Stimulating Green FinTech Innovation for Sustainable Development: An Analysis of the Innovation Process

Susan Ranchber
Stimulating Green FinTech Innovation for Sustainable Development: An Analysis of the Innovation Process

Susan Ranchber

Supervisor: Sofia Wagrell
Evaluator: Åse Linné
## Contents

1. Introduction .................................................................................................................. 1
   1.1. Problem .................................................................................................................. 3
   1.2. Aim and research question ..................................................................................... 3
   1.3. Delimitations .......................................................................................................... 3
   1.4. Outline ..................................................................................................................... 3

2. Background .................................................................................................................. 4
   2.1. Overview of research on green FinTech innovation processes ................................ 4
   2.2. General FinTech innovation ................................................................................... 4
   2.3. Green FinTech innovation ....................................................................................... 7
   2.4. Green FinTech innovation process ........................................................................... 8
       2.4.1. Collaboration during the general FinTech innovation process ....................... 9
       2.4.2. Drivers and barriers for the general FinTech innovation process ................. 9

3. Theory .......................................................................................................................... 13
   3.1. Historical development of theory on innovation processes .................................. 13
   3.2. Analytical framework ............................................................................................. 14
       3.2.1. The Firework Model ....................................................................................... 15

4. Method .......................................................................................................................... 19
   4.1. Research design ....................................................................................................... 19
   4.2. Multiple-case study ............................................................................................... 19
       4.2.1. Choice of unit of analyses and cases ................................................................. 20
       4.2.2. Data collection method .................................................................................... 21
       4.2.3. Quality assurance ............................................................................................. 22
   4.3. Ethical considerations ............................................................................................ 24
   4.4. Data analysis ........................................................................................................... 24
   4.5. Limitations ............................................................................................................. 25

5. Empirical background ................................................................................................... 26
   5.1. Green FinTech innovation support in Frankfurt ..................................................... 26
   5.2. The three examined cases ....................................................................................... 26

6. Results ........................................................................................................................... 28
   6.1. The SDG-Investments innovation process .............................................................. 28
   6.2. The Bettervest innovation process ........................................................................ 32
   6.3. Der Finanzoptimist innovation process ................................................................. 36

7. Analysis ........................................................................................................................... 40
   7.1. The Initiation period ............................................................................................... 40
       7.1.1. Changes in Ideas, People, Transactions, Outcomes and Contexts ............... 40
       7.1.2. Factors influencing the initiation period ............................................................ 42
       7.1.3. Patterns 1-3 in the Firework Model ................................................................. 43
   7.2. The Development and implementation period ....................................................... 43
       7.2.1. Changes in Ideas, People, Transactions, Outcomes and Contexts ............... 44
       7.2.2. Factors influencing the development and implementation periods ............... 45
       7.2.3. Patterns 4-12 in the Firework Model ............................................................... 47
   7.3 Summary ................................................................................................................... 49

8. Discussion and conclusion ............................................................................................. 50
   8.1. The evolvement of green FinTech innovation processes ....................................... 50
   8.2. Factors influencing green FinTech innovation processes ....................................... 52
   8.3. Theoretical and practical implications of the findings ............................................ 53

9. Conclusions .................................................................................................................... 54
10. Acknowledgements ........................................................................................................ 55
11. References ..................................................................................................................... 56

Appendix I – Interview guide ............................................................................................. 63
Appendix II – Case study protocol............................................................................................... 64
Appendix III – Coding Index ........................................................................................................ 66
Appendix IIII – Search quires for literature review .................................................................... 67
Appendix V – Timelines of the Innovation Processes ................................................................. 68
Abbreviations

B2B  Business to Business
B2C  Business to Customer
BDS  Bundesverband Deutsche Start-ups
C2C  Customer to Customer
CEMUS Centre for Environment and Development Studies
EC   Economic capital
FNG  Forum Nachhaltige Geldanlage (Eng. Forum for Sustainable investments)
ICT  Information and Communication Technology
NFC  Near Field Technology
P2P  Peer to Peer
SDG  Sustainable Development Goals
SLU  Swedish University of Agricultural Sciences
WCED World Commission on Environment and Development

List of Tables

Table 1. Clusters of core services and belonging business infrastructure in the FinTech Landscape ........6
Table 2. Drivers and barriers for the general FinTech innovation process ........................................9
Table 3. Case descriptions of green FinTech innovation processes examined in this multiple-case study .. 21
Table 4. Interviews in this multiple-case study .................................................................................. 22
Table 5. Tests and techniques for establishing validity and reliability in case study research ........... 23
Table 6. Observed changes during the initiation period for the three cases in the five concepts ........ 41
Table 7. Individual, internal organizational, and external societal factors identified as influencing the changes in concepts during the initiation period ........................................................................ 42
Table 8. The occurrence of patterns 1-3 from the “Firework model” in the three examined cases ....... 43
Table 9. Observed changes during the development and implementation periods for the three cases in the five concepts ................................................................................................................. 45
Table 10. Individual, internal organizational, and external societal factors identified as influencing the changes in concepts during the development and implementation periods ........................................ 46
Table 11. The occurrence of patterns 4-12 from the “Firework model” in the three examined cases ..... 48
Table 12. Changes in concepts and factors influencing these changes common for all three cases during both the initiation and development and implementation periods ........................................... 49

List of Figures

Fig. 1. The Digital Finance Cube and its dimensions ......................................................................... 6
Fig. 2. Technology Push (First Generation) ..................................................................................... 13
Fig. 3. Market Pull (Second Generation) ......................................................................................... 13
Fig. 4. Key components of the innovation journey .......................................................................... 15
Fig. 5. Divergent, parallel and convergent paths ........................................................................... 16
Fig. 6. Steps taken in the analysis of the empirical data .................................................................. 25
Fig. 7. Key components of the innovation journey ......................................................................... 40
Fig. 8. Timeline of SDG-Investments’ innovation process ................................................................. 68
Fig. 9. Timeline of bettervest’s innovation process ......................................................................... 69
Fig. 10. Timeline of Der Finanzoptimist’s innovation process ......................................................... 70
Stimulating Green FinTech Innovation for Sustainable Development: An Analysis of the Innovation Process

Abstract:
Achieving a sustainable development and fighting climate change will require a faster and vaster allocation of financial resources than what has yet been witnessed. Green FinTech innovations have been identified as one potential solution to this challenge. Stimulating and supporting the development of such innovations is thus important, but requires knowledge about what the innovation processes look like, which individual, internal organizational and external societal factors that influence them, and how these factors influence them. The aim of this study is thus to contribute to the conceptual and empirical understanding of the innovation process of green FinTech innovations by conducting a multiple-case study with the three green FinTech innovations bettervest, SDG-Investments and Der Finanzoptimist in the area of Frankfurt, Germany. The data was collected through semi-structured interviews. The findings show that the green FinTech innovation process begins with an initiation period which consists of a gestation period during which core innovation ideas and related outcome criteria occur, innovation team members gain new knowledge, new social relationships are made, and most aspects in the external context stay stable. The acquired knowledge and the stable aspects in the external context influence the occurrence of ideas and related outcome criteria. The gestation period ends with a shock and the end of the initiation period is defined by the making of plans and budgets. The development period is defined by several paths of activities. The initial outcome criteria develop and outcomes are continuously assessed. Positive outcomes occur and are influenced by innovation members’ capabilities, their new roles and new legal relationships. Negative outcomes defined as setbacks also occur and are influenced by established legal transactions. Innovation team members work part-time during the development period. Social and legal relationships with actors outside the innovation team expand, influenced by previously made social relationships and the innovation team members’ new roles. The expansion of social relationships is also influenced by positive outcomes. Activities aimed at implementing the innovation occur throughout the development period. Eventually, the innovation process finishes. The findings represent the first contribution to research on the topic of green FinTech innovation processes. Future research should examine additional digital business functions such as digital money or digital payments, the differences and similarities between general and green FinTech innovation processes, and use other research and data collection methods.

Keywords: Sustainable Development, Finance, Green FinTech innovation, Innovation process

Susan Ranchber, Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala, Sweden
Stimulating Green FinTech Innovation for Sustainable Development: An Analysis of the Innovation Process

Summary:
The future of humanity is threatened by several challenges such as climate change, malnutrition, corruption, lack of health care and education, criminality, pollution in land, air and water etc. Solutions to these challenges require extensive financial investments, however the current pace of the financial movement for sustainable development is too slow. Innovative solutions such as green FinTech innovations - a novel, technologically enabled solution for financial services, developed by start-ups, established technological firms, or traditional financial service providers, with the aim of increasing the flow of financial resources for sustainable development - may be able to speed up the required allocation of resources. Thus, stimulating and supporting the development of these innovations is important. The development of such a support requires knowledge about what steps the innovators take during the process from coming up with an innovative idea to implementing it. It also requires knowledge on which individual, internal organizational and external societal factors that influence the process, and how these factors influence the process. This study provides an understanding for the innovation process of green FinTech innovations by conducting semi-structured interviews with the three cases bettervest, SDG-Investments and Der Finanzoptimist in the area of Frankfurt, Germany. The findings show that the green FinTech innovation process begins with an initiation period consisting of a gestation period during which core innovation ideas and related outcome criteria occur, innovation team members gain new knowledge, new social relationships are made, and most aspects in the external context stay stable. The acquired knowledge and the stable aspects in the external context influences the occurrence of ideas and related outcome criteria. The gestation period ends with a shock that takes different forms for different innovation processes. The end of the initiation period and the beginning of the development period is defined by the making of plans and budgets. The beginning of the development period is defined by several paths of activities that occur simultaneously and more or less involve all functions in the innovation team. The initial outcome criteria develop during the development and implementation periods and outcomes are continuously assessed. Positive outcomes are likely to occur and are influenced by innovation members’ capabilities, new roles that they have taken on, and new legal relationships. Negative outcomes defined as setbacks are also likely to occur and are influenced by established legal transactions. The innovation team members work part-time with the innovation during the development and implementation periods. Social and legal relationships are created with actors outside the innovation team. These are influenced by previously made social relationships and innovation team members’ new roles. The expansion of social relationships is also influenced by positive outcomes. Activities aimed at implementing the innovation occur throughout the development period. Eventually, the innovation process finishes. These findings represent the first contribution to research on the topic of green FinTech innovation processes. Future research should examine additional digital business functions such as digital money or digital payments, the differences and similarities between general and green FinTech innovation processes, and use other research and data collection methods.

Keywords: Sustainable Development, Finance, Green FinTech innovation, Innovation process

Susan Ranchber, Department of Earth Sciences, Uppsala University, Villavägen 16, SE-752 36 Uppsala, Sweden
1. Introduction

“to change the cash flow is the most important thing to do”
(pers. com. Herr Achenbach, 2018)

In 2015, the world community committed to two documents that largely represent the challenges facing humanity today, the “Paris Agreement” on climate change (UNFCCC, 2015) and the resolution A/RES/70/1 “Transforming our world: The 2030 Agenda for sustainable development” (United Nations, 2015a). These challenges represent the social, economic and environmental dimensions of sustainable development and include issues such as inequality; climate change; malnourishment; macroeconomic instability and lack of access to clean water, energy and healthcare etc. Central in the discussions surrounding the solution of these challenges and thus achievement of the two commitments, was the urgent and massive need for allocated private and public financial capital (United Nations, 2015b). Today, three years later, it has become apparent that the allocation of capital needed to support the achievement of the two commitments, is not happening fast or vast enough (Peake & Ekins, 2016; UNEP, 2016a, p. 9-10; Principles for Responsible Investment, 2017).

The reasons for the slow movement of capital are many:

- The conventional financial industry is inherently reactive rather than proactive. Regulative measures and stakeholder pressure is critical in influencing the industry to consider sustainable development in their operations. However, compared to other industries it is less exposed to stakeholder pressure or regulations on environmental and social issues. (Weber, 2014).

- Sustainability reporting, also known as integrated reporting, is a novel activity in companies meaning that the non-financial data needed for measuring sustainability performance of an investment option is not available (Cubas-Días and Sedano, 2017), or often not reliable (Bush, Bauer and Orlitzky, 2015). In addition, there is a lack of recognized sustainability performance measurements. Different reporting frameworks are used and thus credibility and comparability between potential sustainable investment options is hampered (Cubas-Días and Sedano, 2017; Arena, Bengo, Calderini, and Chiodo, 2018).

- Governments have failed to create a mechanism ensuring that costs of externalities resulting from a company’s unsustainable business practices (pollution etc.) are internalized onto the company’s balance sheets. This makes their financial data, and thus potential return on investment, look better than it should when compared to more sustainable companies (Waygood, 2011).

- There is a lack of investment-ready sustainable products (Oleksiak, Nicholls, Emerson, 2015). This relates to the fact that many initiatives for sustainable development origins from the non-profit sector where social impact is prioritized over commercial success. These actors therefore have a hard time attracting private capital with return expectations (Arena et al., 2018).

As a response, several initiatives for accelerating the financial movement for sustainable development are taking place, many initiated in 2017 by public, private and non-governmental actors1. One of these initiatives, Stockholm Green Digital Finance, focus on promoting what they refer to as Green FinTech innovations. FinTech in general stands for financial technology and refers to the relatively new movement within the financial sector where digital start-ups or existing IT companies take advantage of the growing digitalization and connectivity in society and develop innovative digital solutions to financial services (Gomber, Koch, and Siering, 2017, Ng and Kwok, 2017). Examples of such services are mobile payments, cryptocurrencies, crowdfunding etc. (Gozmann, Libenau and Mangan, 2018; Gomber et al., 2017; Punschmann, 2017).

---

1) The Frankfurt declaration - a voluntary commitment signed by 48 organizations in the financial center of Frankfurt in May 2017. The goal is to transform the Frankfurt Financial Centre, to create sustainable infrastructures and position the financial services sector as a major driver of sustainable economic and social development (Deutsche-boerse.com, 2017a).

2) The German Hub for Sustainable Finance - will consolidate current sustainability initiatives across financial markets in order to identify overlaps and detect and leverage synergies. This knowledge will be used to advise the German Federal Government on sustainable finance issues (Deutsche-boerse.com, 2017b).

3) Stockholm Green Digital Finance - an independent, not for profit centre with the ambition to accelerate green finance and investment through FinTech innovations. The centre does this through awareness building, knowledge exchange and as an independent innovation platform and testbed where creative solutions for scaling green finance and investment can be developed and demonstrated (Stockholm Green Digital Finance, n.d.).
While general FinTech innovation has been treated in literature to a certain but limited extent (Gomber et al., 2017; Ma and Liu, 2017; Zavolokina, Dolata and Schwabe, 2016), research which explicitly focuses on green FinTech innovation is very scarce. The phenomenon could only be identified in two reports (Stockholm Green Digital Finance, 2017; UNEP, 2016b). Briefly described, both reports refer to the phenomena as FinTech innovations with the purpose of contributing to a sustainable society (Stockholm Green Digital Finance, 2017, p. 3; UNEP, 2016b, p. 24). Thus, what differentiates general FinTech innovations from green FinTech innovations is the intended impact of the innovation. Examples of green FinTech innovations could be solutions that extend capital to green start-ups such as crowdfunding platforms with such a focus, or solutions that lower the threshold for consumer action and ensures green investments such as easily accessible sustainable financial advisory (Stockholm Green Digital Finance, 2017, p. 3).

Assuming that green FinTech innovations can contribute to the allocation of capital necessary for achieving the “Paris Agreement” on climate change (UNFCCC, 2015) and the resolution A/RES/70/1 “Transforming our world: The 2030 Agenda for sustainable development” (United Nations, 2015a), further stimulation and development of these innovations is needed. Understanding how to stimulate but also manage the process of bringing an innovation from idea to implementation requires an understanding of how the innovation process evolves, and how it is influenced by individual, internal organizational, and external societal factors (Smith, Voß and Grin, 2010; Geels, 2002, 2011; Van de Ven, Polley, Garud, and Venkataraman, 1999, ix; Rosenberg and Kline, 2010, p. 202). This is because the development of an innovation is not isolated to the actions of a single entrepreneur, rather it is part of a larger context (Van de Ven et al., 1999, ix; Rosenberg and Kline, 2010, p. 202; De Jong and Den Hartog, 2007; Gilley, Dixon and Gilley, 2008).

Previous research on these aspects is scarce both for green FinTech innovation and general FinTech innovation. In a special issue on “FinTech” in the journal of Financial Innovation, Ma and Liu (2017) state that top academic journals have not yet caught up with the phenomenon’s latest developments and that finance and accounting journals have only published a very limited number of articles on the phenomena. The authors also state that several topics are yet to be researched. Gomber et al. (2017) who conducted a literature review on FinTechs find many gaps to be fulfilled by research, however focus lies heavily on the performance and usage of the developed solutions, as well as characteristics of different platforms, hardly any attention is given to the development of these innovations. However, Punschmann (2017) touches upon the innovation processes and suggests further research looks into the innovation patterns of FinTech innovations with respect to the objects of innovation such as product, business model, service etc. Neither of these authors mention green FinTech innovation explicitly.

The few articles that treat innovation processes of general FinTech innovations primarily cover the drivers, and barriers of FinTech innovations (Zavolokina et al., 2016; Haddad and Hornuf, 2018; Zilgalvis, 2014; Weichert, 2017; Punschmann, 2017; Gomber et al., 2017), and reasons for collaboration during the innovation process (Wonglimpiyarat, 2017). Widening the scope from FinTech innovations to financial innovations; Arthur (2017) states that research on processes of financial innovation is also scarce. Existing research focuses on the back-end part of the innovation process, that is, how an existing idea is developed and commercialized and does not account for the idea generation process. The author states the need for more empirical research on organizations in order to better understand financial innovation processes.

Due to the impact dimension in green FinTech Innovations the scope was also widened to social innovation research. Here Tracey and Stott (2017) and Arena et al. (2018) acknowledge the growing role of technology in social innovation. The authors state that during the past two decades, the expression social enterprise has become more and more associated with inspiring digital solutions that are developed to solve global issues. Despite this change, the authors claim that social innovation researchers have been slow to explore the limits and potential of digital technology in social innovation, explaining why no research on green FinTech innovations and their innovation processes can be found in the social innovation literature.

Returning to the two industry reports in which the phenomenon of green FinTech innovation could be identified, only one of them touch upon aspects related to the innovation process of these innovations (UNEP, 2016b, p. 33-38). The focus is similar to that of this study as it also examines external factors influencing the process, however it does this only in terms of barriers and enablers for scaling green FinTech innovations and does not look at how external factors have influenced the process along the way. It also does not cover
the influence of individual or internal organizational factors, or the steps and choices that had to be made during the process. This study thus has a gap to fill both in academic and non-academic literature.

1.1. Problem

Achieving the commitments in the “Paris Agreement” and “The 2030 Agenda for sustainable development” requires allocated private and public financial capital. green FinTech innovations have been identified as a disruptive power with the potential to contribute to the financial movement for sustainable development. Achieving further stimulation and scaling up of these innovations requires an understanding of how green FinTech innovation processes evolve from idea to implementation and how these processes are affected by individual, internal organizational and external societal factors. The review of literature that has been made so far shows that a significant conceptual and empirical gap exists in research related to the innovation process of green FinTech innovations.

1.2. Aim and research question

The aim of this study is to contribute to the conceptual and empirical understanding of green FinTech innovation processes. This includes what the innovation process looks like, as well as how the innovation process is influenced by individual, internal organizational and external societal factors. The findings can be applied to better support the stimulation and development of green FinTech innovations and thereby contribute to the financial movement for sustainable development.

The aim will be achieved through answering the following research questions.

1. What does the innovation process for green FinTech innovations look like?
2. Which individual, internal organizational and external societal factors influence the green FinTech innovation process and how do these factors influence the green FinTech innovation process?

1.3. Delimitations

The researcher does not intend to provide any policy recommendations, recommendations for how a supportive innovation infrastructure should be designed, or how a green FinTech innovation process should be managed. The intention is however that the findings from the research could be used as a basis for others in the development of such recommendations.

1.4. Outline

The structure of this paper is organized as follows. It begins with this introductory chapter (Chapter 1) describing the problem and research questions that the study aims to address. Chapter 2 provides a background to the topic including a multidisciplinary review of previous research on the phenomenon green FinTech innovation process. Chapter 3 presents the theories and concepts on which the analysis of the gathered empirics is based. In Chapter 4 the methodological approach taken in this study is described followed by Chapter 5 which provides an empirical background for the examined cases in the study. Chapter 6 presents the results from the empirical study. Thereafter an analysis of the empirics through the lens of the conceptual framework is presented in Chapter 7. Chapter 8 presents the answers to the research questions, relates the findings to previous research and discusses the theoretical and practical implications of the findings. Lastly Chapter 9 concludes the findings and provides suggestions for future research.
2. Background

The purpose of this chapter is threefold. First it intends to familiarize the reader to what is already known about the phenomenon of green FinTech innovation and its process. Second it argues for the need of this study by highlighting the gap in research that it fills. Third, it provides a framework to which the findings of this study can be related. Due to the lack of research on green FinTech innovation and its process, the chapter is based on a combination of research on general FinTech innovation and its process, and research on social innovation. The chapter begins by presenting an overview of previous research related to green FinTech innovation processes. It then continues by providing a definition for general FinTech innovation which is combined with research on social innovation in order to derive a definition for green FinTech Innovation. Thereafter previous research related to the innovation process of general FinTech innovations, as well as social technology innovations, is presented.

2.1. Overview of research on green FinTech innovation processes

The search for previous research on green FinTech innovation processes revealed that such research is close to non-existent. By using the search queries found in Appendix III in the Uppsala University Library Database, only nine articles that were deemed relevant to the aim and research questions in this study were identified. The articles were published between 2014 and 2018 in the journals: Business Economics, Business & Information Systems Engineering, Financial Innovation, Management Information Systems, Payments Strategy and Systems, Financial Regulation and Compliance, Small Business Economics, and Policy and Internet. These articles however only deal with general FinTech innovation and more specifically two key themes: the characteristics of general FinTech innovation (Gozmann et al., 2018; Gomber et al., 2017; Ma and Liu, 2017; Punschmann, 2017; Zavolokina et al., 2016); and internal and contextual factors which influence general FinTech innovation processes (research question 2) (Haddad and Hornuf, 2018; Weichert 2017; Punschmann, 2017; Gomber et al., 2017; Wonglimpiyarat, 2017; Zavolokina et al., 2016; Zilgalvis, 2014). What the innovation process of general FinTech innovations looks like (research question 1) has hardly been covered. These findings go in line with Gomber et al., 2017; Ma and Liu, 2017 and Zavolokina et al., 2016 who all state that research on even general FinTech innovation is at its infancy.

In addition, only one of these articles is based on qualitative interviews with FinTech innovators (Wonglimpiyarat, 2017). The other analyses are based on literature reviews (Gomber et al., 2017; Punschmann, 2017; Ma and Liu, 2017), media articles (Zavolokina et al., 2016), surveys (Gozmann et al., 2018), industry or government reports and articles (Weichert, 2017; Zilgalvis, 2014) and database data (Haddad and Hornuf, 2018). Thus, on a general level, this study provides the first contribution on the topic of green FinTech innovation and the first holistic perspective of the innovation process of green FinTech innovation which to some extent also could be applied to general FinTech Innovation. It is also the first study based on qualitative interviews with green FinTech innovators, which also could entail a methodological contribution to research on general FinTech innovation processes.

Other identified research on general FinTech innovation not deemed relevant for the research questions in this study include literature that cover technologies used in FinTech innovations (Leon Zhao, Fan, and Yan, 2016) applications of FinTech innovations (Weichert, 2017), FinTech innovations’ impact on traditional financial service providers and how these actors manage the impact (Chen, Li, Wu, and Luo, 2017) or could manage the impact (Weichert, 2017), the risks related to FinTech innovation (Turan, 2015) and how these are managed (Ng and Kwok, 2017) and could be managed and regulated in order to avoid hindering innovation in the sector (Zilgalvis, 2014) and how crowdfunding is promoted (Jegelevičiūtė and Valančienė, 2015).

