

Crowd-Based Entrepreneurship –
How Crowd-Based Infrastructures Can Be Leveraged to
Unlock New Innovation Potential for Entrepreneurs,
Customers and Actors of Entrepreneurial Ecosystems

Dissertation

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Zusammenfassung

Ziel: Ziel dieser Dissertation ist das Innovationspotenzial von Crowdsourcing Plattformen für das Entrepreneurship zu erkunden. Das Hauptaugenmerk liegt dabei herauszufinden, wie Crowd-basierte Infrastrukturen Gründer in ihren Innovationsaktivitäten mit der „Crowd“ unterstützen können und wie dieses neue Paradigma dazu verwendet werden kann, Wert für einzelne Akteure als auch das umliegende Gründerökosystem zu generieren.

Methode: Um das genannte Forschungsziel zu erreichen, greift diese Arbeit auf unterschiedliche Methoden wie Case Studies, Experimente und Design Science Research zurück. Dies ermöglicht die unterschiedlichen Facetten des Themas zielgerichteter und näher zu beleuchten. Damit folgt die Arbeit einem pragmatischen Forschungsverständnis dessen primäres Ziel im Erkenntnisgewinn nach dem Motto „Methoden folgen Forschungsinteressen“ liegt.

Ergebnisse: Die Ergebnisse der Dissertation zeigen, dass Crowd-basierte Infrastrukturen zahlreiche Möglichkeiten bieten um Gründer im Rahmen der Ideenfindung als auch in der Ideenentwicklung zu unterstützen. So bietet Crowdsourcing z.B. die Möglichkeit Ideen gemeinsam mit der „Crowd“ zu validieren bzw. im Rahmen des Crowdfundings zu finanzieren. Zudem zeigen die Ergebnisse dieser Arbeit das Crowdfunding Plattformen sich nicht nur hinsichtlich der Finanzierung von Ideen eignen, sondern auch dazu benutzt werden können neue Produkte und Services gemeinsam mit Kunden zu entwickeln. Dieses ungenutzte Potential lässt sich durch Partizipationsarchitekturen wie z. B. aktive Feedbackstrukturen, multilaterale Austauschformate und Gestaltungselemente wie z. B. partizipatorische Updates aktiv fördern. Darüber hinaus zeigen die Ergebnisse dieser Arbeit, wie neue Crowd-basierte Mechanismen wie ICOs und Tokens dazu eingesetzt werden können, neue Gründerökosysteme zu kreieren und zu koordinieren.

Theoretischer Beitrag: Diese Dissertation bietet drei theoretische Beiträge. Erstens trage ich zu einem besseren Verständnis bei, wie Crowdsourcing Plattformen die

Schaffung und Realisierung unternehmerischer Chancen unterstützt. Zweitens trägt diese Dissertation zu einem besseren Verständnis bei, wie Crowdsourcing- und Crowdfunding-Plattformen genutzt und gestaltet werden müssen um die Innovationsfähigkeit der „Crowd“ voll auszuschöpfen. Ich untersuche hierzu, welches Ko-Kreationspotenzial den vorhandenen Systemen innewohnt und wie Gründer dieses Potenzial effizient nutzen können, um mit Kunden gemeinsam zu innovieren. Abschließend trägt diese Arbeit zu einem besseren Verständnis neu entstehender Crowdsourcing-Modelle und Crowd-basierter Mechanismen sowie deren Rolle in der Entstehung neuer Gründerökosysteme bei. In diesem Sinne liefert die folgende Arbeit einen ersten Baustein für die Entwicklung einer ganzheitlichen Theorie des Crowd-basierten Unternehmertums.

Praktischer Beitrag: Der praktische Beitrag dieser Arbeit ist dreifach. Der erste Beitrag liegt in der Ableitung faktischen Wissens, das Gründern eine rationale Grundlage für die Nutzung von Crowdsourcing-Plattformen zur Unterstützung ihrer unternehmerischen Innovationsaktivitäten bietet. Zweitens liefert diese Dissertation präskriptives Wissen in Form von Leitlinien, die Gründern dabei helfen können das ungenutzte Innovationspotenzial von Crowdsourcing-Plattformen besser zu nutzen. Als dritten Beitrag liefert diese Dissertation präskriptives Wissen für System-Designer mit dem Ziel diese darüber zu informieren wie Crowdsourcing-Plattformen und deren Mechanismen gestaltet werden müssen, um mit Kunden gemeinsam zu innovieren sowie die Entstehung und Koordination neuer Gründerökosysteme zu fördern.

