *"Some get stuck in the models and then nothing happens, and others use them well and get to work with them".*

The activity-based models did not have a convincing effect on parts one and two of the design-implementation gap. The CEOs of the start-ups stated that what they are doing right now, was based on their first idea, so they have followed up their ideas. There have been some minor adjustments but that is not coming from the use of activity-based models. However, according

to the CEO of Wooding (I:4), activity-based models could actually work adversely when it comes to idea generation *"Look at the whole idea generating it might actually be paralyzing. Because yes, often entrepreneurs just have 1 idea that they want to develop".*

Only one start-up (Sustalocal, I:8) has experienced the challenge that promising sustainable business model concepts are not implemented. Sustalocal has a promising sustainable business model concept, however, the CEO is thinking of moving away from the sustainable values, so they can finally start. This is a typical example of a promising concept that has not been implemented yet. This is caused by other factors and not by (not) using activity-based models. These findings lead to the following propositions:

Proposition 1A: The use of activity-based models & tools leads to the attraction of investors, partners, and suppliers and therefore to a larger negative effect on failing in the market.

Proposition 1B: The use of activity-based models & tools leads to more focus on own values and goals and therefore to a smaller chance of quitting which leads to a larger negative effect on failing in the market.

The use of process-based models & tools

The following section presents the results of the use of process-based models & tools and what the effect is on the design-implementation gap.

The use of process-based models & tools is dependent on different factors. The start-ups have worked in two ways, starting and launching as soon as possible (CircuPastry (I:1), Wooding (I:4), Mobysustain (I:7), and Sustalocal (I:8)) or developing the product by prototyping & testing (Circular Houses (I:2), Algae Foodz (I:3), SustainBikes (I:5), and Human Robotics (I:6)).

The CEO's that have launched their product as soon as possible believe more in a launch & iterate philosophy and an agile / scrum method, which is illustrated by the following quotes:

"Start small and try out, otherwise you working out anything in detail, and in the end maybe the conclusion is that the customers do not want this".
CEO of Sustalocal (I:8)

"Well we just started, learned, and changed things over time. You cannot take everything into account in advance. There is no golden rule for this but now we have new products every few weeks that are better than the previous one".
CEO of CircuPastry (I:1)

"You need to speak to someone who can be your customer, based on that, so what their need is, design what you can offer. Working out everything in advance is useless. So start small and start understanding your customer".
CEO of Mobysustain (I:7)

"Well I prefer the Google philosophy, so launch and iterate".
CEO of Wooding (I:4)

So, these CEOs have launched their product as soon as possible to get interaction with their customers, learn from the insights and develop the product over time based on the first experiences.

The CEOs of Circular Houses (I:2), Algae Foodz (I:3), SustainBikes (I:5), and Human Robotics (I:6) have made use of different processes before they have launched their product. However, these CEOs are not familiar with the Value Ideation process or the Cambridge Business Model Innovation Process. They also stated that they did not follow a specific process model. They stated that this is a very iterative process. Looking at the characteristics of these models, prototyping, testing and piloting are the most important steps for these start-ups. The main reason for this is their industry, exemplified by the following.

"In the food industry it has to look good, taste good, smell good and be easy to process. That is very important in our industry".
CEO of Algae Foodz (I:3)

"We run pilots at the largest companies for free […] asked for feedback, and make personalized adjustments […] We see that this works best in the robotics world".
CEO of Human Robotics (I:6)

Therefore, it is very important to do several tests and make adjustments based on the feedback before they can launch the product. The products of Human Robotics (I:6) are also very dependent on the industry. They first gave the product for free to the customer to do some tests and experiments and asked for feedback. Based on that, they make adjustments to perfectly fit the need of their customer. Because of this, every product is different but it is fully in line with the values of that customer. Circular houses (I:2) have used different processes for developing the product, but also for the building instructions. This product is built by people who have a learning disability (I:2) *"Those people are taught how to put this together, so yes, then you are actually already making prototypes and testing them".* The CEO of SustainBikes (I:5) stated that it is very important to fully understand the needs of the customer and that the product perfectly needs to fit these needs. Testing and prototyping are therefore very important to create the perfect product: *"I have the feeling that people want to get to the product very quickly. But*

it is not exactly about the product. The product is only the mean to solve your idea or problem that you see. But in the end, it is about the problem or the need you are trying to fill. Which problem do you solve or which need do you fill? I think that is very important".