2.2. General FinTech innovation

According to Van de Ven et al. (1999, p. 9) the concept of innovation broadens the concept of invention, which the authors define as the creation of an idea, by also including the process of developing and implementing the new idea. Rosenberg and Kline (2010, p. 173) refers to innovation as the process of creating and marketing something new. By something new the authors refer to inventions: “new means for achieving some function not obvious beforehand to someone skilled in the prior art” (ibid., p. 190). Zilgalvis (2014)
states that an innovation has to function in the real world, that is, it must be consumed or used to a certain extent, to be counted as an innovation. According to Van de Ven et al. (1999, p. 9) an idea is innovative as long as it is perceived as new to the people involved in the process. An innovative idea can include technical innovations such as new products, services or technologies, as well as administrative innovations which can include new processes, policies or organizational forms (Rosenberg and Kline, 2010, p. 177; Van de Ven et al., 1999, p. 10).

The term FinTech, which stands for Financial Technology, has been used to denote both innovative solutions for financial services enabled by digital technology - “FinTech innovations” (Gomber et al., 2017; Punschmann, 2017; Ng and Kwok, 2017 and Zilgalvis, 2014), and one of the three primary actors that develop these solutions “FinTech start-ups” (Gomber et al., 2017; Zavolokina et al., 2016; Punschmann, 2017). Gomber et al. (2017), Zavolokina et al. (2016) and Weichert (2017) also include established IT or technology companies in the term and together with FinTech start-ups they are referred to as “FinTech companies” or “FinTechs. The third primary actor that develop FinTech innovations are traditional financial service providers also referred to as traditional financial institutions, incumbents, or traditional actors or players (Haddadd and Hornuf, 2018; Gomber et al., 2017; Punschmann, 2017; Zavolokina et al., 2016). These actors are represented by for example banks, asset management companies, brokerage firms and insurance companies (Gomber et al., 2017). The providers of FinTech innovations represent one of three dimensions that Gomber et al. (2017) use to describe the characteristics of FinTech innovations. These dimensions are depicted in the authors “digital finance cube” in figure 1.

FinTech innovations are claimed to have a strong potential to disrupt the financial sector and fundamentally change the role of traditional financial service providers. This is done through replacing or supplementing current services (Gomber et al., 2017; Wonglimpiyarat, 2017; Zavolokina et al., 2016; Zilgalvis, 2014), or by providing completely new services not previously available (Gomber et al., 2017).

The services that results from FinTech innovations cover a range of financial service functions and have been categorized differently in previous research (Gozmann et al., 2018; Gomber et al., 2017; Punschmann, 2017). Punschmann (2017) follows financial innovation theory and categorizes FinTech innovations based on what the object of focus for the innovation is (products and services, organizational types, processes, systems or business models), as well as their degree of innovation (incremental or disruptive). Incremental innovations can be defined as small changes which hardly incur any uncertainty, for example changing the colour of a car, while radical innovations refer to large changes in the order of things making old ways of doing things obsolete (Rosenberg and Kline, 2010, p. 192). This conceptualization of FinTech innovations does however not reveal much about which financial service functions that FinTech innovations serve. This is done better by Gomber et al. (2017) and Gozmann et al. (2018). Based on a literature review of scientific articles published on the FinTech phenomenon until 2015, Gomber et al. (2017) categorize FinTech innovations into six digital finance business functions which the innovations can be claimed to serve (see figure 1):

- **a. Digital financing**, e.g. factoring, invoicing, leasing, and crowdfunding enabled by digital platforms.
- **b. Digital investments**, e.g. digital platforms that enable investors to identify and invest in suitable investment products,
- **c. Digital money**, e.g. e-currencies or cryptocurrencies like Bitcoin that function independent of the traditional financial infrastructure,
- **d. Digital payments**, electronically initiated, processed and received payments or transfers using fiat currencies issued by central banks, e.g. through mobile apps such the Swedish innovation Swish, online payment services such as PayPal, and digital wallets which function like physical wallets holding identity cards, credit cards, loyalty points etc.,
- **e. Digital insurances**, e.g. community insurances where friends and family insure each other through online platforms without, or just limited, involvement of traditional insurance providers, or according to Punschmann (2017) apps that enable filtering of insurances related to individual needs,
- **f. Digital financial advice**, e.g. robo-advisors which use algorithms to give financial advice based on declared personal preferences, websites that offer financial product reviews or comparisons, online communities where information regarding investment products is discussed and shared, and according to Punschmann (2017) video chat advisory services.
Gozmann et al. (2018) make a similar categorization however the authors depict FinTech innovations as part of a FinTech ecosystem consisting of three constructs: 1) Core Services, 2) Business infrastructure, 3) Components. The term ecosystem is used to emphasize the interdependency that exists between the FinTech innovations within these different constructs. As seen in table 1, the “core services” identified by Gozmann et al. (2018) relate to the “digital finance business functions” and sub-functions identified by Gomber et al. (2017) above. Business infrastructure is however a dimension only identified by Gozmann et al. (2018) and refers to technological innovations that complement core service innovations by improving their performance, facilitating their provision or extending their functionality. For example, FinTech innovations that improve financial literacy can facilitate the diffusion of investment and asset management services (see table 1).

Table 1. Clusters of core services and belonging business infrastructure in the FinTech Landscape (from Gozmann, et al., 2018).

<table>
<thead>
<tr>
<th>Core services</th>
<th>Business infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payments</td>
<td>Merchant/Corp. Support</td>
</tr>
<tr>
<td>Investment and asset management services</td>
<td>Financial education and literacy</td>
</tr>
<tr>
<td>Finance and credit management</td>
<td>Governance, risk, compliance</td>
</tr>
<tr>
<td>New banking</td>
<td>Financial education and literacy</td>
</tr>
<tr>
<td>Crowdfunding and microfinance</td>
<td>Liquidity forecasting and reporting</td>
</tr>
<tr>
<td>Personal financial management</td>
<td>Data governance and privacy</td>
</tr>
<tr>
<td></td>
<td>EC and Financial service aggregations</td>
</tr>
</tbody>
</table>

The third construct identified by Gozmann et al. (2018), “components”, relates to the third dimension used by Gomber et al. (2017) to describe FinTech innovations; “digital finance technologies and technological concepts” (see figure 1). These “components” or “digital finance technologies and technological concepts” are what make a FinTech innovation what it is and what enable a FinTech innovation to disrupt the financial sector (Gomber et al., 2017). They namely represent the technologies on which FinTech innovations are built. Examples are Block Chain, Social Networks, Near Field Technology (NFC), Peer to peer (P2P) technology, and Big Data Analysis (Gozmann et al., 2018; Gomber et al., 2017). These technologies enable organizations that develop FinTech innovations to apply a user-centred approach including reducing costs and increasing flexibility, transparency, security, efficiency, and opportunities (Gomber et al., 2017). Such an approach is of particular focus for start-ups and technological firms as they often do not have an existing client base to rely on and thus need to gain clients from traditional financial service actors (ibid).
provided by Weichert (2017) is the online payment experience that today offers a variety of channels not only provided by traditional financial service providers such as PayPal, invoice, payment in instalments or mobile payments. These solutions lower the barriers for consumers to finalize the purchase and thus increases the potential for a sale.

The FinTech development is having a huge influence on the dynamics within the financial industry despite the industry’s tradition of being an early adopter and user of innovations in ICT (Gomber et al., 2017). Consequences include that customers usually served by traditional financial service institutions are seized and the number of intermediaries traditionally needed for certain financial services are reduced. According to Chen et al. (2017) this development has already started and it is forcing traditional financial service providers to transform and upgrade. However, Gomber et al. (2017) state that FinTech innovations also bring benefits to traditional financial service providers by providing them access to the younger more technology-savvy clientele. Whether a FinTech innovation represents and opportunity or threat to traditional financial service providers can be claimed to depend on the scope of the innovation and furthermore the type of interaction that it targets.

According to Punschmann (2017) the scope of FinTech innovations can be intra-organizational, meaning the focus for the innovation lies internally in an organization, or inter-organizational entailing more customer oriented approaches. These customer oriented approaches can either focus on interactions between Business to Business (B2B), Business to Customer (B2C) or Customer to Customer (C2C). FinTech innovations that target B2B interactions can be claimed to have a more cooperative approach. According to Punschmann (2017) these FinTech innovations aim at providing their solution to other FinTech companies or traditional financial service providers, for example digital identity solutions. FinTech innovations that target B2C and C2C interactions can be claimed to have a more competitive approach as they may seize clients from traditional financial service providers. According to Punschmann (2017) FinTech innovations that target B2C interactions aim at providing their solution directly to the end-customer for example robo-advisory or video advisory. FinTech innovations that target C2C interactions provide solutions that enable customers to interact with each other for example online communities where investment products can be discussed and reviewed by community members.

Drawing on the previous research on general FinTech innovation characteristics presented above, a simple definition for FinTech innovation is applied in this study:

“A FinTech innovation is a novel, technologically enabled solution for financial services, developed by start-ups, established technological firms, or traditional financial service providers.”

However, as the focus of the study is Green FinTech innovations, the definition needs to be further developed.

2.3. Green FinTech innovation

As no conceptualization of green FinTech innovations or green FinTech innovation processes could be found in previous research, the definition of green FinTech innovation used in this study is based on the definition for general FinTech innovation above, but with influences from research on social innovation. The reason for this is based on the assumption that green FinTech innovations, in comparison to general FinTech innovations, are driven by the aim of addressing social needs in the sense of increasing the flow of financial resources for sustainable development. According to Arena et al. (2018) such innovations are defined by a blended-value mission entailing the coexistence of impact objectives (increasing the flow of financial resources for sustainable development) and business objectives (safeguarding a financial return to be able to continue creating impact on a long term). Due to this blended-value mission, green FinTech innovations can be associated with social enterprises which according to Austin, Stevenson and Wei-Skillern (2006) and Haugh (2007) can be defined as organizations that pursue their primary objective of addressing social needs, through enterprise and trading. The definition for green FinTech innovations thus includes a specification of the aim behind the innovation:
“A green FinTech innovation is a novel, technologically enabled solution for financial services, developed by start-ups, established technological firms, or traditional financial service providers, with the aim of increasing the flow of financial resources for sustainable development.”

This further requires a clarification of the meaning behind “increasing the flow of financial resources for sustainable development”. To begin with, the concept of sustainable development is a debated topic in research and no single definition really exists (Bourgeois, 2014). The author (ibid.) states that the most widely used definition can be found in the report “Our common future” published by the WCED in 1987 (World Commission on Environment and Development, 1987). The definition reads: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (ibid., p. 41). This definition does however not reveal what sustainable development means in operative terms. For this purpose, the 17 sustainable development goals (SDG’s) and their 169 targets in the resolution A/RES/70/1 “Transforming our world: The 2030 Agenda for sustainable development” (United Nations, 2015a) gives more guidance and is therefore used to define sustainable development for this study. This framework was developed by the UN member countries together with stakeholders representing civil society, private sector, public sector and academia from all over the world and has been accepted by all country governments. Thus, it can be claimed to be a universal definition of sustainable development (ibid.).

Increasing the flow of financial resources for sustainable development thus means increasing the flow of financial resources needed to achieve the sustainable development goals and their targets, which also include the climate change challenge. Building on the digital finance business functions identified by Gomber et al. (2017) in figure 1, green FinTech innovations can contribute to increasing this flow by developing solutions for digital sustainable investment, digital sustainable financing, digital sustainable financial advice etc.

2.4. Green FinTech innovation process

According to Van de Ven et al. (1999, p. 3), an innovation process is a sequence of events that starts with the creation of a new idea and ends with its implementation or termination. Thus, every time an organization invent, develop and implement a new product, service, program or process, it initiates an innovation process (ibid., p. 3). Managing innovation requires an understanding of the chain of events that constitute the innovation process (ibid., ix). Knowledge about the starting conditions and the desired outcomes is not enough. Innovation managers need a "road map" that can help them navigate the process between input and outcome, a theory of how the process of innovation may look, and which paths that are more or less desirable to take. With that said, Van de Ven et al. (1999, ix) state that the process of innovation is an unpredictable and uncontrollable one. The number, duration and complexity of the events that unfold during the innovation process can vary greatly and the process is claimed to be inherently uncertain and dynamic (Rosenberg and Kline, 2010, p. 177, 183; Van de Ven et al., 1999, p. 3). According to Rosenberg and Kline (2010, p. 173-174) this entails that the process of innovation can be considered as a practice of managing and reducing uncertainty. Achieving a detailed road map is neither possible (nor desirable), however some "fundamental laws of innovating" can be identified and used for describing central processes, sequences and paths in the management of innovation (Van de Ven et al., 1999, ix).

As mentioned in the beginning of this chapter, the innovation process of green FinTech innovation or even general FinTech innovation has hardly been covered in literature. The few articles that were identified as relevant all belong to literature on general FinTech innovation, and primarily relate to research question 2 as they deal with internal organizational and external societal factors that may influence the general FinTech innovation process. More specifically the articles deal with drivers and barriers for general FinTech innovation processes as well as reasons for external collaboration during the process. Although the articles belong to literature on general FinTech innovation and not green FinTech innovation, the findings are still deemed to provide a valuable framework to which the findings of this study, especially of the second research question, can be related. The relevance of this framework is further strengthened through the inclusion of one article that deals with drivers and barriers of social technology innovation processes (Arena et al., 2018). The articles are discussed below starting with the reasons for external collaboration during the process.
2.4.1. Collaboration during the general FinTech innovation process

In a case study conducted by Wonglimpiyarat (2017), the author examines the systemic innovation characteristics of general FinTech innovations, meaning the extent to which the development and diffusion of FinTech innovations depend on the collaboration with other systems. The findings show that the more complex a general FinTech innovation is and the less capabilities and competence that exist in-house to manage the innovation, the more external collaboration will be needed during the innovation process. If this collaboration can be bought on a contract (non-equity) basis, the systemic nature of the innovation is low. If the success of the innovation requires its integration with other systems, entailing an equity partnership, the systemic nature is high.

Sometimes external collaboration is also entered because it extends the reach of the innovation and lowers risk and investment costs for the original innovator. The systemic nature can however still stay low. Examples of such FinTech innovations developed by banks are the ATM, online banking and mobile banking. Another reason for FinTech innovations to initiate collaboration is related to customer requirements and their requests for integrated and value-added, as opposed to isolated, financial services. In these cases, the high or low systemic nature depends on what kind of integration that is performed. In conclusion, the success of FinTech innovations requires them to have a high systemic nature since networks and externalities play an important role for a wide diffusion. The systemic characteristics (extent of collaboration) of a FinTech innovation are however dynamic and may change during the course of the innovation process. (Wonglimpiyarat, 2017)

2.4.2. Drivers and barriers for the general FinTech innovation process

As seen in table 2, a few drivers and barriers have been identified in research on general FinTech innovation processes as well as research on social technology innovation processes. The latter is included as it refers to innovation that addresses social needs through technology-driven solutions (Arena et al., 2018), something that goes in line with this study’s definition of green FinTech innovation. These drivers and barriers are discussed below starting with the drivers.

| Table 2. Drivers and barriers for the general FinTech Innovation process. |
|-------------------|-------------------|
| **Drivers**       | **Authors**       |
| Increased outsourcing of financial business functions by traditional financial institutions | Punschmann, 2017; Gomber et al., 2017 |
| Technology development and digitization | Punschmann, 2017; Gomber et al., 2017; Zavolokina et al., 2016; Haddad and Hornuf, 2018; Weichert, 2017 |
| Unfulfilled needs and market incompleteness | Gomber et al., 2017; Weichert, 2017; Punschmann, 2017; Zavolokina et al., 2016; Haddad and Hornuf, 2018 |
| Macroeconomic conditions | Zilgalvis, 2014; Haddad and Hornuf, 2018; Zavolokina et al., 2016; Weichert, 2017 |
| Social challenges | Arena et al., 2018 |
| Venture capital | Haddad and Hornuf, 2018 |
| Regulatory frameworks | Punschmann, 2017; Haddad and Hornuf, 2018 |
| **Barriers**       | **Authors**       |
| Lack of access to funding | Arena et al., 2018; Zilgalvis, 2014 |
| Hybrid missions | Arena et al., 2018 |
| Information asymmetries and lack of recognized impact measurement frameworks | Arena et al., 2018 |
| Regulatory frameworks | Zilgalvis, 2014; Gomber et al., 2017; Zavolokina et al., 2016; Haddad and Hornuf, 2018 |

Drivers

*Increased outsourcing, technology development and digitization* - One of the identified drivers for general FinTech innovation processes refers to the changing ecosystems within the financial industry as a consequence of years of outsourcing different functions and divisions by insurance companies and banks (Punschmann, 2017). A large part of the production of business processes has instead been managed by for
example established IT companies. This outsourcing has made these actors more familiar to the financial industry in which they earlier did not operate and thus lowered the barrier of entry enabling them to produce their own technologically enabled solutions to financial services. According to Gomber et al. (2017) these actors follow technological developments, already work in an innovative and agile environment, (compared to the financial industry) and thus have an advantage in developing innovative financial services. Their competence and knowledge in combination with the changing role of IT and increasing digitization in society is according to the authors what has enabled the development of the FinTech sector. The latter is supported by Haddadd and Hornuf (2018) who examined what economic and technological factors that influence the difference in number of FinTech formations between countries. The authors found that the more mobile telephone subscriptions and secure internet servers that exist in a country, the higher the prevalence of FinTech innovations.

According to Punschmann (2017), the success of digitization in the financial industry relates to the fact that financial products almost exclusively are based on information. New developments in IT such as big data analytics, internet of things and cloud computing has made it possible to develop completely new products, services, processes and business models. Technological development has also been found as a driver of general financial innovations as it enables more accurate risk management (Zavolokina et al., 2016).

**Unfulfilled needs and market incompleteness** - On the other end of the spectrum, increasing digitization in most aspects of society has changed the way financial service customers interact and want to interact with financial service providers. Mobile devices such as smartphones and tablets have enabled everyone to be connected at any point and anywhere, ready to consume, search, read, listen (Weichert, 2017). Gomber et al. (2017) states that today’s financial service users demand the services to be easy-to-use, intelligent, independent of time and location to lower and lower costs. Inefficient processes such as slow loan approvals, high borrowing costs and complex application processes are examples of challenges that FinTech innovations try to solve (Weichert, 2017). Research on general financial innovation goes in line with this claiming that unfulfilled needs or market incompleteness such as information asymmetries is what stimulates financial innovation (Zavolokina et al., 2016). The success of FinTech innovations is their ability to better fulfil these needs than traditional financial service providers (Gomber et al., 2017). This is supported by Haddadd and Hornuf (2018) who for example find that the number of FinTech innovations is higher in countries where it is difficult for companies to access loans.

One such FinTech innovation is crowdfunding. According to Zilgalvis (2014) the financial crisis in 2008 made banks more restrictive towards lending to the real economy and thus it became difficult for small and medium sized companies to access loans. Crowdfunding then emerged as a solution to fill this funding gap. This leads to another driver behind the development of FinTech innovations - macroeconomic conditions.

**Macroeconomic conditions** - Haddadd and Hornuf (2018) state that macroeconomic conditions influence both the supply and demand of FinTech innovations. According to the authors, the supply, or prevalence, of FinTech innovations in a country is positively influenced by well-developed economies and capital markets, and a large labour force. These are important enabling factors for the development of these innovations. At the same time, as in the crowdfunding example above, the demand for these innovations increases as an effect of macroeconomic instability, particularly negative economic events, as these create uncertainty and instability in the market (Haddadd and Hornuf, 2018; Zavolokina et al., 2016). Haddadd and Hornuf (2018) found that countries that had been severely impacted by the financial crisis in 2008 experience a high demand for FinTech innovation. In addition, the demand for these innovations has been influenced by the fact that the financial crisis made the younger most tech-savvy generation, more sceptical towards traditional financial service providers and more open and less risk averse to try new FinTech solutions (Weichert, 2017).

**Social challenges** - A relating driver, which according to Arena et al. (2018) influences the demand and supply of social tech innovations, is the worsening of social challenges (for example the challenges stated in the sustainable development goals). According to the authors, this development in combination with a reduction of welfare have resulted in a gap which provides opportunities that can be seized by innovative organizations by combining technological and social innovation. Policymakers reliance on these new solutions to contribute in solving social challenges can be noticed by different incentives that have been introduced specifically to support this purpose.
Barriers

**Lack of access to funding and the role of venture capitalists** - According to Zilgalvis (2014), venture capitalists and business angels have come to serve an important role in the financing of innovative activity in Europe. According to the author, these actors fill a gap caused by the fact that the design of the current financial system in Europe does not support the level of innovative activity that is needed for a dynamic economy. It lacks plurality and an appetite for risk and thus innovative activity is decreasing. The implications for FinTech innovations is thus that they experience difficulties in receiving funding to develop their ideas. This explains the findings by Haddadd and Hornuf (2018) who state that availability of venture capital in a country influences the emergence of FinTech innovations positively.

However, Zilgalvis (2014) states that this may not only be a positive thing. FinTech companies in London are hesitant to turn to venture capitalists and business angels for financing. Even though some have had good experiences as the investors have contributed with networks and advice, others experience that the quality of the advice varies. In addition, the investors are viewed as greedy and often take a large part of equity in exchange for a small amount of investments. Thus, among FinTechs in London the view is that going to a venture capitalist may risk the destruction of the enterprise.

**Hybrid missions** - This view is supported by Arena et al. (2018) who examine financial instruments that can be used to fund social tech start-ups - start-ups that address social needs through technology-driven solutions. The authors state that when it comes to funding, especially from profit seeking equity investors such as venture capitalists, the fear does not only lie in losing control over their idea but also the mission driving the idea. This is because innovations driven by hybrid missions, both financial return and social needs are deemed to provide an unfavourable risk/return relation for the investor. Compared to general high-tech start-ups, a social tech start-up may not be able to generate high enough returns to satisfy return expectations and potential profits might not be used for return on share capital but rather reinvestments in the organization.

**Information asymmetries and lack of recognized impact measurement frameworks** - Other barriers to funding, and thus the innovation process, identified for social tech start-ups include information asymmetries and the lack of a commonly recognized measurement system for social impact. Information asymmetries refer to the limited availability of historical and financial information about the start-up which the investor needs to have as decision-basis. This uncertainty entails higher risks for the investor which may be balanced out by a request for high interest rates or large shares of equity. For social tech start-ups, the information asymmetries are higher than for normal high-tech start-ups as most investors are not used to the special characteristics of such innovations. This unfamiliarity either results in no investments or that social tech start-ups are treated the same as other organisations which means that the additional value they create is not included as a base for the decision. These conditions could potentially be improved if there were any recognized performance metrics that social tech start-ups could use to measure and monitor their social impact. To date, no such universal metrics exist. (Arena et al., 2018)

**Regulatory frameworks** - According to Zilgalvis (2014), many barriers to funding for FinTech innovations could be relieved by the development and growth of their own innovative solutions, crowdfunding being one example. This reasoning however leads to yet another barrier which is represented by regulatory frameworks. According to Zavolokina et al., 2016) regulatory aspects related to FinTech innovations have become a more important topic in recent years. The authors conducted a content analysis on media articles published on the topic of FinTech up until 2015 and found that both the topic “regulations” and regulatory actors increasingly have been mentioned. The authors state that this shows the importance of developing a clear legal framework for FinTech activities, which according to Zilgalvis (2014) so far is not the case. Zilgalvis (2014) means that the European regulatory framework rather is designed to prioritize stability and avoidance of fraud before innovation and renewal. This means that the regulatory burdens are difficult to overcome for new entrants in the financial market (Gomber et al., 2017) and that it is important for FinTech innovators to keep an eye on regulatory developments as these can threaten the core of their business models (Haddadd and Hornuf, 2018).