Ausblick: Diese Arbeit legt den Grundstein für neue interessante Forschungsrichtungen im Bereich des Crowd-basierten Entrepreneurship. Zukünftige Forschung sollte dabei nicht nur auf die Erforschung bereits bekannter Crowdsourcing Plattformen fokussieren, sondern sollte sich auch mit der Erforschung neuer Crowd-basierter Infrastrukturen, deren individuellen Problemkontexten (z.B. Gründung), zugrundeliegenden Partizipationsstrukturen sowie deren Einfluss auf die Innovationsfähigkeit von Unternehmen befassen. Ein weiterer interessanter Forschungsschwerpunkt liegt in der Erforschung neuer Crowdsourcing Architekturen, die flexiblere und aktivere Formen der Wertgenerierung mit Kunden begünstigen um so die Innovationsfähigkeit von

Unternehmen zu erhöhen. Abschließend sollte die Forschung auch neue Formen des Crowd-basierten Entrepreneurships berücksichtigen, die durch neue Technologien (z.B. die Blockchain) ermöglicht werden, und untersuchen, wie diese neuen Formen zur Schaffung neuer unternehmerischer Märkte und Ökosysteme beitragen.

Stichworte: Entrepreneurship, Digital Entrepreneurship, Open Innovation, Crowdsourcing, Crowdfunding, Crowd-Based Entrepreneurship, Initial Coin Offerings (ICO), Tokens, Crowd-Governance

Abstract

Purpose: The aim of this dissertation is to explore the innovation potential of crowdsourcing for entrepreneurship. The main focus is to discover how crowd-based infrastructures can support entrepreneurs in their innovation activities with the investors and how this new paradigm can be used to generate value for individual actors such as customers as well as those of entrepreneurial ecosystems.

Methodology: In order to achieve the aforementioned research goal, this work relies on different methods such as case studies, experiments and design science research. This makes it possible to examine different facets of the topic in more detail. The work, thus, follows a pragmatic understanding of research whose primary goal is to gain knowledge according to the mantra “methods follow research interests”.

Findings: The results of the dissertation show that crowdsourcing offers numerous opportunities to support entrepreneurs in finding, creating and developing novel ideas. For example, crowdsourcing offers the possibility of validating ideas with investors or financing them (e.g., through such means as crowdfunding). Furthermore, the results of this work show that crowdfunding platforms are not only suitable for financing ideas but can also be used to develop new products and services together with customers. This unused potential can be actively promoted through new participation architectures such as active feedback structures, multilateral exchange formats and design elements such as participatory updates. Furthermore, the results of this work show how new crowd-based mechanisms such as ICOs and tokens can be used to create and govern new entrepreneurial ecosystems consisting of multiple actors.

Theoretical contribution: This thesis provides three major theoretical contributions. First, I contribute to a better understanding of how crowdsourcing can support entrepreneurs in the creation and realization of new entrepreneurial opportunities. Second, this dissertation contributes to a better understanding of how crowdsourcing and crowdfunding platforms need to be used and designed to fully exploit the innovative capacity of investors. I therefore investigate the co-creation potential of existing crowd-

based infrastructures and how entrepreneurs can efficiently use this potential to innovate with customers. Finally, this thesis contributes to a better understanding of newly emerging crowdsourcing models and their associated (crowd-based) mechanisms and how these mechanisms can be used to create and govern entirely new entrepreneurial ecosystems. In doing so, this thesis provides the first building block for the development of a holistic theory of crowd-based entrepreneurship.

Practical contribution: The practical contribution of this thesis is threefold. First, factual knowledge on crowdsourcing for entrepreneurship is derived that provides founders a rationale for using crowdsourcing to support their innovation activities. Second, this thesis provides prescriptive knowledge in the form of guidelines that can guide entrepreneurs in making better use of the untapped potential of crowdsourcing platforms. As a third contribution, this thesis provides rigid knowledge for system designers with the aim of informing them about how crowdsourcing platforms and their associated mechanisms need to be designed in order to innovate together with customers and to promote the emergence and coordination of new entrepreneurial ecosystems.