So, it is clear that there are two different groups for using process-based models. One group has a perspective to launch as soon as possible to get in contact with their customers and make adjustments based on these experiences. For the other group, prototyping and testing are very important before they launch the product. This has mainly to do with the industry they are operating.

The effect of process-based models & tools on the design-implementation gap

Based on the findings, it is industry-dependent whether CEOs of start-ups are using process-based models & tools. The CEOs of the start-ups are not familiar with the Value Ideation process or The Cambridge Business Model Innovation Process. However, Circular Houses (I:2), Algae Foodz (I:3), SustainBikes (I:5), and Human Robotics (I:6) make use of certain characteristics of these models. Prototyping and testing are some important phases for Algae Foodz (I:3), SustainBikes (I:5), and Human Robotics (I:6). This has helped to identify the customer's needs and to match them perfectly. This gave them a greater opportunity to succeed in the market, which is illustrated in the following quotes:

"Of course we have developed products and conducted taste tests on a smaller scale. So guys how is it, how does it taste, how can we improve it? And, uhm, working with that knowledge to improve the taste. But also baking quality. So well, we have done tests. And received feedback from those experiences […] Look, I can develop a really great bread, super healthy but if that baker can't bake it then it will never succeed on the market".
CEO of Algae Foodz (I:3)

"So really think carefully about the concept and the ideas. Uhm yes, I think a lot of mistakes are made there too. But that's an assumption, I don't have any numbers. I have the feeling that people want to get to the product very quickly. But it is not exactly about the product. The product is only the mean to solve your idea or problem that you see. But in the end, it is about the problem or the need you are trying to fill. Which problem do you solve or which need do you fill? I think that is very important".
CEO of SustainBikes (I:5)

"That is also a very nice commercial tool. We can say to other customers that our product arose from the input of the largest hospitals. This product is based on their input. We didn't make this up ourselves […] but really took it out of the pilots".
CEO of Human Robotics (I:6)

Circular Houses (I:2) uses tests and prototypes as a training program. This allows people with a learning disability to build the houses in 4 days, which is illustrated in the following quote:
"Those people are taught how to put this together, so yes, then you are actually already making

prototypes and testing them[…] This allows us to build in 4 days. So that is also an element that plays an important role". This gives a competitive advantage.

So, for some start-ups, it is very important to fully understand the customer and to do some tests. Algae Foodz (I:3) did some tasting tests with customers but also some bakery tests to check if a bakery could bake the product, while Human Robotics (I:6) tested their product for a free month at the largest potential customers to receive feedback to understand their values. After the tests, they could make adjustments based on the feedback. This allowed them to deliver a better product at the launch. This has ensured that Algae Foodz (I:3) and Human Robotics (I:6) were able to succeed in the market. In addition, prototyping & testing could lead to a competitive advantage. Circular Houses (I:2) started a training programme for people with a learning disability to build these houses. Because of the training program, they practice a lot and are therefore able to build a house in 4 days, which gives them a competitive advantage. So based on the findings, the use of process-based models & tools leads to a better match of customer needs, a better product at launch, and a competitive advantage which leads to a larger negative effect on failing in the market.

In addition, some tests have shown that a certain concept of a product has to wait before it could be implemented because the product does not create the expected value in the short-term, which has been mentioned by the CEO of Algae Foodz (I:3): *"Yes, because it started to colour green and black. Uhm yeah it didn't look very appetizing let's say. And at some point you have to make choices".* So, the use of process-based models & tools could have a small effect to decide whether to implement a potential concept.

CircuPastry (I:1), Wooding (I:4), Mobysustain (I:7) & Sustalocal (I:8) stated that process-based models and tools actually might increase the chance to fail in the market. They stated that it is impossible to take everything into account in advance. Testing and prototyping can spend a lot of time without getting results.

"If you really want to find out everything in advance, there is also a chance that it works paralyzing"
CEO of Wooding (I:4)

"It is useless to think about everything in advance […] New information comes every time. So yes, if you are still discovering the market, you are continuously developing and improving".
CEO of Mobysustain (I:8)

They prefer to implement a product as quickly as possible and learn from that experience. Therefore, it depends on what kind of product the start-ups have and in which industry it operates whether process-based models could bridge the design-implementation gap.