As a response initiatives are taken by FinTech innovators and regulatory actors to improve the situation. Drawing on what Zilgalvis (2014) refers to as best practice from London, public consultation and regulatory
dialogue between regulators and FinTech developers can contribute to ensuring informed actions by regulators and consequently future stimulation of innovative activity. Gomber et al. (2017) highlights the possibilities for FinTech innovators to use such opportunities to influence the regulatory process for this new phenomenon. The function of such dialogue should also include feedback from regulators to FinTech innovators on how their innovations fit into the current regulatory framework (Zilgalvis, 2014).

The importance of a suitable regulative framework can be shown by the research of Haddad and Hornuf (2018) who found that flexible market regulations have a positive influence on the emergence of FinTech innovations in a country. Perhaps as a response to that, some countries such as Singapore, Hong Kong and London have created regulative “sandboxes” (Punschmann, 2017). These initiatives are meant to lower the barriers of entry to the market for new innovations as well as stimulate innovation in the area of FinTech.

***

The achievement of the Sustainable Development Goals could possibly be enabled by green FinTech innovation. The stimulation and development of these innovations requires conceptual and empirical knowledge on what such an innovation process looks like, including which individual, internal organizational and external societal factors that influence the process (Smith et al., 2010; Geels, 2002; 2011; Van de Ven et al., 1999, ix; Rosenberg and Kline, 2010, p. 202). However, as this chapter makes clear, research on the innovation process of green FinTech innovation is scarce. Existing research only covers general FinTech innovation and only a few aspects of its innovation process. This study thus makes an important contribution to research by contributing to filling the evident gap in research on green FinTech innovation processes.
3. Theory

This chapter presents the choice of theories, concepts and models that have been deemed suitable to describe green FinTech innovation processes. The chapter begins with an overview of the historical development of innovation process theory which is used as a background for the choice of theory used to analyse the empirical data in this study. This choice is described in the subchapter titled analytical framework.

3.1. Historical development of theory on innovation processes

There are several different theories and models depicting what an innovation process looks like. According to Van de Ven et al. (1999, p. 3), one approach entails that the innovation process consists of different stages e.g. invention-development-testing-commercialization where each stage is believed to follow another in a predictable manner - the stage-wise model. When one stage in the process has reached stability, the next stage in the process will begin. Thus, progress in the innovation process can be determined based on which stage the innovation team has reached. According to Rosenberg and Kline (2010, p. 183) these kinds of models can also be referred to as linear models.

According to Rothwell (1994), the linear depiction of the innovation process was common in the first generations of innovation process theories. The first model, known as the technology push model (see figure 2), dominated during the first 20 years after World War II – a time when science and new technologies made large contributions to better living standards. The belief was that more investments in R&D would result in more successful innovations. Thus, the innovation process began with scientific discovery, continued with technological developments in firms, and ended with commercialization of these discoveries on the market.

According Rosenberg and Kline (2010, p. 184) the linear model has dominated innovation research and innovation policy since its introduction. However, Rosenberg and Kline (2010, p. 173) and Van de Ven et al. (1999, p. 4, 23) state that the model is too simple to explain the complex and uncertain process of innovation. For example, science is not always the first step in the innovation process (Rosenberg and Kline, 2010, p. 184-186). In most cases innovation is initiated with knowledge already in the heads of the innovators, or less frequently, knowledge that is readily available to them. Only when this knowledge is not enough, innovators turn to research for answers. In addition, the search for knowledge does no only occur in the beginning of the process, but rather throughout when needed (ibid., p. 189).

The second generation of innovation processes, dominant between the mid 1960’s and early 1970’s, conceptualized the innovation process as a market pull process rather than technology push process (see figure 3). During this period, the demand and supply of products and services was quite balanced, and thus marketing became more important. The needs of the market replaced R&D as the driver of innovations and thus also became the driver of R&D-directions. (Rothwell, 1994)

The change from science (not necessarily to market need) as the driver of innovations goes in line with the argument of Rosenberg and Kline (2010, p. 184-186) above. However, a second argument from Rosenberg and Kline (2010, p. 184) on the drawbacks of the linear model is that it does not include any feedback loops, referring to the possibility of gaining knowledge in one step of the process and going back one step to make adjustments based on that knowledge. In an ideal world, it may be possible to get everything right in the first try, but in the real world which involves high uncertainty, inadequate information, and imperfect people, this does not occur. Additionally, the state of stability which is claimed to occur before the process can move on to the next stage in the model does not happen in reality (Van de Ven et al., 1999, p. 23). Rather, the
innovation process is part of a system and according to complex systems theory all "living systems" are far from equilibrium at all times, except for at the state of death. A model that leads the innovation manager to believe that stability should be achieved before moving on to the next stage in the innovation process may therefore cause the innovation to fail.

Since the second generation of innovation processes, the theoretical development has departed more and more from the linear model. According to Rothwell (1994) the third generation of innovation processes, called the coupling model, although still linear, included the feedback loops mentioned by Rosenberg and Kline (2010, p. 184). The different stages of the process were functionally different however interdependent and characterized by interaction. Another change according to Rothwell (1994) was that the driver of innovation was depicted as the result of an interaction between market needs and technological capabilities. As stated by Rosenberg and Kline (2010, p. 174) a technological development will not succeed if there is no market for it and a market need will not be filled if the necessary technology is not available. Overall, communication was key and the innovation process could be depicted as a net of intra-organizational and inter-organizational communication paths that connected both in-house functions to each other and the organization to the market place and the scientific and technological community.

The fourth generation of innovation process models completely left the idea of a linear process and instead depicted the innovation process as integrated and parallel (Rothwell, 1994). It was inspired by the efficiency of Japanese automobile and electronics industries where it was observed that by integrating the expertise of different in-house functions as well as suppliers continuously through the development of an innovation it was possible to reduce the time needed to develop it. Thus, all the functions would work on the development simultaneously. This need for efficiency was a consequence of overall shorter product life cycles and thus became a competitive factor.

3.2. Analytical framework

During the 1980’s Van de Ven et al. (1999, p. 5) conducted a longitudinal field study where fourteen research teams tracked a variety of product, process, and administrative innovations from concept to implementation or termination. The analysis was done on the basis of five concepts which the authors used to describe the innovation process; ideas, people, transactions, outcomes and contexts (Van de Ven et al., 1999, p. 6). Using these five concepts, the innovation process was defined as:

"new ideas that are developed and implemented to achieve desired outcomes by people who engage in transactions (relationships) with others in changing institutional and organizational contexts" (Van de Ven et al., p. 7).

According to Poole, Van de Ven, Dooley and Holmes (2000, p. 105-108):

- **Ideas** refers either to the core idea which drives the innovation process, or related ideas that complement the core idea and are necessary to coordinate, organize or support its development.
- **People** refers to the members of the innovation team and their roles.
- **Transactions** refers to legal relationships (e.g. contracts) or social relationships (e.g. networks).
- **Outcomes** refers either to the established criteria used to measure progress of the innovation development, or observed results related to the criteria. The results can be positive, negative, or mixed.
- **Contexts** refers either to the internal context meaning the organization which houses the innovation development, or the external context meaning the environment outside the organization that may influence the innovation, e.g. markets, technology development, regulation.

The aim of the study conducted by Van de Ven et al. (1999, p. ix) was to understand "How and why innovations develop over time from concept to implementation?". More specifically the aim was to understand how changes in innovation ideas, people, transactions, outcomes and contexts change over time (ibid., p. 7). E.g. ideas can expand during the innovation process meaning the original idea can widen or new ideas can be added to the original idea, ideas can be modified in relation to the initial idea, ideas can contract meaning an idea can be dismissed or put on hold, and finally the idea may stay exactly the same throughout
the process meaning it continues (Poole et al., p. 108). These four types of changes (expansion, contraction, modification or continuation) may change over time. E.g. the beginning of an innovation process may mainly be characterized by an expansion of ideas to be further developed, while later periods may be more characterized by the modification of those ideas as a result of testing their potential while developing them.

Based on an analysis of the authors empirical data, Van de Ven et al. (1999, p. 25) developed what they refer to as the “firework model” (see figure 4). The model incorporates the developments that can be seen through the four generations of innovation process models described above and depicts the process as quite flexible. As it is based on a rigid empirical study of several different innovation processes (Van de Ven et al., 1999, p. 5), its potential to explain yet other innovation processes is strong. Thus, in this study, the five concepts, ideas, people, outcomes, transactions and contexts, in combination with the twelve patterns common for innovation processes illustrated in the “firework” model was used to frame and analyse green FinTech innovation processes in order to answer the research questions. The concept “people” was further developed with the sub-concepts knowledge, capabilities personal motivation which will be further described under pattern 7 in the next sub-chapter.

3.2.1. The Firework Model

According to the firework model, the innovation process consists of three periods: initiation, development and implementation. The initiation period is characterized by the occurrence of activities and events that lead to the launch of an innovation process. During the development period, focused efforts are made to realize the innovative idea. The implementation period, which also could entail termination, is characterized by the adoption of the innovation in whatever context it was meant for (Van de Ven et al., 1999, p. 25). During these three periods, changes occur in ideas, people, transactions, outcomes and contexts that determine the shape of the innovation process. Following is a description of the twelve main patterns of an innovation process identified by Van de Van et al. (1999) in their study, as illustrated in figure 4.

![Fig. 4. Key components of the innovation journey (from Van de Ven et al., 1999, p. 25).](image)

**Initiation period**

1. The initiation of an innovation process does not just occur from one day to another because of a single dramatic inspiration or incident, in most cases it is preceded by a gestation period that can last up to several years. This gestation period is characterized by different events coming from multiple sources not intentionally directed toward an innovation. Together however, they prepare the stage for the innovation process (Van de Ven et al., 1999, p. 10, 23-25). The eventual unfold of the process may also not be what was intended by the initiators, rather during the process they may coincidently cross paths with others and these interactions may lead to new opportunities and new courses of action (ibid., p. 27).

2. The initiation of the innovation process and the allocation of resources usually require more than just persuasion. According to the findings of Van de Ven et al. (1999, p. 10, 23-24, 27, 29) many innovative ideas can be created but the initiation of an innovation process based on them requires a shock that
triggers the attention and action of relevant innovation participants. These shocks may come in many forms but essential is that they make participants reach a threshold of dissatisfaction with existing conditions.

3. The end of an initiation period and the start of a development period is characterized by the development of plans and budgets and acquirement of resources needed to launch the innovation (Van de Ven et al., 1999, p. 30). According to Rosenberg and Kline (2010, p. 195) the amount and level of detail in the planning is often related to the degree of uncertainty or novelty inherent in the innovation. Approaching planning as “the more the better” would be true for innovations which entail hardly any risk, however for more radical and thus more risky innovations, planning can easily turn into “overplanning” which may steer the innovation in unfortunate directions and hinder the effectiveness of the work.

Development period

4. When the development period is initiated, the idea does not maintain a stable identity throughout, and the process does not take the form of a simple linear process with stages and sub-stages (Van de Ven et al., 1999, p. 7). Rather the initial idea expands into several ideas and activities which engage different functions in the organization (marketing, R&D, production etc.) and create a process with parallel, convergent and divergent paths (see figure 5) (ibid., p. 10, 23-24). Some ideas are kept, some discarded and some reborn (ibid., p. 8). Thus, Rosenberg and Kline (2010, p. 175) state that one deals with the optimization of many demands and requests simultaneously.

![Fig. 5. Divergent, parallel and convergent paths. (adapted from Poole et al., 2000, p. 233)](image)

5. The innovation process is accompanied by frequent setbacks because plans go wrong or due to unanticipated environmental events that change the basic assumptions and context for the innovation (Van de Ven et al., 1999, p. 10). Previously the context of an innovation in terms of constraints and resources was presumed to stay fairly stable throughout the innovation process (ibid., 166) however the findings by Van de Ven et al. (1999, p. 149) show that e.g. policies may change radically and unpredictably which creates a risky investment climate. These setbacks either represent signs of rejection of the innovation or opportunities to learn and reinvent (ibid., p. 10, 23-24).

6. As a consequence of setbacks, environmental events, or changing priorities, the goals and criteria used throughout the process to guide and evaluate the progress, often change in order to redirect the innovation process (Van de Ven et al., 1999, p. 10).

7. According to Van de Ven et al. (1999, p. 8, 13) the complexity of most innovations require that more than one person participate in the innovation process. The participants in an innovation team are however rarely dedicated to the entire process and neither on a fulltime basis. Rather their participation is fluent depending on the need for their inclusion and their own interest. Each participant brings a set of skills which depend on their background and experience. Previous research has identified a few skills and characteristics that are positively related to the identification of business opportunities and probable success of an innovation process (Johnsson, 2017). These factors can be divided into three categories;

1) Capabilities – including reflection (Logman, 2007; West, Hirst, Richter and Shipton, 2004), creativity and problem solving (Nanda and Singh, 2009), collaboration, contextual learning, searching, critical thinking, synthesizing information and self-direction (Cobo, 2013), opportunity identification (Tan, 2013) and appropriate use of knowledge (Hung, Lien, Fang and McLean, 2010) by e.g. ensuring good communication between innovation team members (Jablokow and Booth, 2006).
2) Knowledge - including previous experience from taking part in innovation processes (Van de Ven et al., p. 10), appropriate knowledge for innovation (Francois, Favre and Negassi, 2002), maintaining an awareness about trends in the surrounding environment (Logman, 2007; West et al., 2004), a constant generation of new knowledge (Johnsson, 2017, Park, 2005) and know-how resulting from experience (Dooley, Kirk and Philpott, 2013).

3) Personal motivation (Hauschildt and Kirchman, 2001; McGurk and Baron, 2012; Yang et al., 2011) - including an eagerness to learn and inquisitiveness (Nanda and Singh, 2009), extrinsic motivation resulting from external rewards or feedback (Fairbank and Williams, 2001), intrinsic motivation resulting from genuine interest and engagement in the work itself (Amabile and Kramer, 2012; Bright and Godwin, 2010; Kathleen, 2012; Kayabasi, Duran and Çentindere, 2013) and relational motivation resulting from that the work creates value to others (Johnsson, 2017).

8. It is common that external investors or top managers in an organization are involved throughout the development period especially when the process experiences problems or challenges that need to be solved. (Van de Ven et al., 1999, p. 51)

9. As innovations develop over time, the network of actors related to it expands into a complex web of social and legal transactions (relationships) needed to move the innovation forward. Examples of such relationships include relationships within the innovation team, co-ventures, subcontractors, investors, partnerships, competitors, or any other relationship needed to develop and implement the innovation (Van de Ven et al., p. 10). It may also include the involvement of end, lead or extreme users (ibid; Ross, Mitchell and May, 2012; Yu, 2010) or customers (Bossink, 2004; Coviello and Joseph, 2012) in order to adapt the innovation to their context, understand their behaviour and needs, ensure a commitment towards the innovation and a momentum throughout the development process. Innovation processes that do not invite end users to participate in reinvention and modification of the innovation, experience more difficulties in terms of adoption.

In general, networking with actors outside the innovation team for example through participation in conferences and courses (Jenssen and Nybak, 2009) provides opportunities for collaboration and the exchange of knowledge (Hurmelinna-Luukkanen, 2011; Mele, Spena and Colurcio, 2012), a productive innovative climate (Cooper, 2005), increased information flow (Hemlin and Olsson, 2011; López-Fernández, Serrano-Bedina and Gómez-López, 2011), intangible assets such as brand image (López-Fernández et al., 2011), sustainable innovation results due to strategic alliances and long-term relationships facilitated by partners (Bossink, 2004), important sources of new ideas (Mol and Birkinshaw, 2009; O’Brian and Smith, 1995), and, for small companies, help with managing innovation challenges (Andriopoulos and Lewis, 2010). However, even though these relationships may provide opportunities for the innovation, they may also shape and constrain future interactions with other actors (Van de Ven et al., 1999, p. 52).

10. Parallel to developing the innovation, the innovation team may be involved in activities together with competitors, government agencies and other organizations that aim at creating a political, economic, and market infrastructure to support the development and implementation of the innovation. Sometimes this incurs adapting current infrastructures as they may constrain rather than stimulate innovative activity. The infrastructure gives legitimacy to the new innovation through regulations and standards, provides basic scientific knowledge, competent human resources and financing mechanisms, develops a market of informed and educated consumers, and enables the manufacturing, production and distribution that is needed to implement the innovation. Such an infrastructure is necessary as it is very rare that an individual entrepreneur or team of innovators possess all the competence, resources and legitimacy that is needed to develop and implement an innovation. (Van de Ven et al., 1999, p. 149)

**Implementation**

11. The end of the development period and beginning of the implementation period is not a clear one as activities that contribute towards adopting and implementing the innovation are performed throughout the development period. An example of such an activity is testing the innovation with end users to see if any changes need to be made in the development (Van de Ven et al., 1999, p. 23-24). According to Rosenberg and Kline (2010, p. 175) such testing is an important and sometimes critical part of innovation.
12. The innovation process is over when the innovation is implemented or when there are no more resources to keep it going (Van de Ven et al., 1999, p. 23-24). However, the fact that is implemented does not mean that it cannot be further developed. According to Rosenberg and Kline (2010, p. 186), the first version of an innovation usually does not reach its full potential, to do so it will require incremental improvements. In such a case, another innovation process is initiated.

To summarize, an innovation process can be described through changes that occur over time in the five concepts ideas, people, transactions, outcomes and contexts (Van de Ven et al., 1999, p. 6) as well as the twelve patterns described above that have been derived from analyses of changes in these concepts in different innovation processes. These five concepts and the twelve patterns illustrated in the firework model was used as the framework for analysing the three green FinTech innovation processes examined in this study, and thus to answer the study’s two research questions.
4. Method

This chapter presents all the choices made related to this study’s methodological approach. The relevance and consequences of these choices to the research problem and research process are discussed to ensure transparency of the study. A qualitative, exploratory and abductive approach based on a multiple case study has been taken to answer the research questions. The data has been collected through semi-structured interviews.

4.1. Research design

Answering the research questions stated in this study requires data to be collected from actors that have participated in green FinTech innovation processes. This is because potential initiatives aimed at stimulating or supporting green FinTech innovation preferably should be based on an in depth understanding of the experiences, perceptions and perspectives held by those who have developed such innovations. According to Taylor, DeVault and Bogdan (2015, p. 18) such an understanding is best achieved through a qualitative approach which according to Bryman (2015, p. 401) focuses on the point of view of the respondent and what they believe is important and significant. In addition to a qualitative approach, the study takes an exploratory approach. According to Yin (2009, p. 37), an exploratory approach is suitable when previous research related to the phenomenon is scarce, which is the case with FinTech innovation in general (Zavolokina et al., 2016; Gomber et al., 2017; Ma and Liu, 2017), and green FinTech innovation processes in particular.

In terms of the relationship between theories and concepts on the one hand and collected data on the other hand, the researcher chose to take an abductive approach. This means that the researcher started with identifying theories and concepts commonly used to describe innovation processes in previous literature to get some ideas on what kind of data to collect and from where it should be collected (Bryman, 2015, p. 7, 394). The flexibility of the abductive approach then allowed the researcher to revise the theoretical framework to better fit the data (ibid.). The need for the researcher to be able to go back and forth between theory, data and analysis was based on the heterogeneity and complexity of innovation processes and green FinTech innovations, in combination with a scarcity of previous research on the phenomenon.

Thus, to answer the research questions in this study, a qualitative, exploratory and abductive approach consisting of a multiple-case study design with a single unit of analysis was used.

4.2. Multiple-case study

According to Yin (2009, p. 4) the choice of a case study design depends on to what extent the research questions aim to understand why or how a social phenomenon works and to what extent they require an in-depth understanding of the phenomenon and its real-life context. The research questions stated in this study require an in-depth description of the phenomenon “Green FinTech innovation process” in terms of what it looks like and what factors that influence it, but also how these factors influence the process.

Case study methods have also been used in other studies on innovation processes, e.g. longitudinal case studies in Van de Ven et al. (1999) and multiple-case study in Björklund and Forslund (2018). Most previous research on innovation processes have been conducted as retrospective case histories (Poole et al., 2000, p. 118) which according to Yin (2009, p. 11) is a combination of the case study and a history research method. The difference between the two is that a clean history focuses on the dead past, where access to relevant alive people is not possible while the case study design is suitable for examining contemporary events (Yin, 2009, p. 11). As green FinTech innovation can be defined as a contemporary phenomenon and access to relevant people was possible, a case-study was deemed as an appropriate choice of research method for this study.

According to Yin (2009, p. 14-16) the case study research method has been criticized for little basis for scientific generalization and lack of rigor. Yin states that the first criticism is true in terms of generalizing to a population since that is not possible through a single or very few cases. Instead case studies are suitable for theoretical generalization meaning that through a deeper look at an empirical problem, a case study can contribute to, and develop theories further. Yin refers to this as analytical generalization (ibid., p. 38). The
second criticism probably lies in the fact that many case studies have been done in a sloppy way not following systematic procedures such as keeping a case study protocol, conducting a thorough literature review etc.

The possibility for analytical generalization is higher in a multiple-case study than a single case study which is one of the reasons why this choice was made in this study. Multiple-case studies, entailing that more than one case have been examined, are regarded as more robust (Yin, 2009, p. 53) and enable the researcher to apply replication logic. Replication can be claimed when the findings from the second, third and further cases support the findings from the first case, increasing the possibility for external validity and analytical generalization (ibid., p. 44, 54-56). By examining more than one case, this study is also able to present a more nuanced view of the phenomenon including more of the digital business functions mentioned in Gomber et al.’s model in chapter 2, which fits well with the exploratory approach taken in the study.

4.2.1. Choice of unit of analyses and cases

Guided by the aim and research question as well as the theoretical framework for this study (Yin, 2009, p. 30), the unit of analysis in this study was the innovation processes of green FinTech innovations. Cases of such innovation processes naturally were deemed to be found in organizations that had developed green FinTech innovations.

The search for cases was limited to the German city of Frankfurt. This geographical limitation was deemed important in terms of ensuring some level of comparability between the different cases as all the innovation processes would have been developed in the context of the same innovation infrastructure. No geographical limitation was made in terms of the impact reach of the innovations. The city of Frankfurt was also assumed to have a prevalence of green FinTech innovations based on:

1. A strong presence of the financial industry with more than 200 international banks as well as the European Central Bank (Frankfurt Main Finance, n.d.)
2. A strong innovation culture as Germany was ranked on place nine in the ”2017 global innovation index” and Frankfurt on place twelve in terms of subnational innovation clusters (Cornell University, INSEAD, and WIPO, 2017)
3. A regional commitment to sustainable development shown through several initiatives taken the past years with the purpose of achieving a more sustainable financial industry e.g. the Frankfurt declaration (Deutsche-boerse.com, 2017a; Deutsche-boerse.com, 2017b).

The sampling of cases was conducted through a generic purposive sampling approach, which according to Bryman (2015, p. 408-409) is a common sampling approach in qualitative research. In purposive sampling, cases (also contexts and participants) that are deemed to be of true relevance to the research purpose and questions are sought for. As this study is exploratory, and the FinTech industry in general, and green FinTech industry in particular, is quite immature (Zavolokina et al., 2016), the researcher started off from the beginning with a very generous selection frame. Drawing on Gomber et al.’s model in subchapter 2.2., no limitation was made in terms of the digital finance business function targeted by the green FinTech innovation or digital finance institution that developed it. The only criteria that had to be fulfilled by the cases included in the sample was that they had to fit this study’s definition of a green FinTech innovation:

“A green FinTech innovation is a novel, technologically enabled solution for financial services, developed by start-ups, established technological firms, or traditional financial service providers, with the aim of creating value and increasing the flow of financial resources for sustainable development.” (see sub-chapter 2.2.)