Outlook: This work lays the foundation for new interesting research directions in the field of crowd-based entrepreneurship. Future research should not only focus on investigating well-known crowdsourcing platforms, but should also explore new crowd-based infrastructures, their individual problem contexts (e.g., start-ups) and underlying participation structures as well as their influence on the innovative capacity of companies. A further interesting research focus lies in the study of new crowdsourcing architectures, which favor more flexible and active forms of value generation with customers in order to increase the innovation capability of companies. Finally, research should also consider new forms of crowd-based entrepreneurship made possible by new technologies (e.g., a blockchain) and examine how these new forms contribute to the creation of new entrepreneurial markets and ecosystems.

Key words: Entrepreneurship, Digital Entrepreneurship, Open Innovation, Crowdsourcing, Crowdfunding, Crowd-Based Entrepreneurship, Initial Coin Offerings (ICO), Tokens, Crowd-Governanc

List of Publications

During my time as a research assistant at the University of Kassel under the supervision of Jan Marco Leimeister, I authored and co-authored 31 publications which were published or submitted to outlets rated according to VHB-JOURQUAL 3. It is important to note that the published papers were part of my dissertational process and may thus overlap with this dissertation.

Type of Publication	Number of Publications (Ranking)
Journal	<i>A-Journal: 1</i> <i>B-Journal: 4</i>
Ranked Conference Proceedings	<i>A-Conference: 1</i> <i>B-Conference: 3</i> <i>C-Conference: 4</i> <i>D-Conference: 1</i>
Other Peer Reviewed Publications	<i>Peer Reviewed Conferences: 3</i> <i>Peer Reviewed Open Access: 7</i> <i>Workshops: 5</i>
Book Chapters	<i>Peer Reviewed Books: 2</i>

Under Review

Dellermann, D., Lipusch, N., Ebel, P., & Leimeister, J. M. (forthcoming): The Potential of Collective Intelligence and Crowdsourcing for Opportunity Creation. In: International Journal of Entrepreneurial Venturing (IJEV).

Lipusch, N., Dellermann, D., Bretschneider, U., Ebel, P., & Leimeister J. M. (2nd round under review): Designing for Crowdfunding Co-Creation: How to Leverage the Potential of Backers for Product Development. In: Business & Information Systems Engineering (BISE).

Lipusch, N., Dellermann, D., Ghazawneh, A., Ebel, P., & Leimeister J. M.: A New Kind of Boundary Ressource – How Crypto Tokens Govern Blockchain Platform Ecosystems. Submitted to: Journal of the Association for Information Systems (JAIS).

2019

Lipusch, N., Dellermann, D., Bretschneider, U., Ebel, P., & Leimeister J. M. (2019): Radically Rethinking the Way Crowdfunding Works: The Case of JumpStart Fund and the Hyperloop. In: International Journal of Entrepreneurial Venturing (IJEV).

Dellermann, D., Calma, A., Lipusch, N., Weber, T., Weigel, S., & Ebel, P. (2019): The Future of Human-AI Collaboration: A Taxonomy of Design Knowledge for Hybrid Intelligence Systems. In: Hawaii International Conference on System Sciences (HICSS). Maui, Hawaii, USA.

Lipusch, N., Dellermann, D., & Ebel, P. (2019): Managing Initial Coin Offerings: Towards a Taxonomy of ICO Processes. In: Hawaii International Conference on System Sciences (HICSS). Maui, Hawaii, USA.

Lipusch, N., Dellermann, D., Ebel, P., & Leimeister, J. M. (2019): CrowdServ: Eine Studie zur Erarbeitung eines Konzepts für digitale Services von Inkubatoren. In: Abschlussband Digivation, Springer – Gabler, Wiesbaden, Deutschland

2018

Dellermann, D., & Lipusch, N. (2018): A Complementor's Perspective on Co-Innovation Risk. In: Social Science Research Network (SSRN).

Dellermann, D., Lipusch, N., Ebel, P., & Leimeister, J. M. (2018): Design Principles for a Hybrid Intelligence Decision Support System for Business Model Validation. In: Electronic Markets (EM).

Dellermann, D., Jud, C., Lipusch, N., & Popp, K. M. (2018): Managing the Dark Side of Software Ecosystems. In: Social Science Research Network (SSRN).

Schuster, J., Dellermann, D., Lipusch, N., & Kohler, T. (2018): How to Design a Crowdwork Platform. In: Social Science Research Network (SSRN).