The findings lead to the following propositions:

Proposition 2A: The use of process-based models & tools is dependent on the characteristics of the industry.

Proposition 2B: Depending on the industry, the use of process-based models & tools leads to a better match of customer needs, a better product at launch, and competitive advantage which leads to a larger negative effect on failing in the market.

Proposition 2C: The use of process-based models & tools has a small effect on the decision-making of whether to implement a potential concept.

The findings of the results are summarized in the following table. N.D. means that there is no data to conclude what the effect is.

	Case 1 CircuPastry	**Case 2 Circular Houses**	**Case 3 Algae Foodz**	**Case 4 Wooding**	**Case 5 SustainBikes**	**Case 6 Human Robotics**	**Case 7 MobySustain**	**Case 8 Sustalocal**
Use of Activity based models and tools	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Effect on 1: Ideas are not followed up	N.D.	N.D.	N.D.	Could work paralyzing	N.D.	N.D.	N.D.	N.D.
Effect on 2: Promising concepts are not implemented	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	Other factors
Effect on 3: New business models fail in the market	Attracting investors Own focus, values and goals	Partners & suppliers Own focus, values and goals	Could be useful for Attracting investors Own focus, values and goals	Attracting investors Partners & suppliers	Attracting investors Partners & suppliers Own focus, values and goals	N.D.	Partners & suppliers Own focus, values and goals	Attracting investors Partners & suppliers Own focus, values and goals
	Case1 CircyPastry	**Case 2 Circular Houses**	**Case 3 Algae Foodz**	**Case 4 Wooding**	**Case 5 SustainBikes**	**Case 6 Human Robotics**	**Case 7 Mobysustain**	**Case 8 Sustalocal**
Use of Process based models and tools	No	Yes	Yes	No	Yes	Yes	No	No
Effect on 1: Ideas are not followed up	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Effect on 2: Promising concepts are not implemented	N.D.	N.D.	Decision making moments short term expected value	N.D.	N.D.	N.D.	N.D.	N.D.
Effect on 3: New business models fail in the market	Can take a lot of time without		Match customer needs	Can take a lot of time without	Match customer needs	Match customer needs	Can take a lot of time	Can take a lot of time without

	getting results	Working faster Competitive advantage	Better product at launch	getting results	Better product at launch	Better product at launch	without getting results	getting results

Table 5: Summarization of the results

Propositions and revised conceptual model

Based on the findings, several propositions have been identified. These propositions lead to a revised conceptual model, which is visualized in figure 7. The propositions are:

Proposition 1A: The use of activity-based models & tools leads to the attraction of investors, partners, and suppliers and therefore to a larger negative effect on failing in the market.

Proposition 1B: The use of activity-based models & tools leads to more focus on own values and goals and therefore to a smaller chance of quitting which leads to a larger negative effect on failing in the market.

Proposition 2A: The use of process-based models & tools is dependent on the characteristics of the industry in which a start-up is operating.

Proposition 2B: Depending on the industry, the use of process-based models & tools leads to a better match of customer needs, a better product at launch, and competitive advantage which leads to a larger negative effect on failing in the market.

Proposition 2C: The use of process-based models & tools has a small effect on the decision-making of whether to implement a potential concept.