Two different sampling techniques were used. The first consisted of Internet searches on Google and social media (Facebook, Meetup, LinkedIn) using search inquiries such as “Green FinTech Frankfurt”, “FinTech Frankfurt” “Innovation Hub Frankfurt” “FinTech sustainable development Frankfurt”. Most green FinTech Innovations were found through this sampling technique. Secondly snowball sampling was used. According to Bryman (2015, p. 415) and Taylor et al. (2015, p. 106-107) snowball sampling usually involves that the researcher uses interview participants’ networks in order to identify more participants. This can be a useful sampling technique when it is difficult to find appropriate participants (Bryman, 2015, p. 415), which was the case with green FinTech innovations in Frankfurt. Snowball sampling was performed by asking actors within the FinTech sphere in Frankfurt for guidance to further green FinTech innovations. These requests
were either made on social media platforms or via email to different identified innovation hubs or incubators. Snowball sampling has been criticized for lowering the diversity of a sample (Taylor et al., 2015, p. 106-107). This would be more important to consider if the ambition of this study was to generalize to the population rather than to apply replication logic to achieve analytical generalization.

In total 13 green FinTech Innovations were identified and contacted. From these, data was eventually collected from three cases. Due to the nature of innovation processes, the initial ambition was to collect data from more cases, however, according to Yin (2009, p. 58) three cases are enough for the application of replication logic in a multiple-case study. The three cases also make up a large part of the population that could be found in Frankfurt (23%). Finally, the difficulty of finding green FinTech innovations in Frankfurt is an argument in itself for the need to understand how to stimulate and support such innovation and thus for the importance of this study. Table 3 below presents the three cases examined in this study.

Table 3. Case descriptions of green FinTech innovation processes examined in this multiple-case study.

<table>
<thead>
<tr>
<th>Green FinTech Innovation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bettervest</td>
<td>Bettervest is a crowd investment platform that focuses on renewable energy and energy efficiency. Private, public and non-governmental actors that want to install renewable energy solutions or improve their energy efficiency can upload a project on the digital platform together with information about how much investment they need. Thereafter people are able to jointly invest from €50 and up in the project. (bettervest, n.d.)</td>
</tr>
<tr>
<td>SDG-Investments</td>
<td>SDG-Investments is a digital matching platform between investors and projects that contribute to the sustainable development goals. The investors declare which SDG’s they want to invest in and how much capital they can invest, and the projects declare which SDG’s they contribute to. The actors are then matched based on their declared goals. (SDG-Investments, n.d.)</td>
</tr>
<tr>
<td>Der Finanzoptimist</td>
<td>Der Finanzoptimist is a financial advisory podcast that informs its listeners about social, ecological and governance sustainability issues related to traditional investments. (Der Finanzoptimist, n.d.)</td>
</tr>
</tbody>
</table>

4.2.2. Data collection method

According to Poole et al. (2000, p. 91) research on innovation processes requires the collection and analysis of event sequence data. Therefore, data collection methods that enable the researcher to identify events and to characterize sequences of events and their properties are needed. Previous research on innovation processes have used data collection methods such as participant observation, qualitative interviewing and archival records (Van de Ven et al., 1999, p. 7; Björklund and Forslund, 2018). As these methods have been rigorously tested, the researcher decided to evaluate and chose from these for the data collection in this study.

Starting with archival records, these were not able to be obtained by any of the cases due to confidentiality issues and lack of such records. Participant observation in turn would only provide data for a limited section of the innovation process (the four months available for this study), and it would only capture the process during the observation period and would not be suitable for collecting data related to the period before or after the observation period (Bryman, 2015, p. 494).

Qualitative interviews, or more precisely semi-structured interviews with open-ended questions, were on the contrary perceived as a suitable data collection method for this study. As opposed to participant observation, semi-structured interviews enabled the researcher to collect data on the innovation process leading up to the interview, as well as plans for the process after the interview (Bryman, 2015, p. 494). It also enabled data to be collected directly from actors who participated in the process and thus their perspectives, perceptions and experiences of different events could be captured. Finally, semi-structured interviews were deemed suitable to achieve the data richness required for case-study research (Yin, 2009, p. 106). This is because this data collection method allows the researcher to adapt the questions to the respondents’ answers, and ask follow-up questions when necessary (Taylor et al., 2015, p. 102; Bryman, 2015, p. 467-468). Thus no one-size-fits-
all set of questions was required, which also would be difficult to develop for such a heterogenic and complex phenomenon as innovation processes (Van de Ven et al., 1999, p. 7; Rosenberg and Kline, 2010, p. 181). However, since several cases were examined, some kind of structure was necessary in order to be able to compare the collected data which is why an interview guide with some pre-formulated questions (Bryman, 2015, p. 467-469) represented the basis for all the interviews.

Interviews as a data collection method however also has drawbacks. According to Yin (2009, p. 108) these include reliance on respondents’ abilities to remember events, bias due to poor questions and risk of the respondent giving the interviewer what he or she wants etc. Still, interviews are one of the most important sources of data in case studies (ibid., p. 106). Considering the drawbacks, and the fact that interviews were the only potential source for data on the innovation process of the three cases examined in this study, there was a risk that important events would be missed, or recalled in a more positive, negative, or just different way than what actually occurred. To tackle this, the researcher took extra good care during the interviews to ask questions relating to when mentioned events occurred, why they occurred, and what consequences (if any) that they had on the process. The researcher also made sure to repeat questions to which the answers were not clear or contradictory. According to Poole et al. (2000, p. 118) one benefit of basing the analysis on retrospective accounts is that it is not until the end of the process that one knows which events and observations that were relevant for its development. During the process, this may be difficult to determine.

After the three cases of green FinTech innovation presented in subchapter 4.2.1. were chosen, a sampling of interview participants was conducted. Here the choice criteria included that the participants should have been part of the entire innovation process. It was not necessary for them to have performed every task, but they should have insights into all steps, decisions and events during the innovation process. For each of the three innovation cases in the sample, the participant turned out to be one of the founding partners of the green FinTech innovations and consequently the companies that these innovations resulted in (see table 4).

Table 4. Interviews in this multiple-case study.

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Role</th>
<th>Type</th>
<th>Validation</th>
<th>Interview date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patrick Mijnals</td>
<td>Co-Founder, bettervest</td>
<td>Personal</td>
<td>Results chapter</td>
<td>March 27th 2018</td>
</tr>
<tr>
<td>Frank Ackermann</td>
<td>Co-Founder, SDG-Investments</td>
<td>Personal</td>
<td>Results chapter</td>
<td>April 11th 2018</td>
</tr>
<tr>
<td>Philip Achenbach</td>
<td>Founder, Der Finanzoptimist</td>
<td>Personal</td>
<td>Results chapter</td>
<td>April 12th 2018</td>
</tr>
</tbody>
</table>

As required for in-depth interviews, the interviews varied between 65-105 min (Taylor et al., 2015, p. 111. They all went smooth without any major interruptions or other events. The only challenge was a few instances where the respondent did not respond to a question as it was asked, despite probing and reformulations. However, the questions that were misunderstood were different for each respondent and these misunderstandings did not affect the quality of the data adversely. In these cases, the researcher decided to continue with the interview in order not to discourage the respondent.

The researcher did not take additional notes during the interviews as she wanted to be completely focused on the responses from the interviewee (Bryman, 2015, p. 479). Instead the interviews were all recorded and transcribed in order to make sure that information of value was captured without having to rely solely on the memory of the researcher (Taylor et al., 2015, p. 126). Sometimes recording can make the respondent self-conscious about what words they use (Bryman, 2015, p. 480). Such behaviour was however not noticed to any grave extent among the respondents. The transcribing, although time-consuming, was conducted without problems since the recorder had been able to capture almost every word during the interviews.

4.2.3. Quality assurance

According to Yin (2009, p. 40), the quality of a case study’s design should be determined by the four criteria commonly applied to other empirical social science research: construct validity, external validity, internal validity and reliability. Riege (2003) suggests several techniques to be used by researchers throughout the research process in order to fulfil these criteria. Table 5 describes some of these techniques and how they have been applied in this study.
Construct validity refers to the importance of identifying and using correct operative measures for the studied concepts (Yin, 2009, p. 41). The techniques used to construct validity thus ensure that the operative measures used to categorize data according to different concepts are correct. Two techniques have been used to construct validity in this study. First, the interviews were recorded and transcribed in order to enable cross-checks of specific evidence or citations. Second, the results chapter including citations was sent to the interview respondents by email for their comments and approval of the content. All three respondents had comments on the text which entails that the quality was improved.

Internal validity refers to whether the real-life phenomena examined is properly demonstrated in the study (Riege, 2003). Measures taken by this study to achieve this include within case analyses followed by cross-case pattern matching, the application of the same conceptual model on all the collected data and the use of illustrative models that explain the phenomena.

External validity refers to whether research findings can be generalized to other contexts (Bryman, 2015, p. 384). According to Yin (2009) techniques for fulfilling this criterion aim at defining which those contexts or domains would be (p. 40) as well as ensuring the possibility of doing an analytical generalization (p. 44). This study has done this by relating the findings to existing literature, by defining the scope and boundaries for the analytical generalization in the research design and by choosing to conduct a multiple-case study which enables the use of replication logic.

Lastly reliability refers to the degree of which a study can be replicated (Yin, 2009, p. 40; Bryman, 2015, p. 386-387). The goal is to minimize errors and biases in a study (Yin, 2009, p. 45). Efforts to achieve this has been done through documenting the steps in the research process in a case study protocol, recording and transcribing the data, exposing the study to peer reviews, and giving full accounts of the theories framing the study and the methods used.

---

**Table 5. Tests and techniques for establishing validity and reliability in case study research (from Riege, (2003, p. 78-79) modified by the author).**

<table>
<thead>
<tr>
<th>Case study design tests</th>
<th>Relevant techniques</th>
<th>Applied in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct validity</td>
<td>Have key informants review draft of case study report</td>
<td>Write-up of results chapter sent to interview respondents for approval and comments.</td>
</tr>
<tr>
<td></td>
<td>Establish chain of evidence</td>
<td>Interviews were transcribed to allow for cross checks of sources of evidence or citations.</td>
</tr>
<tr>
<td>Internal validity</td>
<td>Within-case analysis, then cross-case pattern matching</td>
<td>Each case was analysed individually then compared</td>
</tr>
<tr>
<td></td>
<td>Use of illustrations and diagrams in data-analysis to support explanation</td>
<td>Illustrations of models from conceptual framework were used for analysis.</td>
</tr>
<tr>
<td></td>
<td>Findings and concepts are systematically related</td>
<td>All data from each case were analysed using the same conceptual framework.</td>
</tr>
<tr>
<td>External validity</td>
<td>Connect findings to existing literature</td>
<td>Findings are connected to theoretical framework and previous research in analysis and discussion.</td>
</tr>
<tr>
<td></td>
<td>Define scope and boundaries for analytical generalizations</td>
<td>Done in 3.4.1. and 3.4.2.</td>
</tr>
<tr>
<td></td>
<td>Use replication logic in research design to support analytical generalization</td>
<td>Done through conducting multiple-case study.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Give full account of theories and ideas</td>
<td>Done in chapter 2</td>
</tr>
<tr>
<td></td>
<td>Assure congruence between research issues and features of study design</td>
<td>Done in chapter 3</td>
</tr>
<tr>
<td></td>
<td>Develop and use case study protocol</td>
<td>Done in Appendix II</td>
</tr>
<tr>
<td></td>
<td>Record data</td>
<td>Interviews were recorded and transcribed</td>
</tr>
<tr>
<td></td>
<td>Use peer review/examination</td>
<td>Study was reviewed by peers throughout the research process</td>
</tr>
</tbody>
</table>
4.3. Ethical considerations

Drawing on Bryman (2015, p. 126-129) the main ethical consideration relevant for the topic of this study is the confidentiality aspect that relates to the ethical area “harm to participants”. Information about the innovation process of green FinTech innovations is sensitive information since it refers to the business idea and business secrets of a company’s success. This constitutes a challenge for the researcher in terms of gaining access to relevant information, but also a responsibility in terms of maintaining confidentiality of records. The spread of confidential information may incur harm to the respondents and their company. It is therefore highly important to be as clear as possible regarding what the information will be used for and to receive consent from respondents regarding which information that will be published in the final study report. It is also very important to clarify whether the name of the company and respondent can be published or not. The following measurements were taken to assure no harm to participants, but also to assure that the research lives up to the requirements of the three other ethical areas that Bryman (2015) mention; “lack of consent” (p. 129-131), “invasion of privacy” (p. 131-133), and “deception” (p. 133-134):

- The participants were invited to a voluntary interview through an e-mail with information about the research aim and research questions, some background information about the researcher, and information on when the researcher would like to conduct interviews and how long they would last.
- Each interview commenced with a repetition of the aim and research questions of the study, as well as a clarification that the participants should only answer the questions that they felt comfortable with answering and that they themselves as well as the company could be anonymous in the study report if they wanted to. The question of anonymity was repeated at the end of the interview. Lastly the relevant sections from the results chapter was sent to the participant for approval.
- The interviews were conducted within the amount of time that was proposed in the email invitation.

Another ethical aspect relates to the use of the study’s findings (Bryman, 2015, p. 144). What might be of ethical concern here is that the study is based on an assumption that green FinTech innovation, including the cases examined in the study, contribute to a flow of financial resources for sustainable development. According to Bush et al. (2015) true sustainable investments probably do not exist. Instead most investments claimed to be sustainable are only more sustainable. The authors use renewable energy as an example and state that even though it may be more sustainable than energy produced from fossil fuels, the production of renewable energy technologies still incurs CO2 emissions. Thus, investments in the same cannot be claimed to be sustainable. As no thorough sustainability analysis has been made of the cases beforehand there is a risk that despite their purpose of contributing to a financial movement for sustainable development, they might have an opposite effect. For example, one of the biggest challenges with FinTech innovations in general is related to cyber security and fraud (Weichert, 2017; Turan, 2015). Thus, designing an innovation support based on research findings with this underlying assumption has to be done with care.

4.4. Data analysis

According to Poole et al. (2000, p. 92), research on innovation processes relies on the analysis of event sequence data. The innovation process consists of several critical incidents that occur during the development of an innovation. These critical incidents have several dimensions that are important to understand and identify for describing the innovation process. The collected data was analysed using process analysis techniques derived from Poole et al., (2000) and case study analysis techniques derived from Yin (2009) see figure 6).

1. The analysis began with identifying critical incidents which according to Poole et al. (2000, p. 104) refers to incidents that 1) are regarded as important by the respondent or 2) specific enough to be categorized according to the conceptual framework used to describe the process, in this study the five concepts ideas, outcomes, transactions, people and context.
2. The incidents were coded into events or observations (see coding scheme in appendix III). An activity was coded as an event if it was determined to be important for the innovation process or if it represented a change in any of the five concepts and their sub-concepts, and as an observation if it was a judgement or opinion about an event (Poole et al., 2000, p. 104). Information such as actors
involved, potential outcomes of the event and causes for it were also noted. The latter representing the factors that influence the process (research question 2).

3. Each event was coded according to the direction of the action, whether the event expanded, modified, contracted or continued the current path of focus. For example, if the innovation team joined a new network, this would be coded as an expansion in the transactions concept (Poole et al., 2000, p. 109).

4. In cases where the events incurred some kind of result, the event was coded as positive (good news or accomplishment), negative (bad news or failure), mixed (uncertain or unclear), or neutral (Poole et al., 2000, p. 108).

5. The events were also coded based on whether they contributed to divergent, convergent or parallel paths of activities (see figure 5 in Chapter 3).

6. The occurrence of the events along the innovation process was determined. The events were given identification numbers based on the year they occurred and their chronological occurrence in the process. Those for which data on more or less specific dates existed were given this as well e.g. 2017:1 early spring, 2017:2, 2017:3 July etc. Some events were point events and some lasted for longer periods. In the latter case the event received a starting identification number and an end identification number belonging to the event that followed after this longer period of events ended e.g. (2017:1 – 2017:7 fall). The longer events were clustered into larger themes of activities – market research phase, technological development phase etc.

7. These phases could then be analysed to see whether they belonged to the initiation period, the development period or the implementation period.

8. Finally, the changes in concepts, influencing factors and duration of events were analysed in relation to the twelve patterns in the firework model by Van de Ven et al. (1999) to see whether it could be applied on the examined innovation processes.

9. Once these procedures were made, the case study analysis technique cross-case synthesis was applied (Yin, 2009, p. 156) to see whether any patterns could be identified not only within cases but also between cases. This is part of the replication logic necessary to apply on multiple-case studies to enable analytical generalization. Each case study is analysed individually and then compared to other case studies in order to see if the findings are replicated. Only then an analytical generalization can be made.

Fig. 6. Steps taken in the analysis of the empirical data.

4.5. Limitations

The limitations of this study’s research method have been discussed throughout the chapter. An additional limitation that could be added refers to the fact that the researcher and the respondents have different first languages. Thereby questions and answers may have been misunderstood. By asking the respondents to comment and revise the final results chapter, such misunderstandings were however minimized.
5. Empirical background

This chapter provides a short contextual background for the cases that have been examined in this study. It begins by describing existing support that the Frankfurt innovation infrastructure has in place explicitly for green FinTech innovations. Then, drawing on Gomber et al.’s model presented in chapter 2, the three cases are categorized according to which digital finance business function and which digital finance institution they belong to. This is intended to provide a better framing for the cases before continuing with presenting the empirical data in the next chapter.

5.1. Green FinTech innovation support in Frankfurt

The supportive infrastructure that Frankfurt has in place to stimulate FinTech innovation mainly consists of initiatives that have been developed for, or at least to a large extent focus on, general FinTech innovation (Techquartier, n.d.; Deutsche Börse Venture Network, n.d.; FinTech Ladies, n.d.). None of these initiatives provide a specific track for green FinTech innovations. Techquartier (n.d.) is however planning for a general Greentech track in the near future. One could argue that this is not necessary, that green FinTech innovations could use the same support as general FinTech innovations. However, the dual-mission behind the innovations may entail that they cannot be treated the same as general FinTech innovations (Arena et al., 2018).

Besides these initiatives focusing on general FinTech innovation, one initiative with an explicit focus on green FinTech innovation that started in the fall 2017 exists. The Initiative is called the SDG FinTech Initiative (Frankfurt Main Finance, 2017) and currently consists of nine organizations (of which two are included in this study). It takes the form of a network with the aim of 1) fostering legal harmonization in the EU, 2) strengthening and establishing links between players in development and development finance and SDG start-ups, 3) foster knowledge exchange and especially know-how knowledge between the current network members and potential start-up members in developed and developing markets, 4) and serve as a point of contact for politics, corporations, NGOs, research institutions and development organizations that are in search of co-operations with start-ups committed to the SDGs.

5.2. The three examined cases

The first case in this study, SDG-Investments GmbH, was founded by an existing traditional financial service institution called AHP. SDG-investments is now a spinoff from AHP, a standalone company but a tight-agent which makes it possible for the company to produce their own financial products (SDG-Investments, n.d.). The idea behind SDG-Investments could be categorized into what Gomber et al. (2017) refers to as the digital finance business function “digital investments”. According to Gomber et al. (2017) solutions that relate to this business function are designed to enable investors to independently identify suitable investment products and perform the investment transaction. This can be done through the use of mobile applications, specialized online trading software, internet platforms where social media networking is combined with investment strategies and is it possible to “follow” and even copy other investors investment decisions, and online software that enables investors to enter predefined investment preferences which are automatically executed when investment products that fulfil the preferences are available on the market. These digital investment solutions enable investors to perform their trading independent of human contact, time and location. As described in subsection 4.3.1. SDG-Investments is a digital matching platform between investors and projects that contribute to the sustainable development goals. The investors declare which SDG’s they want to invest in, and the projects declare which SDG’s they contribute to together with other relevant information for investors. The actors are then matched based on their declared goals which simplifies the process of finding suitable investment products for investors. (SDG-Investments, n.d.)

The second case in this study, bettervest GmbH, was founded as a FinTech start-up (bettervest, n.d.). The idea behind bettervest could be categorized into what Gomber et al. (2017) refers to as the digital finance business function “digital financing” and more specifically the sub-function crowdfunding. According to Jegelevičiūtė and Valančienė (2015) and Zilgalvis (2014) and Turan (2015), the idea behind crowdfunding is that a large number of people collectively provide funding to a project through an online platform. The
amounts provided can be very small and multiple investments can be made. For innovators and entrepreneurs, crowdfunding represents an alternative channel for funding that they may not receive elsewhere or that comes with better terms. In the literature, different types of crowdfunding appear, what term is used depends on the kind of funding that is provided. Gomber et al. (2017) divides these into four categories. Donation-based crowdfunding refers to when the provided funding is in the form of a donation. Reward-based crowdfunding refers to when the funders receive a non-financial compensation in return for their provision of capital, e.g. pre-payments for a not yet developed product or service. Crowd-lending refers to when people collectively lend money to a project and in return receive interest on the loan as well as an eventual payback. Crowd-Investment is mainly related to the funding of start-ups and entails that the investor receives equity in return for the investment. Drawing on these four categories, bettervest GmbH belongs to the crowd-lending category.

As described in sub-section 4.3.1. the idea behind bettervest is to enable people to jointly invest individual sums of money in energy efficiency and renewable energy projects initiated by established enterprises, local municipalities and NGO’s. All projects need to be ecologically sustainable, able to achieve high reductions in costs, energy and CO₂ and verified by energy consultants. The crowd (that is the investors) benefit financially from the resulting energy and cost savings. Thus, in combination with a regular repayment of the money they invested, they additionally receive a financial return. All transactions are done through the company’s digital crowd-lending platform (bettervest, n.d.).

The third case in this study, Der Finanzoptimist, is more difficult to categorize according to the digital finance institutions as it was founded as a start-up but in the spare-time of an employee working for a traditional financial service actor. However, as the innovation was not supported or sanctioned by the employer (pers.com., Herr Achenbach, 2018), it can be claimed to belong to the category FinTech companies (start-up) in Gomber et al.’s model. The idea behind Der Finanzoptimist could be categorized into what Gomber et al. (2017) refers to as the digital finance business function “digital financial advice”. Drawing on the examples of this business function mentioned in chapter 2, digital financial advice refers to different digital forums an investor can turn to, to receive advice on which products to invest in, and not invest in. These forums can be in the form of online communities dedicated to such topics where users can share and discuss information on investment products, real-time advice provided through digital means such as video-calls, websites with reviews and comparisons of investment products, and services called robo-advisors which provide financial advice based on algorithms that use previously declared personal preferences as basis for the advice (Gomber et al., 2017). Der Finanzoptimist (n.d.) provides financial advice in the form of information regarding the social, environmental and governance sustainability of different investments. This information is supposed to help the investor make more conscious choices in their investment decisions. The information is provided through the digital mean of pod-casts. Sometimes experts in the field of sustainable finance are interviewed either on the financial products that they themselves offer or on topics relevant for the subject. The podcasts can be accessed by anyone through the online music services Spotify, iTunes or Soundcloud.
6. Results

In this chapter, the study’s empirical results are presented. They are derived from semi-structured interviews with founders of three Frankfurt-based green FinTech innovation processes presented in the previous chapter. Each process is described individually following a chronological structure. The idea characteristics, the process of developing the idea and factors influencing the process are described. Timelines of the innovation processes are presented in figures 8-10 in appendix V.