Dellermann, D., Lipusch, N., & Li, M. (2018): Combining Humans and Machine Learning: A Novel Approach for Evaluating Crowdsourcing Contributions in Idea Contests. In: Multikonferenz Wirtschaftsinformatik (MKWI). Lüneburg, Germany.

Dellermann, D., Lipusch, N., & Ebel, P. (2018): The Future of Entrepreneurship: Crowd-Based Incubation. In: Social Science Research Network (SSRN).

Dellermann, D., Lipusch, N., & Ebel, P. (2018): Heading for New Shores: Crowdsourcing for Entrepreneurial Opportunity Creation. In: European Conference of Information Systems (ECIS). Portsmouth, UK.

Dellermann, D., Lipusch, N., & Ebel, P. (2018): Integrating Your Ecosystem with the Hybrid Intelligence Accelerator. In: Social Science Research Network (SSRN).

Lipusch, N., Dellermann, D., Oeste-Reiß, S., & Ebel, P. (2018): Innovating Beyond the Fuzzy Front End: How to Use Reward-Based Crowdfunding to Co-create with Customers. In: Hawaii International Conference on System Sciences (HICSS) Waikoloa, Hawaii, USA.

Lipusch, Nikolaus (2018): Initial Coin Offerings – A Paradigm Shift in Funding Disruptive Innovation. In: Social Science Research Network (SSRN).

2017

Lipusch, N., Bretschneider, U., & Leimeister, J. M. (2017): Crowdfunding zur Gründungsfinanzierung von Startups aus dem universitären Bereich. In Crowd Entrepreneurship. Springer Gabler, Wiesbaden, Deutschland.

Lipusch, N., Dellermann, D., & Ebel, P. (2017): Using Crowdfunding for Startup Evaluation: How Task Representation Influences Prediction Accuracy of the Crowd. In: European Conference on Information Systems (ECIS). Guimarães, Portugal.

Dellermann, D., Lipusch, N., Ebel, P., & Leimeister, J. M. (2017): Digitizing Knowledge Intensive Service Systems: The CrowdServ Project. In: Pre-ICIS Workshop on Service Science: Towards Digital Service Innovation. Seoul, South Korea.

Dellermann, D., Lipusch, N., & Ebel, P. (2017): Developing Design Principles for a Service System for Crowd-Based Business Model Validation. In: Design Science Research in Information Systems and Technology (DESRIST). Karlsruhe, Germany.

Dellermann, D., Lipusch, N., Ebel, P., Popp, K. M., & Leimeister, J. M. (2017): Finding the Unicorn: Predicting Early Stage Startup Success through a Hybrid Intelligence Method. In: International Conference on Information Systems (ICIS). Seoul, South Korea.

Lipusch, N., Dellermann, D., Kleinschmidt, S., Ebel, P., & Leimeister, J. M. (2017): Towards Developing a Service Innovation Canvas. In: Pre-ICIS Workshop on Service Science: Towards Digital Service Innovation. Seoul, South Korea.

Dellermann, D., Lipusch, N., Ebel, P., & Leimeister, J. M. (2017): Building Your IoT Ecosystem: Proposing the Hybrid Intelligence Accelerator. In: Buxmann, P., Curan, A. T., Eichler, G., Jansen, S., Kude, T. & Popp, K. M. (Eds.), In: European Workshop on Software Ecosystems. Darmstadt, Germany: Books on Demand.

Dellermann, D., Lipusch, N., Ebel, P., & Leimeister, J. M. (2017): New Ways to Consider: Towards a Design Theory for Hybrid Intelligence Accelerators. In: The Baugh-Ratio Colloquium for Young Social Scientists. Stockholm, Sweden.

Dellermann, D., Lipusch, N., Ebel, P., & Leimeister, J. M. (2017): Design Principles for Hybrid Intelligence Decision Support Systems in Entrepreneurship. In: Electronic Markets Paper Development Workshop. Karlsruhe, Germany.

Dellermann, D., Lipusch, N., & Ebel, P. (2017): Entrepreneurship at the Interface: How Crowdsourcing Can Support Opportunity Creation. In: Academy of Management Annual Meeting (AOM). Atlanta, Georgia, USA.

Lipusch, N., Ebel, P., Dellermann, D., & Bretschneider, U. (2017): Customer Feedback for Startups – A Process Model and Research Agenda. In: ISPIM Innovation Conference. Vienna, Austria.