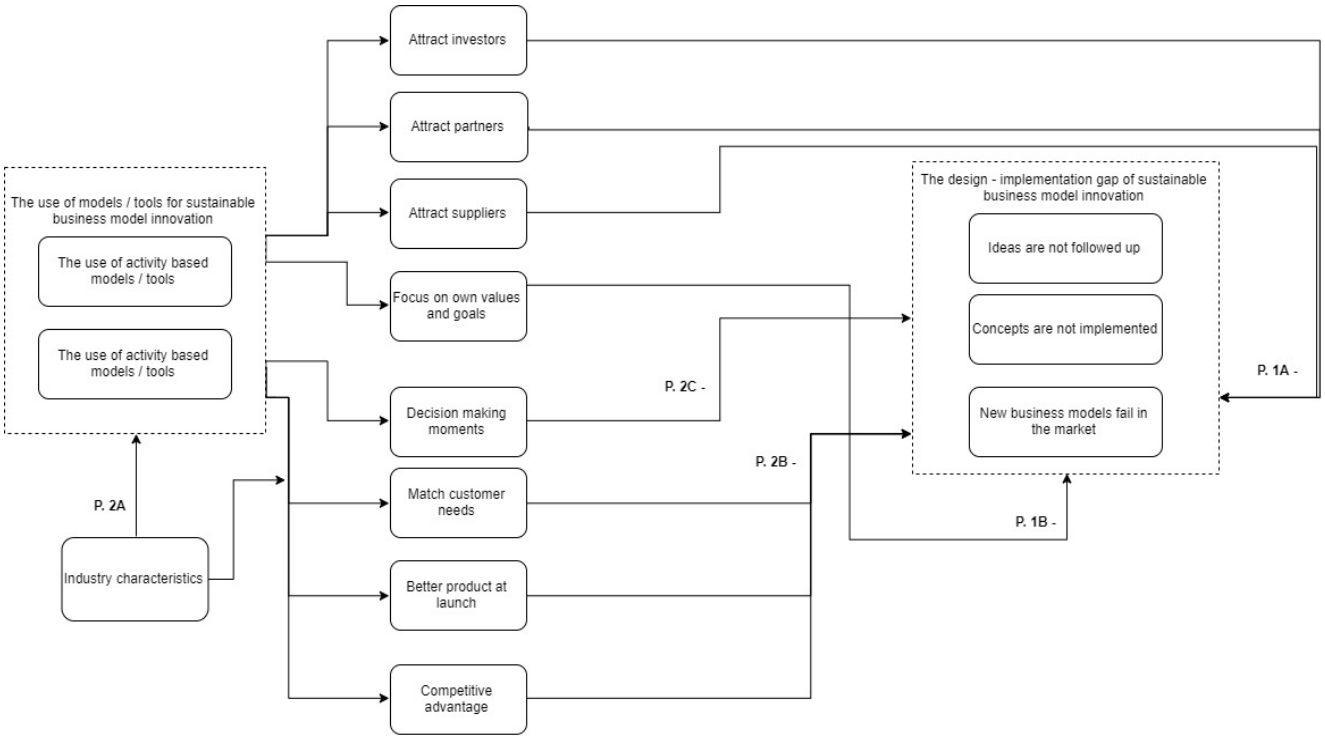

Figure 7: Revised conceptual model based on the identified propositions

Chapter 5: Conclusion

The main objective of this research was to describe how start-ups can bridge the design-implementation gap of sustainable business model innovation. The associated research question was: *How can start-ups bridge the design-implementation gap of sustainable business model innovation?*

First of all, the results of eight case studies show that the biggest challenge for start-ups is not to fail in the market. This is due to several reasons: The sustainable business models and the products are new in the market. It, therefore, takes time and effort to create awareness among the end-user. In addition, entrepreneurs may focus too much on the sustainable aspects of their business model. As a result, little attention is given to the financial aspect of a business model. A suitable revenue model is therefore very important. At last, the industry is also a determining factor for succeeding in the market. Some industries are at the forefront of sustainability, and other industries are still working too conservative and too traditional, making sustainability difficult.

The results of eight case studies suggest that the use of activity-based models and tools by start-ups helps not to fail in the market. These types of models & tools help start-ups to attract investors, suppliers, partners, and customers. As a result, this makes them more likely to succeed in the market. Besides, these tools & models help to stay focused and to stay close to the own values and goals of the start-ups. Because of that, the start-ups keep going despite suffering setbacks.

Process-based models & tools could also be useful for not failing in the market. However, this depends on the industry in which the start-up operates. Prototyping, testing & piloting is in some industries very important, for example, the food industry. By using process-based models & tools, start-ups are able to match better to customer needs, have a better product at the launch, and can cause competitive advantage. As a result, they are less likely to fail in the market. In addition, the use of process-based models and tools could lead to the decision-making whether to implement a potential concept or not. However, prototyping, testing & piloting can take a lot of time. Other start-ups from less demanding industries will therefore skip these steps and immediately launch their product to get in touch with end-users as soon as possible to learn and adapt based on these experiences.

It can be concluded that start-ups can bridge the design-implementation gap by using activity-based models. This makes it easier to attract investors, suppliers, partners, and

customers. In addition, it brings focus to own values and goals. This particularly affects the concept not to fail in the market.

Process-based models could also be used to bridge the design-implementation gap. This leads to a better match of the customer needs, to a better product at the launch, and can cause a competitive advantage. This particularly affects the concept not to fail in the market. In addition, it also affects the decision to implement a potential concept or not. However, the use of process-based models and tools is very dependent on the industry in which a start-up operates.