6.1. The SDG-Investments innovation process

The innovation process for SDG-Investments started by accident in 2015 when a friend of a then new partner of AHP asked for help with a financing problem which the banks would not help him with. The friend rented out musical instruments and experienced a high demand which he could not fulfill as he would have to purchase new instruments. Herr Ackermann, one of three co-founders of SDG-investments and responsible for the strategic development, had a background in structural finance and proposed the arrangement of a bond issue to solve the problem. The idea was however only theoretical and tricky to perform. After some time, Herr Ackermann met two lawyers in Frankfurt who thought the idea was great and wanted to be involved in the documentation of the bond for a low fee. So, a bond issue was arranged. (pers.com., Ackermann, 2018)

To raise the 2 million euro needed to place the bond, AHP approached friends and family. One man who worked at a private equity firm had just invested in Nextbike, a bike rental service for cities. He suggested AHP to arrange a bond issue for this company as well, and they did. Money thus needed to be raised for both bonds. AHP sent a mass email to all institutional investors in Germany with a brochure and description of the bonds. Out of around 250 institutional investors they received answers from two who were unaware that they had answered. During the follow-up call the response was negative and the mass email thus gave no result. This was a tough period which affected the motivation. (pers.com., Ackermann, 2018)

“[…] if you get shot down all the time because people tell you look go away I don’t like your idea it doesn’t make any sense […] at some point you give up. And we had that moment […] in the beginning it was really really hard and people told us your bonds are too small, it doesn’t make any sense [...]” (ibid.)

Eventually AHP came across a family office which thought the idea was great and said that the bonds might be of small volume but one has to start somewhere. (pers.com., Ackermann, 2018)

“[…] and that gave us enough confidence and we realized we are onto something here.” (ibid.)

Late 2015, the two lawyers suggested AHP to arrange a bond issue for Africa Greentec who installs solar containers in Mali. While documenting the bond, Africa Greentec’s founder told AHP about the sustainable development goals (SDGs) and how he hereon would attach his company’s activities to the goals. At this point AHP were unaware of the goals and the sustainable investment sphere. (pers.com., Ackermann, 2018)

“What is SDG’s? We had no idea.” (ibid.)

Researcher: “[…] did you have any knowledge about sustainable investments before you started going into it? [Respondent:] Not really no.” (ibid.)

The bond issue for Africa Greentec triggered a reflection period that started the spring 2016. AHP started looking into the SDGs, talking to people, going to conferences and Stammtisches (a German tradition where people meet at a bar, drink beer and discuss different topics. (pers.com., Ackermann, 2018)

“[…] then we had to sort of reconsider what we are actually doing. Because we didn’t want to come across like a sort of department store of all kinds of different things and no one can really put a pin on us […]. So we were thinking and talking to people and then we entered the sustainable investment world” (ibid.)

In June 2016, AHP went to a conference where they actively approached a professor from Stuttgart who had been involved in the sustainable finance sphere for 15 years. They asked about the key problem with sustainable investments and were told that there are many hurdles. Neither investors nor projects looking for
investment know how to define sustainability, thus that becomes the main discussion when they meet. They also have cross-purposes, do not understand each other and experience language barriers. Herr Ackermann and his co-founders almost immediately came up with the idea of a digital platform which would enable institutional investors and projects to meet and thus solve some of the hurdles. (pers.com., Ackermann, 2018)

Their previous research into the SDGs revealed that the goals were a worldwide phenomenon introduced by the UN and on the agenda of several governments. In addition, they saw that when countries implement the SDGs, they are pushed down to big companies and big financial institutions and eventually will reach the working level of these institutions. Thus, integrating the SDGs in the platform and in general entering the sustainable investment world was viewed as a great business opportunity. (pers.com., Ackermann, 2018)

“And then obviously when we did our research we discovered this is a great business opportunity because it’s worldwide, it’s everywhere and it’s simple. [...] it hasn’t reached the working level yet. But we are already there so when it comes we are well positioned and that was the idea [...]” (ibid.)

A few weeks after the meeting with the professor, Herr Ackermann spent half a day drafting the basic idea of the platform and registering the websites and the trademark. Him and his colleagues wanted to make it extremely simple. In addition to declaring which SDG’s the investors want to contribute to, they are also asked to declare how much capital they want to invest, in what timeframe, what their return expectation is and what kind of financial instruments they can cope with for example if they can do bonds or private equity. These latter criteria are not used in the digital matching process yet but gives SDG-investments more information to make better matches. When a match occurs, an automatic email is sent to the investor. SDG-Investments then follow up the match with a call to discuss whether the other criteria declared by the investor matches the project. If yes, the parties are introduced and can continue their discussion. SDG-Investments’ income consists of a fee that is only charged the project seeking investment if an investor is found with the help of SDG-Investments. Herr Ackermann and his co-founders thus always base their decision of entering an agreement on whether they actually believe that the product can be sold. (pers.com., Ackermann, 2018)

After Herr Ackermann and his co-founders came up with the idea for the digital platform, a period of market research began where they looked at what features the digital platform should have, what financial instruments it should be able to capture etc. They also looked at already existing platforms, e.g. crowdfunding platforms. Two main findings came out from the market research (pers.com., Ackermann, 2018):

1) Institutional investors require volume, the financial instruments registered on the platform need to be scalable and enable investments of 10-20 million, something not possible with crowdfunding today. Scalable investments also mean that the positive impact on the SDGs will be greater.

2) The financial instruments need to go through an objective sustainability evaluation in order to ensure the investors that their investments actually can count as sustainable. (ibid.)

The second finding initiated a search for an independent sustainability evaluator that hereon would act as the sustainability and impact gatekeeper for the platform. SDG-Investments met with two different German rating agencies and chose one called IMUG. As a pilot IMUG was asked to evaluate which of the SDG goals and targets that the Africa Greentec project contributes to. In four weeks, a concept called 360 degrees impact was developed which evaluates both positive and negative sustainability impacts of the projects. The evaluation results in a report which is communicated both to the project owners and investors, and paid by the project looking for investment. (pers.com., Ackermann, 2018)

SDG-Investments also spent the fall 2016 searching for a developer for the digital platform. The initial idea was to include a partner with technology skills and a cooperation was initiated with one of Herr Ackermann’s previous colleagues. The suggested development price entailed a need for third-party investments so SDG-Investments did some pitches for private equity firms. Unfortunately, the cooperation did not work as planned and was therefore ended after six months during the spring of 2017. (pers.com., Ackermann, 2018)

Instead the development was outsourced to an IT-company in Frankfurt which came recommended by a business partner to SDG-investments. The digital development took 9 months, it started in June 2017 and the platform went live in January 2018. During these 9 months, the three co-founders were responsible for different tasks. Besides normal work at AHP, they all evaluated and tried to get projects on-board. One co-
founder who generally handles the contact with investors gave important feedback from an investors perspective. The second co-founder gave general feedback regarding the functions and layout of the platform, translation of texts and final polishes. The feedback was managed by Herr Ackermann, the third co-founder, who made the basic design of the platform and was the contact person for the IT-company during the development process. He made sure to react immediately to potential questions or concerns and thus SDG-investments managed to stay within budget which accounted for only 10% of the price requested by the previous developer. The development could be financed with the proceeds from the placements of the Africa Greentec and Nextbike bonds. Finding a developer for the platform was one of the main challenges that SDG-investments experienced, a challenge which also caused a delay of six months. (pers.com., Ackermann, 2018)

“Actually, the real challenge we faced and that is where we had a delay was to find the right partner for the technical part.” (ibid.)

During the development of the platform, the only feedback requested from investors and project initiators was regarding their interest in registering on the platform to which the answer always was positive. Feedback on features and user experience is expected to come now after the platform has gone live. The belief was that the sooner the platform went live, the sooner business could be made. (pers.com., Ackermann, 2018)

“We try to keep it simple, [...] the problem with Germans is they over-engineer everything. [...] I can spend five years developing that platform to perfection but then I will never do business. [...]” (ibid.)

Further development of the platform will be done depending on what is needed, e.g. more modern technology, such as blockchain, smart contracts etc. to facilitate and automate the process. (pers.com., Ackermann, 2018)

“So we are flexible because I have no idea what the future looks like in two years’ time in terms of blockchain and all that.” (ibid.)

Important for the initial idea of the digital platform was its surrounding ecosystem which SDG-Investments has cultivated since the idea came to them the summer 2016. Besides developing a digital platform, SDG-Investments also wanted to provide a home for those actors who do not fit in the categories of investors and projects, but still have a relevant role to play in making the idea come true. One role these actors take is to make projects investable for institutional investors. The role played by Herr Ackermann and his co-founders in this is e.g. through the arrangement of a bond issue, a financial product, or arranging that the bond has an attached ISIN [International securities identification number] which is required by investors. They also provide office space for projects. Sometimes however, a project can approach SDG-Investments without having a business plan, or they can be in need of legal advice which needs to be solved before the project can become investable. In such cases SDG-Investments do not have the time or resources to help, however they have business partners who can. (pers.com., Ackermann, 2018)

“[…] it is all about networks, we don’t intend to build a massive company with many many employees, we believe in networks” (ibid.)

“[…] [they are all] one part of the whole big puzzle so we are […] like a table and these are our little puzzle pieces and they find each other on the platform. […] we want to have answers to every question […]” (ibid.)

The ecosystem is also used as a tool for SDG-Investments to get connected to projects and investors. In exchange for connections the partners can be featured on SDG-Investments’ website, or receive a financial remuneration if the connections lead to an income for SDG-Investments. (pers.com., Ackermann, 2018)

Other marketing tools include sponsoring a market report on impact investing initiated by Forum Nachhaltige Geldanlage (eng: forum for sustainable investments) (FNG). In return, they are given the possibility to write an article, and a spot for their logo on the front page. In May 2018, they will have a both on their first fair, the Grüne Messe in Stuttgart. Appearing there is important as 50% of the other booths will be occupied by potential clients. At the fair, they will be interviewed by a newspaper. In terms of more proactive marketing, Herr Ackermann believes they would be successful, particularly with investors. But first they need to build up a scalable project portfolio that can handle investor demands. Providing a placement option of 10 million to an investor that wants to invest a minimum of 20 million will not work. (pers.com., Ackermann, 2018)
Besides important for building the business and useful for marketing, the ecosystem they build also provide unexpected opportunities where often one thing leads to another. (pers.com., Ackermann, 2018)

“A lot of stuff occurs [...] the best way of [...] manoeuvring your way around that period of time [...], is to be completely open minded. So, we have so many conversations here [at the office] and we are permanently discussing ok shall we turn down meetings [...]? And I think no we should take what we can because there [...] are so many opportunities occurring in each of these meetings.” (ibid.)

“one thing leads to the other that is the amazing thing it is like ok you have a dot here and you do a line and a dot here and it branches out. [...] ibid.

Due to their membership in the SDG FinTech initiative, they have been invited by the World Bank to have a booth and a workshop for a reduced price at the next climate conference in Frankfurt. Another example occurred after a presentation given by Herr Ackermann during the spring 2018. A man from Bundesverband Deutsche start-ups (BDS), a governmental organization supporting start-ups, suggested a cooperation entailing that start-ups which fulfil specific criteria could be rewarded with a registration at the SDG-investments platform, and thus an opportunity for investments. (pers.com., Ackermann, 2018)

“At that point, we didn’t [consider including start-ups on the platform] because we think it’s tricky” (ibid.)

However, since BDS would act as a gatekeeper of high quality start-ups for the platform, an agreement to cooperate was reached. Consequently, Herr Ackermann was to have a meeting with the head of the Business angels network after this interview, to examine their interest in registering as the counterpart (investors in the start-ups). Conversations have also been initiated with a start-up fund which could register both as a fund in which institutional investors can invest, but also as an investor in start-ups. (pers.com., Ackermann, 2018)

“[it’s a two-way thing, that is something we didn’t decide it just came to us.” (ibid.)

Conversations have also been initiated with impact funds which also could register as projects and investors. These discussions have revealed another role that SDG-Investments could play. (pers.com., Ackermann, 2018)

“[…]to be a sort of inbound placement agent for international funds […] we take these big international funds and give them the opportunity to list themselves on the platform and we do the marketing.” (ibid.)

Since the platform went live in January 2018, several deals have been closed, additional projects have been registered and the registered available investment volume on the platform is €120-130 million. Besides a few investors from their previous network at AHP, most of the new investor network had to be developed from scratch. The new investors were primarily discovered in a compendium written by the professor they met at the conference in Stuttgart in June 2016. It contained interviews and contact information to several institutional investors in the sustainable investment sphere, many of which were new to the co-founders. A few phone calls led to a network of investors that really like their idea. (pers.com., Ackermann, 2018)

Getting SDG-investments to where it is today has depended on several factors; being at the right place at the right time in terms of the novelty of the SDGs, having the right setup and people, a track record as a placement agent, the capability of doing sales and ability to execute, the flexibility that comes with being a small team, and life experience in terms of knowing how to manage people. (pers.com., Ackermann, 2018)

During the spring 2018 a new member who currently works as a financial advisor joined the team. He brings along a network of clients and will possibly be responsible for an impact fund which SDG-investments intend to create if everything goes as planned. (pers.com., Ackermann, 2018)

The driver behind SDG-investments was initially to find a common denominator for AHP. This search led to the second driver which was the great business opportunity of the SDGs. For Herr Ackermann, the driver is to work in an environment with interesting people passionate for their work. (pers.com., Ackermann, 2018)
“[…] everybody burns for what they are doing and I really really like that and if we can contribute to that and if we can help to make it happen with our skill set, fantastic.“ (ibid.)

For the future SDG-Investments have one short-term and one long-term goal. The short-term goal is to have a volume of one billion euro registered as investment requirements on the platform by the end of 2018. This would not require more than 10 large institutional investors to register on the platform. The long-term goal is to be recognized as a guardian for sustainable investment products within three years. E.g. if an investor at a pension fund would be approached by someone selling a product, the investor would say that he or she only looks at products registered on the SDG-Investments platform. (pers.com., Ackermann, 2018)

Reaching these goals will primarily depend on how well governments manage to push the SDGs and sustainable investment priorities down in the financial institutions. Based on Herr Ackermann’s experience he states that a bottom up movement is very hard in big financial institutions since such initiatives are not appreciate by the corporate culture. Arguments that Herr Ackermann and his co-founders meet from investors is that their main concern is to maximize their return, whether this is done through investments in a weapon manufacturer or in a sustainable product doesn’t matter. In terms of pension funds and insurance companies, Herr Ackermann states that besides being heavy regulated, their employees only see downsides. If they invest in a sustainable product and it does not pay back, the investment committee will criticize the employee’s choice. If on the other hand it goes well, no one will pet her/him on the back and say good job or give her/him an extra financial remuneration. This makes it hard to convince these actors. (pers.com., Ackermann, 2018)

According to the Herr Ackermann, the initial idea has expanded from a digital platform for their arranged bond issues, to also include start-ups and third-party funds. This particular expansion may not have been planned, however the platform was designed to be open for such expansions. (pers.com., Ackermann, 2018)

“[…] it has expanded from ok we do something for our bonds which we develop, but now we have start-ups and we have third party funds […]. But that I think it’s also the initial design of the platform […].” (ibid.)

In addition, Herr Ackermann (pers.com., 2018) states that being open for different products is also the core in being a placement agent which SDG-investments is. If someone approaches them with a financial product and asks them to place it then they enter into an agreement and use the platform as a tool to sell it.

“So we were doing it already [with Africa Greentec, Nextbike etc.] and the platform is more or less a digitalization of our work.” (ibid.)

6.2. The Bettervest innovation process

The idea behind bettervest occurred in 2006, six years before the company was founded in 2012. Herr Mijnals, one of five founders, CEO, and marketing and communications manager of bettervest, was not actively looking for an idea. However, his former work as an innovation consultant involving helping clients with their ideas, entailed a prepared state of mind for such thought activity. (pers.com., Mijnals, 2018)

Herr Mijnals came across one of the very early crowdfunding platforms. It was a British platform based on the idea that in exchange for crowdfunding people would gain access to a pacific island for a time corresponding to how much they paid in the crowdfund. Herr Mijnals found crowdfunding to be a very strong and democratic concept and considered if it could be applied to a more sustainable topic that he had read about in the book Factor 4 written by Ernst Ulrich von Weizsäcker. The book deals with the topic of energy efficiency in society and energy efficiency potentials that are not used. He does not remember if the idea popped up clearly in his mind one day or not, but somehow the two concepts came together and both he and people he talked to thought it was a good idea. The purpose driving the idea was to solve the energy transition problem as this according to Herr Mijnals is the most important question. (pers. com., Mijnals, 2018)

“[…] if you solve the energy problem, you solve many other problems that are very strongly related to it, transportation, food, everything is dependent on it.” (ibid.)
The purpose would be achieved by enabling normal people an easy way to contribute through crowdfunding, instead of referring to large companies or politicians to solve problems. In addition, the overarching goal was to influence peoples’ investment behaviour. (pers.com., Mijnals, 2018)

“[…] hopefully at least every citizen will someday [consider] to invest in products like this, it doesn’t have to be on our platform but they should consider to make their investments more sustainable, to have a direct impact on this kind of energy transition and also social impact. That is the overarching goal.” (ibid.)

Herr Mijnals (pers.com., 2018) did not think that crowdfunding would be the only thing needed to achieve the goal, but an important part of it. However, after the idea came to him, nothing happened for 6 years.

In 2012 Herr Mijnals went to a start-up weekend in Frankfurt, an international event concept often sponsored by companies like Google and Amazon. During these events, people with different professional backgrounds usually needed to launch a start-up (designers, programmers, venture capitalists etc.) are divided into groups with the task of developing a business idea. Herr Mijnals idea was chosen by his group and on the last day of the weekend, every group pitched their idea to a jury. Herr Mijnals idea won first price and according to him this weekend was an important step in the innovation process of bettervest. (pers.com., Mijnals, 2018)

“That was the initial spark that was needed to launch bettervest. I met two of my co-founders there.” (ibid.)

Herr Mijnals (pers.com., 2018) believes that timing played an important part in the creation of bettervest. The financial crisis in 2008 had created a demand for a more sustainable financial sector and crowdfunding was one of the changes that occurred. However, four years later it still was not that common, only a few other crowdfunding platforms with a focus on energy existed and they were only in an early stage.

In the weeks following the start-up weekend, the founders developed their business plan. They had an idea of what the crowdfunding platform should look like, however not which steps they needed to take to get there or what to expect along the way. Therefore, no long-term plan from start to finish was made rather continuous short-term plans along the innovation process. (pers. com., Herr Mijnals, 2018)

“[…] we expected the unexpected to happen so when you don’t really know where you are going or what you are especially doing then everything is somehow unexpected.” (ibid.)

One example mentioned by Herr Mijnals (pers.com., 2018) of what they were not aware of, was the legal situation for crowdfunding in Germany and Europe.

“[…] there were many legal issues we had to solve and still have to solve. Not even in Europe there is a harmonized law for crowdfunding so every country has its own rules. There are special regulations for the investors and the project owners as well. This makes it very difficult, we have to learn every day and to speak to lawyers and do lobbying and [things] like that to solve this.” (ibid.)

During the first one and a half years after the start-up weekend, more founders with different expertise joined the team. As the founders lived in different cities, the development of the crowdfunding platform was done on a distance. In the beginning, none of them could dedicate full-time to the development and they also did not have a full-time office but rather used co-working spaces. They met physically 2-3 days per month and had one general call per week. To structure all the information internally, they used a project management software. This structure, besides being the only possible at the time, made their work at times more productive compared to when they finally started a real office and sat together. (pers.com., Mijnals, 2018)

The development work was divided between them however Herr Mijnals states that naturally in small companies many tasks and areas of responsibility overlapped. One of the founders was responsible for the digital development of the platform in terms of coding. Another founder focused on finding projects that would register on the platform. A third founder focused on marketing the platform for investors, the crowd. Herr Mijnals had a more general role which involved coordinating the needs of project owners and investors with the platform development, as well as managing the legal aspects. (pers.com., Mijnals, 2018)
The founders continuously performed several tasks at the same time, e.g. handling legal issues, developing the platform, finding projects, finding investors etc. Due to the new phenomenon of crowdfunding, and the fact that none of the co-founders had worked with it before, Herr Mijnals states that in the beginning they could experience a lack of competence in the team every day. (pers.com., Mijnals, 2018)

“we knew nothing about the legal situation or what the best platform design would look like […] so we had to figure everything out.” (ibid.)

The teams previous professional experience of 5-6 years each helped them manage this phase even if the experience was not from the crowdfunding scene. For very specific issues where deep knowledge was needed, they used consultants. The consultancy that they received was mostly beneficial however the novelty of the phenomenon meant that in the case of legal questions, there may have been answers but no opinions and therefore it was not always clear how the answer should be interpreted. The first year bettervest worked with a legal consultant whose advice endangered the future of the company. (pers.com., Mijnals, 2018)

“We thought that the guy that consulted us would really know what he was doing, but after a while we learned from a real expert that it was in a rather grey area of legality. If we would have done it as he suggested it might have really killed the company. Fortunately, we noticed this in time.” (ibid.)

Later they came in touch with one of the leading experts of the legal situation for crowdfunding in Germany. The legal counselling has been expensive, but also good and necessary as new changes in legislation which bettervest need to follow occur continuously on a national but also European level. Bettervest also tried free consultations but these did not provide anything that Herr Mijnals could not do himself. Networks on the other hand gave and give bettervest valuable support. (pers.com., Mijnals, 2018)

“[…] in the beginning the existing networks were very important. The older the company gets the more we are relying or newer or post founding time point networks.” (ibid.)

During the development of the platform bettervest turned to their initial crowd of investors to gain feedback, something that was very important and valuable for the early stage. Due to the crowd’s deep engagement in sustainability, the platform’s focus is emotional for people and therefore they gladly talked to the founders and even stopped by the office for a coffee and discussed different aspects. (pers.com., Mijnals, 2018)

Initially the founders invested their own capital in the development of the idea however in 2013, while the platform still was not finished, they decided to do an investment round for third-party investment. They had received an award where the prize was to set up a both at CEBIT, a tech exhibition in Germany of which one section was dedicated to start-ups. At the fair, they met two of three business angels that together invest in impact projects. It was immediately the right fit and the business angels decided to invest in bettervest. They did not require changes in strategy or similar in exchange for the investment, rather bettervest could use the money freely. However, one of the business angels worked with the company 2-3 days per week for a year, not as an employee but as a part of the team which was very valued. (pers.com., Mijnals, 2018)

As the funding situation in Germany is more difficult than e.g. the UK or USA, especially in terms of finding investors with an impact focus, it might have taken bettervest much longer to find investment if they had not met these business angels. Other business angels did not believe in the idea or its potential, and traditional financial service providers were not interested or found the idea amusing. (pers.com., Mijnals, 2018)

“yeah nice little thing that you are doing but worth nothing or not important”. (ibid.)

Such negative feedback did not really influence bettervest and Herr Mijnals believes that this attitude is changing the more mature the crowdfunding sector becomes. E.g. the cooperation between crowdfunding platforms and traditional financial service providers is increasing. (pers.com., Mijnals, 2018)

In 2014 bettervest hired their first employee and in the following years, an additional five employees were hired. The scaling of the company required an extension of current competence, more people doing the same thing. The employees have not affected the basic idea behind bettervest but they have contributed with
innovating the processes and internal structures by for example iteratively optimizing the process from getting in touch with a project, until it is online and ready to get funded. (pers.com., Mijnals, 2018)

2015 was an eventful year. First one of the co-founders who is married to a woman from Africa suggested that bettervest should do a specific project there. This decision was perceived as risky and difficult since the founders did not know how bettervest’s crowd would react to a widening of the project-focus from energy efficiency in Germany to also renewable energy instalments in developing countries. The reaction however turned out to be positive and since then bettervest have gradually shifted more and more into this direction. The new direction also constituted a widening of bettervest’s impact. (pers.com., Mijnals, 2018)

“you have these diesel generators in a small village which causes health issues. You have people that without light they cannot read or learn for school or something like that in the evening hours. There is also this impact that the projects in Germany usually didn’t have.” (ibid.)