Dellermann, D., Lipusch, N., & Ebel, P. (2017): Crowd-based Incubation: A New Pathway to Support Entrepreneurship. In: ISPIM Innovation Conference. Vienna, Austria.

2016

Lipusch, N., Bretschneider, U., & Leimeister, J. M. (2016): Backer Empowerment in Crowdfunding: How Participation beyond Funding Influences Support Behavior. In: ICIS Workshop on the Digitization of the Individual. Dublin, Ireland.

Lipusch, N., & Bretschneider, U. (2016): Get the Balance Right: Can Normative Appeals Encourage Funders to Support Selected Crowdfunding Campaigns? In: European Conference on Information Systems (ECIS). Istanbul, Turkey.

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List of Abbreviations

AML	-	Anti Money Laundering
AMT	-	Amazon Mechanical Turk
AON		All or Nothing
API	-	Application Programming Interface
CIS	-	Crowdfunding Information System
DApp		Decentralized Application
Dev Grants		Development Grants
DR	-	Design Requirement
DP	-	Design Principle
DSR	-	Design Science Research
EIP	-	Ethereum Improvement Proposal
ERC	-	Ethereum Request for Comment
eWOM	-	Electronic Word of Mouth
FAQ	-	Frequently Asked Questions
HTT		Hyperloop Transportation Technology
ICO	-	Initial Coin Offering
ICT	-	Information and Communication Technologies
IoT	-	Internet of Things
IP	-	Intellectual Property

IPO	-	Initial Public Offering
IS		Information Systems
IT	-	Information Technology
KIA		Keep it All
KYC	-	Know Your Customer
OS	-	Operating System
P2P	-	Peer to Peer
POT	-	Psychological Ownership Theory
SaaS	-	Software as a Service
SDK	-	Software Development Kit
TCP/IP	-	Transmission Control Protocol/Internet Protocol
VIC		Virtual Idea Community

Chapter 1

Introductory Chapter

1 Introduction

My main interests when I started my thesis in 2015 constituted crowdsourcing infrastructures and entrepreneurship. Back then, crowdsourcing was conceived as a new way to solve problems through leveraging a heterogenous crowd of users (Brabham 2008). Problems addressed through crowdsourcing ranged from generating novel ideas (Poetz and Schreier 2012; Bayus 2013), designing new products and services (Brabham 2008, 2010; Leimeister et al. 2009; Schenk and Guittard 2011), fostering internal learning (Schlagwein and Bjørn-Andersen 2014; Vukovic 2009), to finding solutions to complex social and scientific problems (Lakhani and Panetta 2007; Boudreau and Lakhani 2013; Goodchild and Glennon 2010; Choy and Schlagwein 2016). While crowdsourcing was mainly used by large corporations to find external solutions to their internal problems, with the advent of crowdfunding, crowdsourcing also slowly entered the entrepreneurial arena. Little did I know back then how these digital infrastructures would alter entrepreneurial innovation.

When I embarked on my dissertational journey another topic that caught my interest was entrepreneurship. In recent years, entrepreneurship in Europe has finally gained some traction. This was demonstrated not only by an increasing number of start-ups but also by a rising number of subsidies and training opportunities made available to entrepreneurs (Kollmann et al. 2016). Despite the general positive narrative surrounding entrepreneurship, one thing I noticed when looking into this topic more closely was that start-ups still encountered a variety of problems. One of the biggest problems start-ups are facing today are shorter innovation cycles which puts them under pressure to come up with new innovative products or services more quickly. According to the European Startup Monitor, this leads to one third of European start-ups lagging behind their innovation schedule (Kollmann et al. 2016). Parallel to this, a variety of new digital platforms and services emerged that offer a potential solution to the increased innovation pressures that start-ups are facing (Ziegler et al. 2018). Popular examples are crowd working and crowdfunding platforms that allow start-ups to flexibly call upon the resources they need (e.g., capital, work, etc.). Despite these interesting developments, it was not until 2017 when Nambisan would introduce his seminal paper on digital entrepreneurship. In this paper he proposes that digital artifacts, platforms and infrastructures will fundamentally affect entrepreneurial processes and outcomes. By doing so, this paper introduces a new research perspective, one in which technology is not simply a supplementary part of a start-up business but in which technology and

digital infrastructures are at the basis of enabling new entrepreneurial opportunities that pave the way for unprecedented entrepreneurial innovation.