Chapter 6: Discussion

Theoretical implications

The insights derived from this study advance knowledge about the effect of the use of activity-based and process-based models and tools on the design-implementation gap. Previous research had mostly focused on some business model concepts, but not on the total business model innovation process (Geissdoerfer et al., 2017). Besides, the way how organisations actually implement a business model was still unexplored (Chesbrough, 2007). This study had focused on the whole process, from idea generation to implementation. This study suggests that start-ups should make use of activity-based models and tools to bridge the design-implementation gap of sustainable business model innovation. In addition, it is industry-dependent whether start-ups should make use of process-based models and tools.

This paper first contributes to the sustainable business model innovation literature suggesting what types of models/tools start-ups could use to bridge the design-implementation gap of sustainable business model innovation. The visualisation and use of tools and models can support firms in generating and developing new business models and in overcoming organizational innovation barriers (Eppler & Hoffmann, 2011). This research made a difference between activity-based models and tools and process-based models and tools. Activity-based models and tools could be used to attract investors, suppliers, partners, and customers. In addition, it helps to stay focused on own values and goals. The use of process-based models & tools is dependent on the industry in which a start-up operates, and could be useful to match better to customer needs, have a better product at the launch, and can cause a competitive advantage. As a result, start-ups are able to succeed in the market. With this, they reduce part three of the design-implementation gap of sustainable business model innovation (Geissdoerfer et al., 2017).

In addition, this paper contributes to the literature about the design-implementation gap of sustainable business model innovation. The design-implementation gap was developed for all types of organizations. Geissdoerfer et al. (2018) suggested namely that sustainable business model innovation can be caused by sustainable start-ups, sustainable business model transformation, sustainable business model diversification, and/or sustainable business model acquisition. This study had focused on start-ups and suggests that they mostly experienced problems regarding not failing in the market, which is the third dimension of the design-implementation gap. In addition, other challenges of the design-implementation gap have been found like the creation of awareness to the customer, forget to focus on the financial aspect of

the business model, and that it depends on the industry what the chance of success is. This extends the existing literature.

At last, this research contributed to the development of The Cambridge Business Model Innovation process of Geissdoerfer et al. (2017). This model has been developed in 2017 and has not been tested widely. Geissdoerfer et al. (2017) stated that this model is useful for all kinds of start-ups. However, the results of this study show that the use of this type of process-based model is dependent on the industry in which a start-up operates. Prototyping, testing, and piloting are important steps in this model, but it is dependent on the industry whether these steps are necessary. In some cases, it is better to start and launch the product/service as soon as possible.

Managerial implications

From the results, it is clear that the use of activity-based models and tools could help start-ups to attract investors, suppliers, partners, and customers. In addition, it helped to stay focused on their own values and goals. This increases the chance of succeeding in the market. It is therefore strongly recommended to use these types of models and tools. So, activity-based models could help for the growth potential of a start-up. In addition, activity-based models could help to stay focused and to stick to their goals and values. Because of this, start-ups keep believing in themselves and they keep going despite several setbacks. However, it is necessary to get the right balance so you do not lose too much time and effort on filling in the model.

The use of process-based models and tools is dependent on the industry. Testing, prototyping, and piloting could result to match better to customer needs, have a better product at the launch, and can cause competitive advantage. However, in some industries, it is better to launch as soon as possible. These processes can take a lot of time without getting results.

At last, it is remarkable that a lot of entrepreneurs are not familiar with models & tools for sustainable business model innovation. It is therefore recommended that these types of models & tools should be under attention.

Limitations and directions for future research

The first limitation of this paper lies in the fact that triangulation was not used. Per case, the founder/CEO of the start-up has been interviewed. For this research, it was necessary to interview those who have been through the entire process, from idea generation to implementation. In all cases, it was just only the founder/CEO. As a result, only one person was

interviewed per case. In addition, due to the regulations of Covid-19, no observations have been made and documents were not usable for the desired data.

A second limitation lies in the fact that the entrepreneurs from the cases have never heard of the Triple-Layered Business Model Canvas, Value Mapping Tool, Value Ideation process, or The Cambridge Business Model Innovation Process. This study had focused on the generic characteristics of these types of models and tools. So, the founded results relate to these generic characteristics and are therefore limited because it is not possible to specifically conclude which models & tools are more likely to bridge the design-implementation gap. A suggestion for future research is to focus on start-ups who have used these types of models and tools, and investigate again what the effect is on the design-implementation gap.