The cofounder who suggested the initial project in Africa eventually left his position at bettervest to continue working with a new company that he had founded based on this new project idea. Another founder also left bettervest due to personal reasons and today 5 founders remain in the company. (pers.com., Mijnals, 2018)

The projects in developing countries are mostly owned by a small scene of companies. Bettervest meets these companies or other actors, such as associations for companies, at conferences and through word of mouth. Another of bettervest’s marketing tools is the application to start-up or innovation awards of which they have won a few. Initially this was not a conscious strategy however as it was a good way to receive publicity, they started using these awards more strategically. (pers.com., Mijnals, 2018)

The mid-volume energy efficiency and renewable energy projects that bettervest’s platform supports experience a huge financing gap. While small projects usually are financed by family members or by people themselves through e.g. microfinance in developing countries, and large projects are financed by the World Bank, development organizations or states, mid-volume projects are not feasible for traditional banks in terms of administration costs or legal aspects. Thus, the demand for the financial instrument they provide is high and once they stepped into this scene, not much marketing was necessary to find projects. However, Herr Mijnals believes that crowdfunding is one of only a few tools that can fill this gap. (pers.com., Mijnals, 2018)

In 2015 bettervest also made a second investment round through a crowdfunding campaign on their own platform. The end of 2015 represented a crucial time for the company. Germany was introducing new regulations which meant that bettervest could not do any projects for four months. The legal aspects thus have a tendency of making things take longer. (pers.com., Mijnals, 2018)

“This nearly could have stopped the company all together because four months without any revenues for a start-up is of course terrible.” (ibid.)

In the coming months, bettervest will do a third investment round. The plan is to scale to an organization with around 30 employees in five years. According to Herr Mijnals crowdfunding is at the moment a niche product that has potential to go mainstream. Achieving the scale-up as well as the purpose behind bettervest means they need more good people and that the interest among investors, the crowd, increases. In turn, marketing towards investors and new employees requires more financing. (pers.com., Mijnals, 2018)

Another condition needed for bettervest to achieve their purpose is a legal harmonization of crowdfunding on an international basis. The differing legislation between countries currently represents a threshold for their concept to be feasible everywhere, as entering some countries would be costly and entail a redesign of the whole process. In an attempt to influence the legal situation, bettervest is part of crowdfunding platform associations on both the German and European level which does lobbying for their cause. According to Herr Mijnals, politicians need to notice the potential in crowdfunding not only for energy projects but also for a renewal of the economy through innovation and start-ups. (pers.com., Mijnals, 2018)
6.3. Der Finanzoptimist innovation process

The innovation process of Der Finanzoptimist started in June 2016 when the founder of Der Finanzoptimist, Herr Achenbach, was given an article that described the relationship between the financial industry and the weapon industry. At the time Herr Achenbach worked at a traditional financial service institution called TauRes. TauRes is an allfinanz financial institution which means that it does not produce its own financial products but rather matches clients with existing financial products from other actors, such as insurance, loans, investments etc. After reading the article Herr Achenbach started informing himself on a more regular basis of the negative impact that the financial industry has on the world. He realized that this new engagement could not really be combined with his current work as it involved the recommendation of conservative investment products to his clients. Thus, him and some of his colleagues requested the possibility to start providing sustainable investment options to their clients. The management of TauRes however did not allow it based on the arguments that it gives less return and is more insecure. Another problem was that there was no database which gathered confirmed sustainable investment products. (pers.com., Achenbach, 2018)

A few weeks after reading the article, Herr Achenbach started informing people at Taures regarding what traditional banks use the money on one’s account for and arranged an information event. After this internal event, colleagues to Herr Achenbach suggested him to arrange events for clients of TauRes as well. Herr Achenbach saw a challenge in informing clients about sustainable investments when TauRes was resistant, and at that time not able, to offer the clients a solution to it. His colleagues argued that it did not always have to be that way and that they could develop a solution. Even though Herr Achenbach realized that the road to changing it would be long, he agreed to do the events but not alone. He gathered a team of around 10 people that had expressed an interest in working on it with him including people in the management, and started brainstorming around how an event on sustainable investments could be held for clients under the name of TauRes even though TauRes was not working with it. Planning and research for the events was done outside working hours. The tasks were divided in the sense that Herr Achenbach came up with themes to be brought up at the events and a general framework for the presentations, and then delegated the research work and presentation design to his team. The events started in the fall of 2016 during which Herr Achenbach presented the material. (pers.com., Achenbach, 2018)

After the events people would call or email Herr Achenbach with a request to invest in sustainable investment products. By that time a database for rated sustainable investment products had been built by a new institute called FNG. In the normal case, Herr Achenbach would need to sell the conservative investment products that TauRes recommends, however, when a client asked for something specific he was allowed to respond to their requests. This was not a planned consequence of the events however it gave Herr Achenbach and his colleagues an opportunity to give such recommendations. The demand for sustainable investments grew and Herr Achenbach and his team spent their spare time developing a portfolio with sustainable investment products that they could offer their clients. This was not easy to do parallel to their normal working hours. The team decided on a bottom line for the investments together and then Herr Achenbach left them to do research which included screening excel charts etc. He also paid a person to do research for them. They then gathered again and based on the fact sheets from the research they decided the design for the portfolio that they wanted to build. In making these decisions or recommendations to clients, Herr Achenbach (pers.com., 2018) states that there can be some disputes regarding where one draws the limit for what a sustainable investment is. For example, there are funds where 5% of the holding may be invested in unsustainable industries such as the weapon industry. These funds would not be recommended by some in the team while Herr Achenbach is of the opinion that one will never achieve the goal of more sustainable investments if it always has to be 100%.

The increasing interest among clients did not mean that the idea of sustainable investments was supported by TauRes as a whole. Three types of opinions were expressed at the company including in the management. First, those who said that considerations for sustainability and ecological aspects should be left for personal consumption, at TauRes they did finance. They had never worked with sustainable investments, and therefore not do it now. Second, people who realized that sustainable investments are a megatrend and so why not sell it? In addition to this attitude, the third group of people, like Herr Achenbach, saw the necessity of including sustainable investments if there is to be a planet left where Taures clients can spend their money. For the most part, these people belonged to the younger generation. (pers.com., Herr Achenbach, 2018)
The events and their consequences also caused some tensions between Herr Achenbach, his manager and TauRes. Herr Achenbach was told that even though he may not directly be telling the clients that he sells sustainable investments, he is still hinting that they can ask him about it through the information he provides. Taures meant that this could entail a governance problem in the long run. Thus, Herr Achenbach was asked to start reporting the results of the sustainable investments as well as the changes in recommendations that him and his team made. Taures would then keep an eye on it and eventually make a decision on whether to include sustainable investments or not in the company’s investment idea. (pers.com., Achenbach, 2018)

The team kept arranging events and then during the fall 2017, a colleague suggested Herr Achenbach to start using IT to reach a bigger audience. Herr Achenbach was introduced to the colleague’s friend who could help him start a podcast. Despite the fact that Herr Achenbach was not convinced of the idea, he decided to try it out. The podcast started in October 2017 and Herr Achenbach is still receiving help with the technology from the friend of his colleague. The podcast received its name “Der Finanzoptimist” since Herr Achenbach wanted to convey an optimistic view of finance. (pers.com., Achenbach, 2018)

“I was saying Finanzoptimist, that is a good word because it combines two things that are not combined normally [...] Finance and optimism.” (ibid.)

Because Herr Achenbach had a fulltime job on the side of Der Finanzoptimist, he started with one podcast per week. He made them short, 10-20 minutes each, so that people could listen to them several times. They included a short overview and advice on where to find more information about the topic. After the first two podcasts Herr Achenbach started thinking about the next step. He combined two features that he claims are common for Germans, their anger about everything and their interest in travelling. Every podcast was given a country theme and would deal with what companies do in that specific country. This visualisation would enable people to connect to the information. The purpose of the podcast was to use it as a tool to inform people about the negative impact that the traditional financial industry has on a sustainable development and thereby try to change peoples’ mind-sets. (pers.com., Achenbach, 2018)

“people do not think in that dimension [...] that every single euro that they invest [to some extent is] harming children, killing people in the world and destroying rainforests and to make this visible was the first idea I had with der Finanzoptimist” (ibid.)

With time the podcast got a second purpose. (pers.com., Achenbach, 2018)

“there were some unexpected successes that made me rethink about the idea because there were some people who were saying ok I just played one or two of your podcasts to my parents and now I can invest at your company. I was like ok I’ve never thought about that dimension” (ibid.)

With time the number of podcasts increased to two per week for which all research and planning is done by Herr Achenbach. His first podcast features him alone, while the second is in the form of an interview. This idea came to Herr Achenbach after a colleague of him, who also had a podcast, suggested they could feature each other. (pers.com., Achenbach, 2018)

“we started to get people involved that are sellable for us, [...] who produces investment which is sustainable [...] to influence the customer that he tries to ask us “do you sell socially responsible investments?”” (ibid.)

Initially he was doubtful to conducting interviews as it entailed additional work in finding interviewees who are available, belong to an organization or network related to sustainable investments or sustainable business, and are optimistic about the role that finance can play for the future. Finding the first three interviewees was hard but then the possibility of sending potential interviewees a copy of previous interviews made it easier as it gives them an idea of what a participation entails. Herr Achenbach also receives valuable help from his network in the search. Sometimes people are even brought to him by colleagues who introduce him to their acquaintances, or employees of the innovation incubator Social Impact Hub, where Der Finanzoptimist has its office, who introduce him to other members of the incubator. (pers.com., Achenbach, 2018) Herr Achenbach found out about Social Impact Lab through a man that he came in touch with due to an event that Herr Achenbach had organized. Besides offering a reasonable office rent and supporting the image that Herr
Achenbach wants to convey with Der Finanzoptimist, the Social Impact Lab and the entrepreneurs sitting there provide a good support for Herr Achenbach. Primarily because it is a place where people think the same way which makes the process less lonely. (pers.com., Achenbach, 2018)

Besides the challenge of finding interviewees, conducting interviews would also mean less control over the content. However, this attitude changed once he started doing interviews since less control also meant that negative reactions to a podcast not necessarily would be directed only towards him. This feeling of less pressure enabled him to spread the podcast in more channels such as YouTube. (pers.com., Achenbach, 2018)

Today the podcast has around 1000 regular listeners, but Herr Achenbach’s initial idea was never to start a podcast. (pers.com., Achenbach, 2018)

"[…] right now, I have a real impact on many people and I would never imagine to have that […] that was never the main idea of what I did. […] I wanted to put the idea into TauRes [...] that was the idea at first and the way to get there was never clear […] it was some kind of trial and error. (ibid.)"

The podcast was not meant to grow into a fulltime occupation for Herr Achenbach, rather he always intended to stay at TauRes where he has worked since 2003 and today has a position of junior partner, team leader and head of the Frankfurt office. This however would require Taurus to open up to the inclusion of sustainable investments in the portfolio. Such an achievement would be the best way to make a large impact since it would enable the 700 consultants working for TauRes to broaden their recommendations to sustainable investments. In addition, Herr Achenbach would have the necessary resources in terms of software, human resources, networks and financial products to offer his clients a good service. (pers.com., Achenbach, 2018)

In March 2018 Taures finally made the decision to merge the ideas and place sustainable investments as a comparable investment idea to the traditional idea, 18 months after Herr Achenbach started having events for clients. This decision also means that Der Finanzoptimist somehow will merge with TauRes and be given financial support as well as support with the research for sustainable investment products. This is welcomed since Herr Achenbach so far only has put money into Der Finanzoptimist. The merge is however not uncomplicated since there still is resistance among colleagues at TauRes. Herr Achenbach thus has to handle much of the communication with the main office in Hamburg himself instead of delegating it to his Frankfurt team. This puts much pressure on him and makes the process complex. (pers.com., Achenbach, 2018)

"[…] when I talk to the company then the people listen to me when the other people on my team talk to the company they say go away.”

According to Herr Achenbach (pers.com., 2018) people listen to him because of his long history at TauRes and his reputation as the person with the most volume of investment. His position and history at the company was according to him also what enabled him to drive the change towards sustainable investments through.

"I am working at TauRes since 2003 and I know everybody and the people know me and they know that I do not really want to harm the company but to put it on a higher level. And with that in mind the people let me do things that normal people who were not that long in the company would never have been allowed to do. “ (ibid.)

If TauRes decision would have been the opposite, Herr Achenbach probably would have left the company and built something himself with the help of Der Finanzoptimist. Colleagues of his have stated that they too would have left the company if the decision had been something else. Feedback like this has been important for Herr Achenbach and motivated him to keep fighting. (pers.com. Herr Achenbach, 2018)

"[…] when the people come to you and they say like it’s really good that you do it […] and thank you that you do your good work then you […] feel compelled to do [it] a little more longer and right now [after TauRes decision to merge] there are so many people really thankful inside of the company.” (ibid.)

To reach the purpose of changing people’s mind-sets when it comes to how they manage their money, Herr Achenbach (pers.com., 2018) believes that one thing that is needed is that the German government makes
 stricter regulations. Not only for companies and their production but also for financial advisors so that they will be obligated to inform their clients about the sustainable investment alternative.

“These are the two points I would say. To make stricter laws for what can we buy by the companies and the other thing is what topics are talked about in the customer relationship.” (ibid.)

The main barrier for this is according to him (pers.com., Achenbach, 2018) a big bank lobby.

“I think the lobby of the banks is really big and that is the reason why things do not change.” (ibid.)

On an organizational level, he has two ambitions. One is that his podcast will be taken up as one of the podcast suggestions that TauRes have in their managerial system. Another one is to gather more people that want to fight for the idea behind Der Finanzoptimist. Other than that, he states that the team has a strategy in place with which they will just keep working step by step. There is much to do but it is not so complicated anymore. What happens in the next three to four years he does not now. (pers.com., Achenbach, 2018)
7. Analysis

In this chapter, the empirical results are analysed through the analytical framework developed in sub-chapter 3.2.1. After a short recap of the analytical framework, the analysis of the initiation period is presented in sub-chapter 7.1. It starts by presenting observed changes in the five concepts ideas, people, transactions, outcomes, context. Then it presents the factors that have been identified as having influenced these changes in concepts and thus the innovation process. Finally, an analysis of the initiation period is made on the basis of the patterns identified and illustrated by Van de Ven et al. in the “firework model”. The same structure is followed in the analysis of the development as well as the implementation periods which are presented in sub-chapter 7.2. Sub-chapter 7.3. summarizes the analysis in preparation for the discussion.

An innovation process refers to the process of developing an innovation from idea to implementation (Van de Ven et al., 1999, p. 3). According to Van de Ven et al. (1999, p. 6) it consists of several events, activities and observations that can be described through the five concepts ideas, people, transactions, outcomes and contexts and their belonging sub-concepts. The changes that occur in these concepts can take four different directions; expansion, contraction, modification or continuation (Poole et al., p. 108). In addition, some events may result in an outcome which can be either positive, negative, mixed or neutral. By applying this framework to several innovation processes, Van de Ven et al. (1999, p. 25) derived 12 common patterns that the authors depicted in the “firework model” (see figure 7) which is explained in more detail in sub-chapter 3.2.1. According to the authors these patterns occur in most innovation processes. By applying the analytical framework used by Van de Ven et al. (1999) to the empirics gathered for this study, the author identified a few patterns common for the examined green FinTech innovation processes, patterns which also coincide with the firework model. Some dimensions of the model are not relevant for all cases but this is also in line with Van de Ven et al.’s (1999, p. 23) experience. The timelines of the three cases’ innovation processes are illustrated in figures 8-10 in appendix V.

![Fig. 7. Key components of the innovation journey](image)

7.1. The Initiation period

7.1.1. Changes in Ideas, People, Transactions, Outcomes and Contexts

During the initiation period, all three cases experienced changes related to all five concepts however as depicted in table 6, only three changes had the same direction of action for all three cases. These include the expansion (or occurrence) of the core idea that later went on to be developed, the expansion (or occurrence) of outcome criteria used to assess the progress of the innovation process, the expansion (or acquirement) of people’s knowledge, the continuation of the external context, as well as the expansion of social transactions.

Starting with the continuation of external context, this entails that the external environment or at least aspects of it was perceived as quite stable during the initiation period for all the three examined cases. In the case of SDG-Investments these aspects referred to the existing financing gap experienced by the three clients for which AHP arranged bond issues, existing social issues, existing opportunities to network provided by actors in society such as conferences or stammtisches, information asymmetries and lack of impact.
measurement tools preventing investors and projects seeking investment to meet on the same level, unsustainable values in the financial market where profit maximization is prioritized, and existing competence in society such as the lawyers which they started to cooperate with or the people they met who informed them about sustainable investments.

For bettervest the stability in the external environment referred to aspects such as the existence of environmental issues which in turn entail a need to transform the energy sector as well as changing people’s investment behaviour, the existence of start-up events such as the start-up weekend, and the continued effects from the financial crisis in 2008 entailing an existing lack of trust in the financial sector. For Der Finanzoptimist, the aspects included social issues which entailed a need to change the values in the financial sector as well as the nonexistence of a database which gathered sustainability rated investment products.

Continuing with the expansion of people’s knowledge, this entails that all three cases experienced an acquirement of new knowledge during the initiation period. For SDG-Investments this knowledge was related to the SDG’s as well as sustainable investments and the challenges that exist in the sector. For bettervest this acquirement of knowledge referred to the book Factor 4 that Herr Mijnals read as well as learning about the crowdfunding concept. In the case of Der Finanzoptimist, the knowledge referred to the relationship between the financial sector and environmental, social and governance issues e.g. the support of the weapon industry.

All three cases also experienced an expansion (or extension) of social transactions. In the case of SDG-investments this referred to when the founders were approached by the potential client with the musical instruments, when they met the two lawyers, when they searched for investors within and outside their network, as well as when they started networking in the sustainable investments sphere in order to find their common denominator. For bettervest these social transactions were represented by the feedback that Herr Mijnals received from his current network on his idea, as well as the start-up weekend he attended. In the case of Der Finanzoptimist the social transactions referred to the information event that Herr Achenbach held for the employees at Taures.

Finally, the expansion of core ideas, and expansion of outcome criteria used to assess the development of the ideas, occurred in all three cases. In some, the ideas and criteria were more detailed than others. SDG-Investments had a clear idea both of what they wanted to achieve and, to a large extent, how and through what means they would achieve it. Bettervest on the other hand had a clear idea of what they wanted to achieve and through what means it should be done, but due to the novelty of crowdfunding, how to get there was less clear. Der Finanzoptimist also had a clear idea of what they wanted to achieve, however how this should be done and through what means was something that developed over time.

Table 6. Observed changes during the initiation period for the three cases in the five concepts ideas, people, transactions, outcomes and contexts used by Van de Ven et al. (1999) to describe the innovation process. The changes are defined as either expansions, contractions, continuations or modifications. Outcomes are defined as positive, negative or mixed.

<table>
<thead>
<tr>
<th></th>
<th>SDG-Investments</th>
<th>bettervest</th>
<th>Der Finanzoptimist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Core idea</td>
<td>Expand</td>
<td>Expand</td>
<td>Expand</td>
</tr>
<tr>
<td>- Related idea</td>
<td>Expand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>People</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Members</td>
<td>Expand and continue</td>
<td>Expand</td>
<td>Expand</td>
</tr>
<tr>
<td>- Roles</td>
<td>Continue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Capabilities</td>
<td>Expand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Knowledge</td>
<td>Expand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Motivation</td>
<td>Expand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transactions</td>
<td>Expand and continue</td>
<td>Expand</td>
<td>Continue and expand</td>
</tr>
<tr>
<td>- Social</td>
<td>Expand and continue</td>
<td>Expand</td>
<td>Continue and expand</td>
</tr>
<tr>
<td>- Legal</td>
<td>Expand and continue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Value</td>
<td>Positive and negative</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>- Criteria shift</td>
<td>Expand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contexts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Internal</td>
<td>Modify and continue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- External</td>
<td>Continue and modify</td>
<td>Continue and modify</td>
<td>Continue</td>
</tr>
</tbody>
</table>

To summarize, common patterns for the initiation period of the three green FinTech innovation processes include an expansion of the core idea, an expansion of people’s knowledge, a shift in outcome criteria, and a continuation of the external context.
7.1.2. Factors influencing the initiation period

The changes and direction of changes that could be observed in the five concepts during the initiation periods of each case were influenced by either individual, internal organizational or external societal factors. Out of the four changes presented in the previous sub-chapter that were common for all three cases during the initiation period, only two were the consequence of the same factors (see table 7). The expansion (or occurrence) of core ideas, and the expansion of outcome criteria were in all the cases influenced by the expansion of people’s knowledge, and the continuation of the external context.

Table 7. Individual, internal organizational, and external societal factors identified as influencing the changes in concepts during the initiation period of each of the three cases.

As mentioned in the previous sub-chapter, many of the aspects in the external context that were observed as somewhat stable by the interviewees were related to challenges in society. Whether it is social issues, environmental issues, financing gaps, information asymmetries, lack of impact measurement tools, unsustainable values in the financial sector etc. The continuation or stable existence of these challenges, in other words this external context, entailed a demand for innovations that could help solve the challenges. In the cases of bettervest and Der Finanzoptimist, this demand acted as a source of inspiration for philanthropic action and in the case of SDG-Investments is represented a good business opportunity. In any case, the continuation of the external context influenced the expansion (or occurrence) of core ideas and related outcome criteria for all three cases.

So did the expansion (or acquirement) of people’s knowledge. In the case of SDG-Investments, it was the acquirement of new knowledge that made the founders realize the business opportunity that existed in the sustainable investment sector. The new knowledge, especially that which they acquired from the professor at the conference in Stuttgart, also made them realize what challenges they could contribute to solving, what aspects that would be important in a potential solution, and thereby what role they could fill. In the case of
bettervest, the new knowledge acquired from the book Factor 4 and the encounter with the crowdfunding concept came together and gave Herr Mijnals the idea for the crowdfunding platform with related outcome criteria. For Der Finanzoptimist, the article that Herr Achenbach read as well as the further research he made into the negative impact of the financial sector made him realize that he needed to try and change the investment priorities at Taures where he worked. In all cases, the acquired knowledge was readily available to the founders, which is in accordance with Rosenberg and Kline’s (2010, p. 184-186) view of the use of knowledge during innovation processes.

7.1.3. Patterns 1-3 in the Firework Model

As illustrated in table 8 and figures 8-10 in appendix V, all three cases followed the three patterns that Van de Ven et al. (1999) depicts as part of the initiation period in the firework model (see figure 7). As illustrated as pattern 1 in the model, all cases began the innovation process with a gestation period that, in line with Van de Ven et al. (1999, p. 10, 23-25), consisted of coincidental, seemingly independent events that were not intentionally directed towards an innovation. For SDG-Investments this period lasted between the moment that AHP was approached by the man with the musical instruments in early 2015, until the professor they met at a conference in Stuttgart in June 2016 shared knowledge that gave them the idea for the platform. For bettervest the gestation period was longer and lasted between the time that Herr Mijnals read the book Factor 4 about the energy efficiency potentials that are not used in the world, to when he went to the start-up weekend six years later. For Der Finanzoptimist the gestation period was very short and lasted between when Herr Achenbach read the article which described the relation between the financial industry and the weapon industry in June 2016, and when he finally suggested to the management of TauRes to widen their investment idea to also include sustainable investment products.