When I started to delve into the topics of crowdsourcing and digital entrepreneurship, my colleague Dominik and I noticed that there was relatively little research focusing on the intersection of these two interesting phenomena. Hence, we reckoned that this blind spot would constitute an interesting and worthwhile research area to explore. While my colleague endeavored into exploring the role of machine learning to leverage the potential of crowdsourcing for entrepreneurial decision making, I wanted to investigate the potential of these platforms in terms of how they support entrepreneurial processes thereby leading to new and unprecedented entrepreneurial innovation outcomes. My interest in this phenomenon helped me to derive interesting theoretical and practical implications as to how crowdsourcing systems should be designed and used to create and unlock new value for entrepreneurs, customers and the entrepreneurial ecosystem as a whole.

1.1 Motivation and Background

With the Internet revolution, a new class of start-ups emerged. This new breed of start-ups differs from traditional businesses in that it operates fully digitally. At the heart of this phenomenon are digital technologies that allow the creation of entirely new business models (Chesbrough 2010; Yoo et al. 2010). Popular examples include Airbnb and Uber that disrupted the hotel and transportation industries.

Along similar lines, new web-based infrastructures developed with the aim of bringing the agility and innovation that is characteristic of these start-ups into large corporations (Chesbrough 2006; Piller and Walcher 2006). One popular example of such infrastructures is crowdsourcing platforms which allow tasks that were once performed by a company to be outsourced to a heterogenous crowd of people willing to solve this task (Howe 2006). Companies can use such platforms to phase out some of their value creating activities to people who might be better suited and more capable of doing them. Additionally, they can use this platform to source new innovative solutions.

I began this thesis in 2015 when some of the merits of crowdsourcing were already known. Back then, crowdsourcing was mainly used by large companies in order to open up the boundaries of their business, thereby facilitating innovation within the company (Hippel 1994, 2005). An example is IBM that built a platform on which it conducted so

called “Innovation Jams” to identify new promising business ideas. IBM’s efforts resulted in a total of 46,000 ideas (Leimeister et al. 2009). The 31 most promising ideas of this open innovation initiative were developed further, some of which resulted in the creation and formation of new business units at IBM (Bjelland and Wood 2008). Another example constitutes LEGO’s Ideas platform which was specifically geared to finding new innovative concepts. One result of this platform was a new innovative product line that integrated movable parts that could be programmed by users (Chesbrough 2011).

With the advent of crowdfunding, a crowdsourcing subtype (Schwienbacher and Larralde 2010), also start-ups began to grasp the potential inherent to these new infrastructures. At the heart of this new phenomenon were new information and communication technologies that suddenly made it economically feasible for start-ups to collect small sums from amateur investors that added up to investment sums large enough to finance their entire businesses. In the case of crowdfunding, this was enabled through crowdfunding platforms which allowed start-ups to connect with potential investors over large geographic distances (Mollick 2014).

My interest in this topic was initially sparked by crowdsourcing’s capability of finding innovative solutions to pressing problems (Brabham 2008). I soon realized that crowdsourcing platforms (including crowdfunding) also facilitate new innovation potential among entrepreneurs. In doing so, they provide entrepreneurs with new means of tackling problems such as a lack of legitimacy (Clercq and Voronov 2009; Frydrych et al. 2014), a lack of resources and a lack of experience (Stuart and Abetti 1990) and expertise (Sarasvathy 2001; Read and Sarasvathy 2005) but they also set free generative capabilities. At the heart of this are web-based infrastructures that allow start-ups to mobilize a crowd of avid supporters and co-entrepreneurs who are willing to complement a start-up’s capabilities and resources, and who are willing to build upon existing entrepreneurial solutions thereby enabling new entrepreneurial opportunities and opening up new avenues for innovation.

The topic of my dissertation began to form when I discovered that the topics of crowdsourcing and entrepreneurship had not been considered in combination yet. One exemption is crowdfunding which was mainly given consideration as a new source of funding, but which has rarely been investigated with regard to its other potentials (i.e., its co-creation capabilities). Apart from that, existing literature did not provide any

insight into how these two interdependent concepts relate to each other and how this digital technology might transform entrepreneurial opportunities. Based on this notion, I became particularly intrigued with investigating how crowdsourcing platforms and their associated mechanisms might affect entrepreneurial innovation.