A third limitation is that the design-implementation was not specific defined by Geissdoerfer et al. (2017). The concepts "Ideas are not followed up, "Concepts are not implemented", and "New business model fail in the market" were sometimes close together and difficult to distinguish. Especially the concepts are "not implemented" and "fail in the market" because they overlap each other sometimes. In this research, "concepts are not implemented" referred to start-ups who have developed a potential business model, but is struggling with its implementation and is thinking of moving away from (sustainable) values and decided to do something else. "New business models fail in the market" referred to start-ups that have implemented their business models but are facing different challenges and therefore decide to quit the company. As a result, the findings show that the start-ups faced the most challenges regarding not failing in the market and that there are several problems with potential concepts that not have been implemented. However, the results show that the CEOs did not face any problems regarding the follow-up of ideas. Therefore, it seems that this concept is not applicable for start-ups, but more for sustainable business model transformation, diversification, and/or acquisition. At established companies, more workshops will be held, so the follow-up may be more important for these types of companies. However, future research could investigate if there is a difference between start-ups and established companies and whether they experience a difference between the concepts of the design-implementation gap.

In addition, other causes have been found for the design-implementation gap, as described by Geissdoerfer et al. (2017). For example, from the results, it became clear that some industries are at the forefront of sustainability while other industries are struggling with the transformation to become more sustainable. While start-ups are important actors for this

transformation, future research could investigate which industries are facing the most challenges for sustainable business model innovation, and how to overcome these challenges.

At last, this study impedes the generalizability of the results because it includes only eight case studies. The results can therefore not be generalized to all other start-ups. For this, it is necessary to make use of large-scale quantitative research. Hereby, the results could be analysed by statistics, resulting in more accurate results.

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Appendix A: Interview protocol

Introduction: Right now I am doing my master thesis of the master Innovation & Entrepreneurship at the Radboud University. My research is about the Sustainable Business Model Innovation processes of Start-ups and which methods and tools can help to close the design-implementation gap. Is it okay if I record this? The conversation will be typed out later and will be analysed.

Introduction

1. When is this start-up founded?
2. Can you give a short description about this start-up?
3. What was your motivation to start this business?
4. How many people work at this start-up?
5. Can you describe your business model? How do you create, deliver and capture value?

Questions about the whole process:

6. Could you please describe the development of this start-up. From idea generation to the implementation?

In the literature there are 3 major problems for SBMI. Namely: 1) many business model innovation meetings and workshops are conducted, but the ideas are not followed up, 2) even promising sustainable business model concepts are not implemented, and 3) most implemented business models, especially in the start-up context, fail in the market.

7. Have you experienced certain problems regarding to development and implementation of your business model?
8. How have you fixed these problems?
9. Have you experienced other difficulties/problems regarding to the development and implementation of this start-up?
10. How have you fixed these problems?

Questions about tools / Methods

For sustainable business model innovation there are certain models & tools to help. Like a better understanding how you create value, for who you create value and other types of process models with types of testing and validating.

11. Have you used some models / tools in your start-up? For instance for value determination, idea generation, prototyping etc.
12. How have you used them?
13. Have these models helped you? For generation of ideas, the implementation and success?

Questions about the effect of the activity based models on the design – implementation gap

Showing activity based models.

14. Do you recognize these types of models?
15. What is your opinion about these models?

16. What is the effect of these models on generating ideas, the implementation and the success? Have these models helped you?
17. Do you think these models or tools could help other start-ups for generating ideas, the implementation or the success?

Questions about the effect of these process based models on the design implementation gap
Showing process based models

18. Have you worked very process-based?
19. Did you make use of a prototype or test / pilot? How did that go?
20. How many phases does it consist?
21. Did you have any stop/go moments?
22. What is the effect of these models on generating ideas, the implementation and the success? Have these models helped you?
23. Do you thinks these process models could help other start-ups by generating ideas, the implementation and the success?

Closure:

24. Have you experience other difficulties / problems with regarding to the generation and implementation of a sustainable business model, which has not been discussed?
25. Do you have some tips for new entrepreneurs who would like to start a business with a sustainable business model?

Appendix B: Informant overview

This appendix is not available for the public version