Further in accordance with the model (pattern 2) all the gestation periods ended with a shock that led them to initiate the innovation process (ibid., p. 10, 23-24, 27, 29). These shocks were of different character. In the case of SDG-Investments, this shock can be claimed to have been represented by the knowledge shared by the professor at the conference in Stuttgart. For bettervest the shock was represented by the start-up weekend that Herr Mijnals went to where his idea was chosen to be developed by his group and he met his two future co-founders. Der Finanzoptimist’s shock can be claimed to have been the resistance Herr Achenbach faced by the management of Taures when he suggested to widen the company’s investment idea to include sustainable investments.

According to Van de Ven et al. (1999, p. 30) the end of the initiation period and beginning of development period is usually characterized by the development of plans and budgets, depicted as pattern 3 of the model. SDG-Investments did not make a detailed long-term plan for their innovation processes however they made a basic design for what they envisioned the platform to be. Bettervest had developed a business concept during the start-up weekend and in the weeks after they developed a business plan and invested their own capital in the process. The planning of Der Finanzoptimist consisted of brainstorming sessions where the team tried to solve the challenge of conducting events for Taures clients without the events being sanctioned by Taures.

<table>
<thead>
<tr>
<th>Patterns</th>
<th>SDG-Investments</th>
<th>bettervest</th>
<th>Der Finanzoptimist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Gestation period</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2) Shock</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>3) Plans</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

7.2. The Development and implementation period

According to Van de Ven et al. (1999, p. 23-24) determining when the implementation period starts and the development period finishes is not so easy as activities aimed for the adoption and implementation of an innovation are often done during the development period. Thus, both periods will be analysed together in this subsection.
7.2.1. Changes in Ideas, People, Transactions, Outcomes and Contexts

The development and implementation period also incurred changes in all concepts for all three cases (see table 9). The changes that were shared during this period include the continuation (or maintained responsibility) for roles previously held by people in the innovation team, the continuation of people’s existing capabilities, the expansion of legal and social transactions (or relationships), the continuation (or stability) of certain aspects in the external context, as well as the experience of positive as well as negative outcomes.

Starting with the **continuation of people’s roles**, this refers to the fact that the innovation team members in all cases worked part time with the innovation during the development and implementation periods, while also maintaining the professional roles they had before. SDG-investments worked simultaneously with their tasks at AHP, bettervest continued with their current employments for the first 1,5 years of the development period, and Der Finanzoptimist worked with the development of the innovation in their spare time. The bettervest team eventually started working full time with the company.

The **continuation of people’s capabilities** refers to existing capabilities among the innovation team members which were of importance for the development and implementation periods. For SDG-Investments this refers to the ability to do sales, to manage people, having a track record and effective communication with the IT-company. For bettervest it refers to the creativity held by the team member who came up with the idea of expanding to development countries and renewable energy installations. For Der Finanzoptimist it refers to Herr Achenbach’s good reputation at Taures which enabled him to push the boundaries.

The **expansion of legal transactions** mainly refers to executed sales or initiated partnerships. In the case of SDG-investments these partnerships refer to those made within the developed ecosystem, with the two lawyers, IMUG, the IT-company, BDS, FNG etc. For bettervest they refer to the legal advisors, the business angels, the crowdfunding associations, the SDG-Fintech initiative etc. And in the case of Der Finanzoptimist they refer to the office at Social Impact Lab, the partnership with the man who helps Herr Achenbach with the podcast, the man they paid to help them with research for the portfolio etc.

The **expansion of social transactions** refers to all the relationships that were made that eventually either led to a legal transaction or not. This includes the search for the partnerships mentioned above, the feedback that SDG-Investments and bettervest asked for from the institutional and individual investors, and the general networking occurred in all cases. In the case of SDG-Investments, the purpose and benefit of this networking was, besides for the reasons mentioned above, to gain more knowledge about the sustainable investment sphere, for bettervest it was to learn more about crowdfunding and to find projects and investors, and for Der Finanzoptimist it was to find interviewees for the podcast.

All cases experienced both **positive and negative outcomes** from events that occurred during the development and implementation periods. For SDG-Investments positive outcomes referred to executed sales, registration of investors and projects on the platform, the establishment of an investor network, going live with the platform, staying within budget for the development etc. Negative outcomes refer to the first partnership for the IT-development which did not work and caused a six-month delay. For bettervest positive outcomes also refer to sales, finishing the platform, receiving valuable feedback from the crowd and two rounds of investment. Negative outcomes refer to the wrong legal advice that they received and the change in regulations which hindered them to do business for four months. Positive outcomes for Der Finanzoptimist included sales, the execution of events, the start of the podcast and the breakthrough with Taures. Negative outcomes mainly included the resistance experienced from the management at Taures.

Finally, just as during the initiation period, all cases experienced a **continuation** (or stability) of certain aspects in the **external context** which were of importance for the development and implementation period. In the case of SDG-Investments, these aspects included the existence of competence in society such as the IT-company, IMUG and the compendium with a collection of institutional impact investors written by the professor they met at the conference in Stuttgart. It also included the financing gap for impact-focused SMEs, the existence of social issues, and the novelty and business opportunity of the SDGs. For bettervest it included the existence of different awards for start-ups, the continued novelty and thus unclear legal situation for crowdfunding, the existing financing gap experienced by mid-sized energy efficiency projects, the existence
Table 9. Observed changes during the development and implementation periods for the three cases in the five concepts ideas, people, transactions, outcomes and contexts used by Van de Ven et al. (1999) to describe the innovation process. The changes are defined as either expansions, contractions, continuations or modifications. The outcomes are defined as positive, negative, mixed or neutral.

<table>
<thead>
<tr>
<th>SDG-Investments</th>
<th>bettervest</th>
<th>Der Finanzoptimist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideas</td>
<td>- Core idea</td>
<td>Observation</td>
</tr>
<tr>
<td></td>
<td>- Related idea</td>
<td>Expand</td>
</tr>
<tr>
<td></td>
<td>- Members</td>
<td>Expanding</td>
</tr>
<tr>
<td></td>
<td>- Roles</td>
<td>Expand and continue</td>
</tr>
<tr>
<td></td>
<td>- Capabilities</td>
<td>Continue and observation</td>
</tr>
<tr>
<td></td>
<td>- Knowledge</td>
<td>Expand and observation</td>
</tr>
<tr>
<td>People</td>
<td>- Motivation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transactions</td>
<td>- Social</td>
<td>Expand and continue</td>
</tr>
<tr>
<td></td>
<td>- Legal</td>
<td>Expand, continue, contract and observation</td>
</tr>
<tr>
<td>Outcomes</td>
<td>- Value</td>
<td>Positive and negative</td>
</tr>
<tr>
<td></td>
<td>- Criteria shift</td>
<td>Expands</td>
</tr>
<tr>
<td>Contexts</td>
<td>- Internal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- External</td>
<td>Continue and observation</td>
</tr>
</tbody>
</table>

7.2.2. Factors influencing the development and implementation periods

Like the initiation period, the changes and direction of changes that could be observed in the five concepts during the development and implementation periods of each case were influenced by either individual, internal organizational, or external societal factors. Many commonalities between the cases in terms of factors that influenced the innovation process could be identified (see table 10).

To begin with, in all three cases the expansion (or widening) of roles influenced the expansion (or extension) of social and legal transactions (relationships) as well as positive outcomes. The widening of people’s roles entailed that a new task had to be performed which in many cases also entailed that this performance succeeded entailing a positive outcome, and/or that connections had to be, or would be, made with actors outside the innovation team entailing social and legal transactions. Examples of the former include the development of the platforms for SDG-Investments and bettervest which entailed an expansion of roles for those involved in the development which also led to positive outcomes in terms of finished platforms. For Der Finanzoptimist the planning of events for clients and development of a portfolio with sustainable investment products entailed an expansion of roles which led to positive outcomes in terms executed events and sales. The events are also an example of how the expansion of roles led to an expansion of legal transactions in terms of connecting with the clients while the sales are an example of how the expansion of roles led to an expansion of legal transactions. Building the ecosystem entailed an expansion of roles in the case of SDG-Investments which also led to an expansion in social transactions in terms of networking and an expansion in legal transactions in terms of deals being made with partners in the ecosystem, or joining the SDG FinTech initiative. For bettervest, the team’s navigation through legal and other issues incurred an expansion of roles which also led to an expansion of social transactions as this navigation required networking with actors in the industry and an expansion of legal transactions as bettervest initiated a cooperation with a legal advisor.
Table 10. Individual, internal organizational, and external societal factors identified as influencing the changes in concepts during the development and implementation periods of each of the three cases.

<table>
<thead>
<tr>
<th>Identified factors influencing the dev. and impl. Periods</th>
<th>Observed changes in concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea-core exp.</td>
<td>Idea-core exp.</td>
</tr>
<tr>
<td>Idea-related exp.</td>
<td>Idea-related exp.</td>
</tr>
<tr>
<td>Peop-memb. exp.</td>
<td>Peop-memb. exp.</td>
</tr>
<tr>
<td>Peop-role exp.</td>
<td>Peop-role exp.</td>
</tr>
<tr>
<td>Peop-capab conti</td>
<td>Peop-capab conti</td>
</tr>
<tr>
<td>Peop-know exp.</td>
<td>Peop-know exp.</td>
</tr>
<tr>
<td>Peop-know obs</td>
<td>Peop-know obs</td>
</tr>
<tr>
<td>Trans-soc. exp.</td>
<td>Trans-soc. exp.</td>
</tr>
<tr>
<td>Trans-soc conti.</td>
<td>Trans-soc conti.</td>
</tr>
<tr>
<td>Trans-legal exp.</td>
<td>Trans-legal exp.</td>
</tr>
<tr>
<td>Trans-legal conti.</td>
<td>Trans-legal conti.</td>
</tr>
<tr>
<td>Trans-legal obs.</td>
<td>Trans-legal obs.</td>
</tr>
<tr>
<td>Outcome-posit.</td>
<td>Outcome-posit.</td>
</tr>
<tr>
<td>Outcome-negat.</td>
<td>Outcome-negat.</td>
</tr>
<tr>
<td>Outco-criter shift</td>
<td>Outco-criter shift</td>
</tr>
<tr>
<td>Contx-int. conti</td>
<td>Contx-int. conti</td>
</tr>
<tr>
<td>Contx-ext modifi</td>
<td>Contx-ext modifi</td>
</tr>
<tr>
<td>Contx-ext. conti</td>
<td>Contx-ext. conti</td>
</tr>
<tr>
<td>Contx-ext. obs.</td>
<td>Contx-ext. obs.</td>
</tr>
<tr>
<td>Contx-ext exp.</td>
<td>Contx-ext exp.</td>
</tr>
<tr>
<td>Contx-ext obs.</td>
<td>Contx-ext obs.</td>
</tr>
</tbody>
</table>

SDG-Investments
Bettervest
Der Finanzoptimist

The expansion of social and legal transactions was also influenced by previous expansions of social transactions. In early spring 2018 SDG-Investments expanded their social transactions by conducting a presentation at an event which led to yet an expansion in social transactions when they were approached by the man from BDS. This new connection later led to an expansion of legal transactions when the two parties agreed to cooperate. Bettervest’s networking with actors in the industry entailed an expansion in social transactions which led to another expansion in social transactions when they met the legal expert in crowdfunding who told them their current legal advice was incorrect. This in turn led to an expansion in legal transactions in terms of the initiation of a cooperation with the legal expert. For Der Finanzoptimist, the expansion of social transactions represented by the events that the innovation team held, led to an expansion in social transactions in terms of the man Herr Achenbach met who advised him about the Social Impact lab. Legal transactions were then expanded when Herr Achenbach signed a contract to rent an office there.

Finally, the expansion of social transactions was also influenced by positive outcomes. In the case of SDG-Investments, the finalization of the platform (positive outcome) led to the expansion of social transactions in terms of investors registering on the platform. For bettervest the start of the development period (positive outcome) led the team to start looking for projects and investors. And as mentioned above, the execution of events (positive outcome) led Herr Achenbach to meet the mean who advised him about Social impact lab.
The **expansion of legal transactions** either entailed positive or negative outcomes. Examples of legal transactions that led to negative outcomes include the agreement between SDG-Investments and the potential partner who would manage the IT-development which had to be ended since it did not work as planned, the agreement between bettervest and the first legal advisor that had to end since he gave wrong advice, and the sales of sustainable investment products by Der Finanzoptimist which caused tension between Der Finanzoptimist and the management at Taures. Examples of positive outcomes include the agreement between SDG-Investments and the IT-company which led to the start of the platform development, the investments made by the bettervest team of their own private capital which enabled the initial development of the idea, and the eventual change of mind by the management of Taures after Der Finanzoptimist performed a longer period of sales of sustainable investment products.

The **continuation (or existence) of people’s capabilities** also influenced the occurrence of positive outcomes for all cases. As mentioned in the sub-chapter above, for SDG-Investments this e.g. included the team members track record and ability to execute sales and manage people which was necessary to close deals with projects and investors. For bettervest it included the in-house IT-capability which was necessary to develop the platform. Finally, for Der Finanzoptimist it included Herr Achenbach’s reputation at Taures which enabled him and his team to keep trying to influence the management.

To summarize, positive outcomes were influenced by the **continuation of people’s existing capabilities, the expansion of legal transactions and the expansion of roles**. The expansion of social transactions was influenced by **positive outcomes, previous expansions of social transactions, and the expansion of roles**. Negative outcomes were influenced by the **expansion of legal transactions**. The expansion of legal transactions was influenced by the **expansion of people’s roles** and the **expansion of social transactions**.

### 7.2.3. Patterns 4-12 in the Firework Model

In all three cases the development period initiated with several diverging and parallel paths of activities and ideas (as depicted in figures 8-10 in appendix V) and all team members, each representing one or more functions in these small constellations, were more or less involved in all paths which is in accordance with **pattern 4** the model by Van de Ven et al. (1999, p. 10, 23-24) and not in line with the linear models belonging to the first, second and third generations of innovation processes (Rothwell, 1994). For SDG-Investments these paths consisted of ecosystem building, market research, digital development, search for an independent sustainability evaluator etc. For bettervest the paths included the development of the digital crowdfunding platform, administrative work involving the development of the investment process for investors and projects, conducting two investment rounds, and networking activities which were necessary for finding projects and investors. In the case of Der Finanzoptimist, the parallel activities consisted of planning, research and execution of the information events, development of portfolio with sustainable investment products and the sales of these, and the planning, research, execution and search for interviewees for the podcast.

In terms of setbacks (**pattern 5** in the model), this was as mentioned in sub-chapter 7.2.1 also experienced by all cases represented by the negative outcomes of different events. These setbacks were as stated by Ven de Ven et al. (1999, p. 10) either related to plans that went wrong or some contextual event. E.g. of the former includes the first legal advisor that bettervest had, and the first IT-cooperation that SDG-Investments initiated. E.g. of the environmental events includes the resistance from the management of Taures that Der Finanzoptimist experienced and the new regulations for crowdfunding in Germany that stopped bettervest’s operations for four months.

**Pattern 6** in the model refers to the change and assessment of outcome criteria during the innovation process (Van de Ven et al., 1999, p. 10). As was mentioned in sub-chapter 7.2.1. all three cases experienced an expansion of outcome criteria as well as both positive and negative outcome values meaning that the innovation process was assessed during the development and implementation periods. Sub-chapter 7.2.1 also presents examples of these criteria shifts and positive and negative outcomes.

As depicted in figures 8-10 in appendix V, and further developed in relation to the continuation of peoples’ roles that occurred in all three cases as mentioned in sub-chapter 7.2.1., none of the teams worked fulltime with the innovations during the development period. In addition, both SDG-Investments and bettervest experienced expansions in their innovation teams during the development and implementation period while
this was difficult to derive from the data for Der Finanzoptimist. Fluid participation of team members goes in line with pattern 7 in the model by Van de Ven et al. (1999, p. 8, 13)

The intervention of top managers and investors (pattern 8 in the model) was the only pattern that did not occur in any of the cases. Instead SDG-investments used funds from the founders’ previous placements through AHP, Der Finanzoptimist was financed from Herr Achenbach’s own pocket, and even though bettervest received external funding from business angels, these never intervene in the work but rather supported the development of the innovation. In all three cases, the founders represented the top management.

As mentioned in sub-chapter 7.2.1. all three cases experienced an expansion of social and legal transactions, entailing the development of networks of actors that enable the development and implementation of the innovation (pattern 9 in the model). The characteristics of these relationships were explained in more detail in sub-chapter 7.2.1.

Further networks can be built and used in order to create or influence the infrastructure that is needed for the innovation to be able to succeed, as it is rare that one team of innovators possess all the competence, resources and legitimacy that is needed to develop and implement an innovation (pattern 10 the model) (Van de Ven et al., 1999, p. 149). The only case in which such efforts were clearly observed was in bettervest which cooperates with crowdfunding networks in Germany and on an EU–level to lobby for a harmonization of regulative frameworks for crowdfunding.

The 11th pattern in the model refers to the beginning of the implementation period. As mentioned above, Van de Ven et al. (1999, p. 23-24) states that it is difficult to determine the end of the development period and the beginning of the implementation period. This was also the case with the innovation processes examined in this study. SDG-Investments may already have launched the digital platform however this was done with the acknowledgement that it is a simple first version on which feedback probably will be received as it was never really tested with end-users. SDG-Investments are open to continue developing the platform if such needs occur. Der Finanzoptimist is in the middle of potentially merging with TauRes meaning many steps are left both for development and implementation in terms of combining the new idea with the old idea at TauRes (Van de Ven et al., p. 54). As these two cases are still in the process of developing and implementing their idea, no analysis of the end of the innovation process as depicted by pattern 12 in the model (Van de Ven et al., 1999, p. 23-24) could be made.

Bettervest could however be determined to have finished their innovation process as the company has moved on to a focus on scaling the innovation rather than primarily developing it. Exactly when the implementation process began or the innovation process finished could however not be determined by the data.

To summarize, all cases experienced a proliferation in ideas and paths, setbacks, shift of outcome criteria, fluid participation of innovation team members, relationships with actors outside the team, and activities aimed at adopting or implementing the innovation (see table 11). None of the cases experienced an intervention from investors or top management and only bettervest was actively involved in trying to influence the surrounding infrastructure. Additionally, only bettervest has finished the innovation process.

<table>
<thead>
<tr>
<th>Patterns</th>
<th>SDG-Investments</th>
<th>bettervest</th>
<th>Der Finanzoptimist</th>
</tr>
</thead>
<tbody>
<tr>
<td>4) Proliferation</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5) Setbacks</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6) Criteria Shift</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7) Fluid participation of organizational personnel</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8) Investors/top management intervene</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9) Relationships with others</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>10) Infrastructure development</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>11) Adoption</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12) Termination</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 11. The occurrence of patterns 4-12 from the “Firework model” in the three examined cases.
7.3 Summary

The analysis shows that the innovation process of all three cases follow most of the patterns in Van de Ven et al.’s “Firework model”. The only patterns that did not occur in all three cases was the intervention of investors or top management (pattern 8), activities aimed at influencing the surrounding infrastructure (pattern 10), and a termination of the innovation process (pattern 12). In addition, changes in the five concepts common for all three cases could be identified both for the initiation as well as the development and implementation periods (see table 12). For some of these changes, influencing factors common for all three cases could also be identified. The implications of these findings will be discussed in the following chapter.

Table 12. Changes in concepts and factors influencing these changes common for all three cases during both the initiation and development and implementation periods.

<table>
<thead>
<tr>
<th>Change in concept</th>
<th>Influencing factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation period</td>
<td></td>
</tr>
<tr>
<td>Continuation of external context</td>
<td>No identified factor</td>
</tr>
<tr>
<td>Expansion of people’s knowledge</td>
<td>No identified factor</td>
</tr>
<tr>
<td>Expansion of social transactions</td>
<td>No identified factor</td>
</tr>
<tr>
<td>Expansion of core ideas</td>
<td>Expansion of people’s knowledge and continuation of external context</td>
</tr>
<tr>
<td>Expansion of outcome criteria</td>
<td>Expansion of people’s knowledge and continuation of external context</td>
</tr>
<tr>
<td>Development and implementation period</td>
<td></td>
</tr>
<tr>
<td>Continuation of people’s roles</td>
<td>No identified factor</td>
</tr>
<tr>
<td>Continuation of people’s capabilities</td>
<td>No identified factor</td>
</tr>
<tr>
<td>Expansion of legal transactions</td>
<td>Expansion of people’s roles and expansion of social transactions</td>
</tr>
<tr>
<td>Expansion of social transactions</td>
<td>Positive outcomes, expansion of social transactions and expansion of people’s roles</td>
</tr>
<tr>
<td>Positive outcomes</td>
<td>Continuation of people’s capabilities, expansion of legal transactions, expansion of roles</td>
</tr>
<tr>
<td>Negative outcomes</td>
<td>Expansion of legal transactions</td>
</tr>
<tr>
<td>Continuation of external context</td>
<td>No identified factor</td>
</tr>
</tbody>
</table>
8. Discussion and conclusion

This chapter discusses the findings from the analysis in order to answer the research questions in this study, and compare the findings to previous research. Sub-chapter 8.1. addresses the first research question and sub-chapter 8.2. addresses the second research question. Sub-chapter 8.3. discusses the theoretical and practical implications of the findings including suggestions for future research.

8.1. The evolvement of green FinTech innovation processes

The answer to the first research question “What does the innovation process for green FinTech innovations look like?” was derived by analysing changes in the five concepts ideas, people, transactions, outcomes and contexts during the innovation processes, as well as by applying the innovation process model, the firework model, developed by Van de Ven et al. (1999) to the collected data. The findings show that the green FinTech innovation process can be divided into an initiation period which also includes a gestation period, and a development period which is intertwined with the implementation period. The innovation process begins with:

Pattern 1. The gestation period which lasts between a few weeks to several years during which seemingly independent events occur that prepare the launch of an innovation process. During this period, five changes in the five concepts are likely to occur. These include:
- a continuation of external context which can refer to existing social and environmental issues in society, existing financing gaps, existing opportunities to network, information asymmetries and lack of impact measurement tools, unsustainable values in the financial market, existing competence in society, the need to change people’s investment behaviour and lack of trust in the financial sector as a consequence from the financial crisis in 2008.
- an expansion of people’s knowledge, which relates to the existing social issues mentioned above, as well as potential solutions to these issues and challenges with these solutions.
- an expansion of social transactions, which refers to the participation in, and arrangement of, different events as well as different forms of networking.
- an expansion of core ideas which occur either during or at the end of the gestation period.
- an expansion of outcome criteria which occurs in relation to the core idea and include what the innovators want to achieve.

Pattern 2. The end of the gestation period is defined by a “shock” that leads to the initiation of the official innovation process and the official initiation period. The characteristics of this shock differs between different green FinTech innovation processes in accordance to Van de Ven et al.’s findings. (1999, p. 10, 23-24, 27).

Pattern 3. The end of the initiation period and beginning of development period is defined by the making of plans and budgets. The detail of these vary between different green FinTech innovation processes.

Pattern 4. When the development period begins, the innovation process divides into several diverging and parallel paths of activities in which all innovation team members (organizational functions), are more or less involved which is in accordance with Van de Ven et al.’s findings (1999, p. 10, 23-24). These paths can consist of networking, digital development, search for investors, marketing efforts etc.

Pattern 5. Setbacks, which in relation to the concept outcomes represent a negative outcome, is to be expected during the development and implementation periods, however the characteristics of these differ between different green FinTech innovation processes. These are as stated by Ven de Ven et al. (1999, p. 10) either related to plans that go wrong (e.g. unmet expectations on legal transactions) or some contextual event (e.g. changing regulations or resistance from the internal organizational context).

Pattern 6. Outcome criteria is assessed and changes during the development and implementation periods which is in accordance to Van de Ven et al. (1999, p. 10). Both positive and negative outcomes are experienced. Characteristics of negative outcomes is described under pattern 5, while positive outcomes can include executed sales, established networks, finished digital development, staying within budget, receiving investments, the execution of planned activities, and achieved goals.
Pattern 7. The innovation team members do not work fulltime with the green FinTech innovation during the development and in some cases implementation period which is in line with Van de Ven et al.'s findings (1999, p. 8, 13). Observed changes in the concept people rather show that team members continue with previously held roles in addition to the innovation work. In addition, existing or continued capabilities held by the team members turn out to be of importance during the development and implementation periods. These can include the ability to conduct sales, to manage people, having a track record, creativity and a good reputation.

Pattern 8. Pattern 9. The development of networks is important for the development and implementation period of a green FinTech innovation and consists of an expansion of both social and legal transactions. Legal transactions can refer to executed sales, initiated partnerships, contracts with suppliers, investment agreements, consultations, memberships in associations, sponsorships, or office contracts. Social transactions can refer to the initial contacts that led to the legal transactions, as well as feedback from target groups and general networking with different aims.

Pattern 10. Pattern 11. Determining the end of the development period and the beginning of the implementation period in a green FinTech innovation process is difficult. This is because, in accordance with the findings from Van de Ven et al. (1999, p. 23-24), activities aimed at implementing the innovation are already initiated during what can be defined as the development period, meaning the development is not finished even though first versions of an innovation have been implemented.

Pattern 12. Will eventually occur in all cases once the innovation periods for Der Finanzoptimist and SDG-Investments is finished.

Two of the patterns identified by Van de Ven et al (1999) did not occur during the innovation processes of all the three cases. Pattern 8, intervention from investors or top management, did not occur during the innovation process of bettervest, and will probably not occur for SDG-Investments before their innovation process is finished as the innovators themselves represent the top management and the development probably will continue to be financed with revenues from their investment products. Der Finanzoptimist might however come to experience some kind of intervention as the merge with Taures entails that the current top management of Der Finanzoptimist will be replaced by the management of Taures who might intervene in the content of the podcast.

Pattern 10, infrastructure development, occurred during the innovation process of bettervest but not during the innovation processes of Der Finanzoptimist and SDG-investments. Common for all cases was that certain aspects of the external context (or infrastructure) were observed to remain stable or continue throughout the development and implementation periods (see table 12). Some of these aspects have also been observed in research on general FinTech innovations and social tech start-ups. These include a financing gap for impact-focused SMEs, the existence of social issues, information asymmetries between conventional investors and impact focused startups (Arena et al., 2018) and regulatory issues (Zilgalvis, 2014; Gomber et al., 2017; Zavolokina et al., 2016; Haddad and Hornuf, 2018) more specifically an unclear legal situation due to the novelty of green FinTech innovations. Other aspects not mentioned in previous research on general FinTech innovation processes or social tech start-ups include the existence of necessary competence in society, the availability of awards for start-ups and a divide between conventional and more sustainable values in the financial industry. Out of these aspects, the unclear regulatory situation was perceived as a large enough obstacle for bettervest to take action and try and influence the infrastructure. On the contrary to bettervest, SDG-Investments and Der Finanzoptimist has so far not experienced obstacles that require such action.

As mentioned in chapter 2, previous research related to what the innovation process of green FinTech innovations look like could not be found. Thus, the findings presented above represent the first contribution to research on this topic. All in all, the findings show that the green FinTech innovation process can be described through ten of the twelve patterns identified by Van de Ven et al. (1999) in the firework model. This means that general patterns of the innovation process of green FinTech innovations, although having their nuances, do not differ much from general patterns in other innovation processes. What does differ from the patterns in the firework model is that the green FinTech innovation process is also defined by an expansion of knowledge during the gestation period and a continuation of capabilities during the development and implementation periods that prove to be of importance for the innovation process.
8.2. Factors influencing green FinTech innovation processes

Just as for research question 1, no previous research related to research question 2 “Which individual, internal organizational and external societal factors influence the green FinTech innovation process and how do these factors influence the green FinTech innovation process?”, could be found. However, some previous research related to general FinTech innovation processes and social tech start-ups could be found and was summarized in Table 2. Below, the research is compared to the findings from this study.

As the analysis shows, (see table 12) a few factors common to all three cases could be identified as influencers of the changes in the five concepts that occurred during the innovation processes. Starting with the initiation period, the expansion of core ideas and the expansion of outcome criteria were in all three cases influenced by the expansion of people’s knowledge and the continuation of the external context. The influence that knowledge development has on ideas and outcome criteria has not been treated in previous research on general FinTech innovation processes, however, it’s influence on the occurrence of ideas can be supported by literature on innovation process theory. According to Johnsson (2017) and Park (2005) a constant generation of new knowledge influences the generation of new ideas positively. In addition, Logman (2007) and West et al. (2004) state that maintaining an awareness about trends in the surrounding environment influences the identification of business opportunities.

The influence of the continuation of the external context, referring to the stability of certain aspects in society, has however been treated in previous literature on general FinTech innovation. How these aspects have influenced the general FinTech innovation processes has however not been further developed than to define them as drivers or barriers of the process. Thus, whether they influence the occurrence of ideas or outcome criteria is not specified. Nonetheless, the aspects that have been identified in previous research as drivers or barriers of the general FinTech innovation process, which correspond to the aspects that have been identified as influencing the occurrence of ideas and outcome criteria in this study include social challenges (Arena et al., 2018) such as unsustainable values in the financial market, the need to change people’s investment behaviour and existing social and environmental issues in society; unfulfilled needs and market incompleteness (Gomber et al., 2017; Weichert, 2017; Punschmann, 2017; Zavolokina et al., 2016; Haddad and Hornuf, 2018) including existing financing gaps; macroeconomic conditions (Zilgalvis, 2014; Haddad and Hornuf, 2018; Zavolokina et al., 2016; Weichert, 2017) including lack of trust in the traditional financial sector as a consequence from the financial crisis in 2008; information asymmetries and lack of impact measurement tools (Arena et al., 2018). Two other aspects perceived as stable in the external context and found to influence the occurrence of ideas include existing opportunities to network and existing competence in society. These findings are further supported by literature on innovation process theory (Mol and Birkinshaw, 2009; O’Brien and Smith, 1995).

As for the development and implementation periods, a few more factors were identified as influencing the changes in the five concepts.

1) Positive outcomes were influenced by the continuation of people’s existing capabilities, the expansion of legal transactions and the expansion of roles.
2) The expansion of social transactions was influenced by positive outcomes, previous expansions of social transactions, and the expansion of roles.
3) Negative outcomes were influenced by the expansion of legal transactions.
4) The expansion of legal transactions was influenced by the expansion of people’s roles and the expansion of social transactions.

The first finding related to the factors that influence positive outcomes cannot be identified in previous research on general FinTech innovation processes or social tech start-ups. However, aspects of the findings are supported by literature on innovation process theory. For example, the capability “creativity” has been identified as having a positive influence on the success of an innovation process (Nanda and Singh, 2009). Other capabilities identified in this study such as the ability to conduct sales, to manage people, having a track record, and a good reputation are not mentioned. Also, the expansion of legal transactions such as strategic alliances and long-term relationships facilitated by partners have been found to contribute to the success of the innovation process by providing sustainable innovation results (Bossink, 2004).
The second, third and fourth findings which relate to the factors influencing the expansion of social transactions, negative outcomes and the expansion of legal transactions have neither been treated in previous research on green FinTech innovation processes or social tech start-ups. However, one aspect of the fourth finding, namely that the expansion of social transactions influences the expansion of legal transactions is supported by the literature on innovation process theory (Bossink, 2004; Hurmelinna-Luukkanen, 2011; Mele, Spena and Colucchio, 2012).

The fact that neither of the four findings related to factors that influence changes in the five concepts during the development and implementation periods of the innovation processes of green FinTech innovations have been treated in previous research on general FinTech innovation processes and social tech start-ups, shows one of two things. Either there has not been enough research into influencing factors on the development and implementation periods of general FinTech innovation processes. Or, research on general FinTech innovation processes cannot be used as a basis for creating a conceptual and empirical understanding of which factors that influence green FinTech innovation processes and how these factors influence green FinTech innovation processes. Regardless of which of these statements are true, the findings from this study enriches the research on general FinTech innovation processes, and provides the first contribution to research on the topic of factors that influence green FinTech innovation processes.

8.3. Theoretical and practical implications of the findings

The findings of this study have both theoretical and practical implications. As described in the introduction and background to this study, no previous research could be found related to the phenomenon of green FinTech innovation processes. Thus, this study represents the first contribution to research on the topic and provides an initial step in the conceptual and empirical understanding of what the green FinTech innovation process looks like, which individual, internal organizational, and external societal factors that influence it, and how these factors influence it. The findings enrich research on general FinTech innovation processes and social tech start-ups. and provide further evidence of the firework model’s applicability for explaining yet more innovation processes than those examined by Van de Ven et al. (1999). Further contributions to the firework model include the addition of the two sub-concepts knowledge and capabilities under the concept people. Finally, the study also makes methodological contributions including the establishment of a coding index that can be used in future qualitative studies of green FinTech innovation processes. For researchers, the findings can thus be used as a basis for further research into green FinTech innovation processes.

For innovators, policy makers, and innovation infrastructure actors, the findings can be used as a basis for stimulation and successful management of green FinTech innovations, and for the development of a supportive innovation infrastructure. Insights derived from this study for such efforts include a need to:
- increase and ensure the general knowledge in the region related to social challenges and possible solutions and challenges with these solutions. No specific target group for this knowledge development is necessary, however as the innovators in two of the three cases came from the financial sector this could be a first step.
- ensure networking opportunities with actors that to some extent are involved or interested in the areas of finance and social challenges. The need for technical competence in the innovation team was beneficial for bettervest but not necessary as seen in SDG-Investments and Der Finanzoptimist.
- ensure the development of capabilities such as creativity, sales and the management of people.
- through policies achieve a behavior and value change that increases the general demand for a more sustainable financial sector and investment products and thus the demand for green FinTech innovation products.

In applying these insights, it is important to recognize the limitations of this study consisting in that the findings are only based on three of the digital finance business functions identified by Gomber et al. (2017).

As described in chapter 5, the Frankfurt region has a limited support aimed specifically at green FinTech innovations. Only one case mentioned the SDG-FinTech initiative however it did not play a vital role in the innovation process. Frankfurt’s position as the possible future financial capital of the European Union makes it an important centre and most likely a role model for FinTech innovation. Harvesting the full potential of green FinTech innovations to contribute to the financial movement for sustainable development, entails a need for an innovation support aimed not only at general but also green FinTech innovations.
9. Conclusions

The aim of this study was to contribute to the conceptual and empirical understanding of green FinTech innovation processes. This would be done by answering the two research questions “What does the innovation process for green FinTech innovations look like?” and “Which individual, internal organizational and external societal factors influence the green FinTech innovation process and how do these factors influence the green FinTech innovation process?”.

The findings show that the green FinTech innovation process begins with an initiation period which consists of a gestation period during which core innovation ideas and related outcome criteria occur, innovation team members gain new knowledge, new social relationships are made, and most aspects in the external context stay stable. The acquired knowledge and the aspects in the external context that stay stable is shown to influence the occurrence of ideas and related outcome criteria. The gestation period ends with a shock whose characteristics differ between different innovation processes. The end of the initiation period and beginning of the development period is defined by the making of plans and budgets.

The development period is defined by several paths of activities that occur simultaneously and that more or less involves all functions in the innovation team. The initial outcome criteria are likely to develop during the development period and outcomes are continuously assessed. Positive outcomes are likely to occur and are influenced by the innovation members’ capabilities, the fact that they take on new roles and established legal relationships. Negative outcomes defined as setbacks are also likely to occur and takes different shapes but are likely to be influenced by established legal transactions. The participation of innovation team members during the development period is fluid and part-time work is common. Social and legal relationships are made with actors outside the innovation team and prove to be of importance for the development and implementation of the innovation. The development of these relationships is influenced by previously made social relationships and the new roles that the innovation team members take on. The development of social relationships is also influenced by experienced positive outcomes. The end of the development period and beginning of the implementation period is difficult to identify as activities aimed at implementing the innovation occur throughout the development period. Eventually, the innovation process finishes.

Based on these findings, the aim is deemed to be achieved. As no previous research into the innovation processes of green FinTech innovations could be found, this study represents the first contribution to research on green FinTech innovation processes and provides an initial step in the conceptual and empirical understanding of what the green FinTech innovation process looks like, which individual, internal organizational, and external societal factors that influence it, and how these factors influence it. For innovators, policy makers, and innovation infrastructure actors, the findings can be used as a basis for stimulation and successful management of green FinTech innovations, and for the development of a supportive innovation infrastructure. For researchers, the findings can be used as a basis for further research into green FinTech innovation processes. Suggestions for future research include:

- Research into additional digital business functions such as digital money or digital payments to see whether the findings would be similar.
- Research into general FinTech innovation processes to identify differences and similarities.
- Research into specific influencing factors or specific steps in the firework model.
- Research using other research and data collection methods to see whether the findings would be the same, but also to enable generalizations to other green FinTech innovation processes since generalizations from multiple-case studies should be done with care.
10. Acknowledgements

The completion of this study would not have been possible without the support and generosity of all the people I have met on the way.

I would like to thank my incredibly supportive and encouraging boyfriend who has kept my motivation up and patiently tolerated my immersion in this work. The same can be said for my mother who has always been my biggest support in life.

I am very thankful for the generosity of Herr Mijnals from bettervest, Herr Ackermann from SDG-Investments and Herr Achenbach from Der Finanzoptimist who provided their precious time and valuable information about the experiences they have made during their innovation processes. I wish them all the best in their future aspirations.

I would also like to thank Herr Schäfer at Techquartier and Herr Schekhar at Deutsche Bank Fintech initiative for their guidance in the Frankfurt FinTech ecosystem.

Naturally my supervisor Sofia Wagrell has been a critical support throughout the process and her comments and encouragement has been very valuable. I am also very thankful for the time invested by my evaluator Åse Linné, my examiner Ian Snowball, my opponent Kristina Naunova and my peers that I have met in seminars during the process, their comments have truly helped me to perfect my final product.

Finally, I would like to thank Uppsala University and SLU, but especially CEMUS for two fantastic years of my life that I will never forget. Studying Sustainable development, together with such kind and interesting classmates, who have turned into friends from all over the world, has been one of the most valuable experiences in my life that I am very happy that I got to experience. I will miss it.
11. References

Academic resources


Electronic resources


Personal Messages

Ackermann, Frank
SDG-Investments, Co-founder and responsible for strategy, platform development and relationship management
Male, 45-60 years
Started SDG-investments 2016, long work experience from the financial industry
Personal interview (2018-04-11)

Achenbach, Phillipp
Der Finanzoptimist, Founder
Male, 35-45 years
Started Der Finanzoptimist 2016, works at financial institution since 2003
Personal interview (2018-04-12)
Mijnals, Patrick
Bettervest, Co-founder, CEO and responsible for communications and marketing
Male, 35-45 years
Started bettervest 2012, previously worked as innovation consultant
Personal interview (2018-03-27)
Appendix I – Interview guide

F – Questions regarding influencing factors

P – Questions regarding the innovation process

Introduction and initial questions
- What is your role at Bettervest?
- What is your background? (F)
- Tell me a little about the idea behind Bettervest. (purpose, goals, vision)

Initiation period
- When and how did the idea behind Bettervest occur? (P and F)
- Did you come up with it alone? (F)
- Did you work actively with coming up with it or was it a coincidence? (P or F)
- What factors do you think played a part in the creation of the idea? (F)

Development period
- What did the process of making the idea come true look like? (P)
- Did you know exactly what you needed to do? (P)
- Did you make a plan that you followed? Did this change?
- Did you work on several things at the same time? (P)
- How were you organized? (P)
- Has the idea changed compared to the initial idea?
- Why did it change? (P and F)
- Have you experienced any kind of setbacks, resistance or disbelief? (F)
- Did you request feedback from end-users? Were they valuable to do? (F)
- Did you have access to any kind of support? (F)
- What kind of support would you have needed that you did not receive? (F)

Implementation period
- When did you make your first sale? (P)
- Do you feel like you have achieved the purpose behind the idea (or does it require further development)? (P)
- What would you say are the biggest challenges forward in achieving the purpose with your idea? (F)
- Do you feel like there is a support internationally, nationally and regionally that will enable you to handle these challenges and achieve your purpose? (F)
- Can you handle the challenges alone or are the solutions out of your control? (F)
- If you would go through the process again would you do anything differently? (P and F)
- What was of fundamental importance for the innovation process? (F)
Appendix II – Case study protocol

According to Yin (2009, p. 79), a case study protocol does a lot to increase the reliability of a study by enabling other researchers aiming at replicating the study to follow the same procedures for e.g. contacting informants, field work arrangements, ethical considerations towards informants, and possible questions to be used during interviews. The protocol also helps the researcher conducting the current study to carry out the data collection of the different cases.

Case study
*Green* FinTech innovation processes.
Three cases in the area of Frankfurt, Germany.

Case study background
Presented in Chapter 4

Research questions
Presented in Chapter 1

Theoretical framework
Presented in chapter 2

Data collection methods/sources
Semi-structured personal interviews with founders of *green* FinTech innovations and resulting companies.

Full list of interviewees
Presented in Chapter 3

Frank Ackermann, Co-founder, responsible for strategy and platform development at SDG-Investments, 
frank.ackermann@sdg-investments.de

Phillipp Achenbach, Founder of Der Finanzoptimist, phillipp.achenbach@derfinanzoptimist.de

Patrick Mijnals, Co-founder, CEO and Head of communications and marketing at bettervest, 
patick.mijnals@bettervest.de

Data collection procedure and history
- *March 2*nd, 2018 - approached Patrick Mijnals from bettervest by email with request for interview.
- *March 2*nd – *April 6*th, 2018 – Found SDG FinTech initiative through google search. Contacted several of the 9 members with requests for interviews. Continued searching on google and in different social media channels (Meetup, Facebook, LinkedIn), contacted several innovation hubs or incubators in the Frankfurt area for guidance to potential cases. Received many responses from the hubs and incubators but no help could be given. In terms of the participants, they either could not participate or they did not respond.
- *March 12*th, 2018 – made arrangements with Patrick Mijnals for interview on *March 27*th.
- *March 19*th, 2018 – approached Frank Ackermann from SDG-Investments by email with request for interview, received a response the same day and made arrangements for an interview on April 11*th*, 2018.
- *March 21*st-23*rd* – Developed interview guide for interviews (Appendix I) based on literature review and theoretical framework.
- *March 23*rd – talked to a Frankfurt based FinTech hub on the phone and asked for guidance to find *green* FinTech innovations, no direct advice except for SDG FinTech initiative could be given.
- *March 25*th – examined website of bettervest to prepare for interview
- *March 26*th – Met with another Frankfurt based FinTech hub at their office. Was also referred to SDG FinTech initiative.
- *March 27*th conducted interview with Patrick Mijnals at bettervest, interview was recorded.
- April 4th – approached Phillipp Achenbach at Der Finanzoptimist with request for interview.
- April 5th – arranged meeting with Phillipp Achenbach at Der Finanzoptimist for April 11th to discuss conditions for interview.
- April 10th, 2018 – examined website of SDG-Investments examined to prepare for interview. Examined Der Finanzoptimist website to prepare for meeting.
- April 11th – conducted interview with Frank Ackermann at SDG-Investments, interview was recorded. Also met with Phillip Achenbach at Der Finanzoptimist to discuss conditions for an interview. Arranged an interview for the 12th of April.
- April 12th – Conducted an interview with Phillipp Achenbach at Der Finanzoptimist, interview was recorded.
- April 30th – Finished transcribing
- May 7th, 2018 – Email sent to Frank Ackermann, Patrick Mijnals, and Phillipp Achenbach with draft of results section regarding their green FinTech innovation processes. A few control questions were sent to Frank Ackermann. Asked the respondents for comments and approval. Response received the same day from Frank Ackermann with answers, comments and approval.
- May 13th- May 20th – categorization, analysis, report

**Ethical considerations**
- Interview respondents should be asked if they want to be anonymous;
- Interview respondents should know they are recorded and be aware that they can refuse to answer any question they want;
- Interview respondents should be aware of study purposes and how data will be used
- Interview respondents should approve participation as well as final data used in study report.
- Collected data should be stored in a safe way as information regarding the innovation process may be confidential.
- Keep the interview within the suggested time frame.

**Interview guide**
Appendix I

**Special preparations**
- Both phone and computer has good recording applications;
- Bring computer with interview guide and computer charger to face-to-face interviews
Appendix III – Coding Index

The coding index used for the analysis of the collected data is adapted from Poole et al. (2000, p. 105-108)

1. Critical Incidents – Incidents that can be deemed as important for the process (for example since respondents state that they are important), or that clearly can be categorized into one of the five concepts ideas, people, transactions, context and outcomes. Critical incidents are divided into events or observations.
   a. Events – major milepost during the innovation process or a change in one of the five concepts. These incidents can be characterized as factual.
   b. Observation – judgements of events that are can be identified to be made on specific dates. These incidents are characterized as more subjective expressions. The observation has to include a reference to the event, which of the five concepts that the event belongs to and the actor making the judgment.

Events and observations are further coded into the five concepts as well as courses of action. These codes are in turn divided in sub-codes that are deemed suitable to describe the green FinTech innovation processes.

2. Ideas
   a. Idea-core – change in main innovation idea
   b. Idea-related – change in ideas that are related to core idea and necessary to coordinate, organize or support development of core idea.

3. People – knowledge, capabilities, personal motivation, roles, or members of innovation team

4. Transaction – legal or social relationships

5. Outcome – That which is used to measure progress of the innovation development. Current criteria, e.g. successful construction of necessary component, or change in the criteria/goals themselves. The outcomes can further be coded as positive, negative, or mixed.
   a. Positive - Good news/successful accomplishment
   b. Negative – bad news, failure, mistake
   c. Mixed – neutral or mix of positive and negative
   d. Null – no information regarding impact exists

6. Context
   a. Internal – refers to the organization which houses the innovation development.
   b. External – Refers to environment outside organization that relates to the innovation, e.g. markets, technology development, regulation.

7. Course of Action of event in relation to previous status in the concepts e.g. context
   a. Expansion
   b. Continuation
   c. Modification
   d. Contraction

8. Course of activity paths
   a. Diverging
   b. Parallel
   c. Converging
Appendix III – Search queries for literature review

1. ("FinTech" OR ("Financial" AND "Technology"))
2. (("FinTech" OR ("Financial" AND "Technology")) AND ("Innovation" OR ("Innovation" AND "Process")))
3. ("Green" AND "FinTech") OR ("Green" AND "Financial" AND "Technology")
4. (("Green" AND "FinTech") OR ("Green" AND "Financial" AND "Technology")) AND ("Innovation" OR ("Innovation" AND "Process"))
5. ("Sustainab*" AND "FinTech") OR ("Sustainab*" AND "Financial" AND "Technology")
7. ("Financial" AND ("Innovation" OR ("Innovation" AND "Process")))
8. ("Digital" AND ("Innovation" OR ("Innovation" AND "Process")))
9. ("Social" AND ("Innovation" OR ("Innovation" AND "Process")))
10. ("Digital" AND "Social" AND "Innovation")
11. ("Green" AND "Digital" AND "Finance") AND "Innovation"
12. ("Sustainab*" AND ("Innovation" OR "Innovation process"))
13. ("Innovation AND process")
Fig. 8. Timeline of SDG-Investments’ innovation process including changes in ideas, outcomes, people, transactions and contexts, as well as factors influencing the process.
Fig. 9. Timeline of bettervest’s innovation process including changes in ideas, outcomes, people, transactions and contexts, as well as factors influencing the process.