Having discussed the background and motivation of this thesis, I now turn to discussing the structure of my thesis.

1.2 Objective and Structure of the Thesis

The main objective of my thesis is to investigate how digital infrastructures, in particular crowd-based infrastructures, can be used to unlock new innovation potential among entrepreneurs. To this end, my thesis pursues three overarching research goals, which aim at investigating 1) how crowdsourcing platforms can support entrepreneurs in creating new opportunities, 2) how crowdsourcing platforms, in particular crowdfunding platforms, can be used by entrepreneurs to create new products with the crowd, and 3) how new crowd-based mechanisms such as initial coin offerings (ICOs) and tokens can be used to create and govern novel entrepreneurial ecosystems. Each of the proposed research goals is addressed within a single chapter which taken together constitute the core findings of this thesis.

To address the overarching research goals, my thesis is structured in seven chapters (see Figure 1). Chapter 1 provides the introduction to this thesis and is comprised of four sections. In section one (Chapter 1.1), I discuss my main motivation to explore the topics covered in this thesis. In section two (Chapter 1.2), I present my main research goals and give a structural overview of my thesis. In section three (Chapter 1.3), I detail how the papers I created throughout my dissertation process link to the research goals and chapters discussed in the earlier section. In section four (Chapter 1.4), I discuss the bigger picture of my thesis by explaining how the individual research goals relate to each other.

Chapter 2 is comprised of three sections and gives an overview of the theoretical background upon which this thesis builds. In section one (Chapter 2.1), I provide an overview of the theoretical foundations of digital infrastructures by discussing their general role as well as their role for innovation. In doing so, I also discuss current research on crowdsourcing and crowdfunding (which includes an important sub-type of crowdsourcing) which constitute special cases of digital infrastructures that are

particularly conducive to innovation. In section 2 (Chapter 2.2), I elaborate on the research context of this thesis by discussing the topic of digital entrepreneurship, in particular the role of digital infrastructures in entrepreneurial endeavors. I conclude this chapter (Chapter 2.3) by discussing the role of crowd-based infrastructures in the context of entrepreneurship based on which I derive the research gaps for this thesis.

Chapter 3 is comprised of three sections and provides a fundamental overview of the research approaches used within this thesis. In section one (Chapter 3.1), I cover qualitative research methods with a particular emphasis on case studies that I used to empirically explore some of the research goals of this thesis. In section two (Chapter 3.2), I cover the topic of quantitative research approaches. In doing so, I focus on experimental research that I used to empirically validate the effects of new design elements within crowd-based infrastructures. In section three (Chapter 3.3), I explain the Design Science Research (DSR) approach which I used to explore new design elements of crowd-based infrastructures.

Chapter 4 starts with the presentation of the actual research findings. It relates to research goal one (RG-1) and thus contains the findings of one study that deals with the topic of “how crowdsourcing platforms can support entrepreneurs in creating new opportunities”. Section one (Chapter 4.1) thereby focuses on the entrepreneurial Opportunity Creation Theory and elaborates how different types of crowdsourcing can support the objectification and enactment of entrepreneurial opportunities. Moreover, I provide a future research agenda in which I identify interesting research topics at the intersection of crowdsourcing and entrepreneurship.

Chapter 5 relates to research goal two (RG-2) and thus provides insights on “how crowd-based infrastructures, in particular crowdfunding platforms, can be used by entrepreneurs to create new products with the crowd”. To answer this research question, the chapter is divided into three sections. In section one (Chapter 5.1), I define the concept of co-creation in the context of crowdfunding and provide a framework that explains how crowdfunding platforms can be used to systematically integrate the crowd in a start-up’s product development activities. In section two (Chapter 5.2), I cover the empirical case of JumpStartFund, a crowdfunding platform that employs a unique platform participation architecture with the aim of facilitating co-creational product development between entrepreneurs and investors. From this case, I derive a model that explains how platforms must be designed and used to engage users in innovation

activities during large-scale crowdfunding projects. In section three (Chapter 5.3), I explore new design elements of crowdfunding platforms and how these elements influence the co-creational product development with the funders. By doing so, I derive guidelines on how to design novel crowdfunding participation architectures that foster users' likeliness to engage in co-creational activities such as product feedback and funding.

Chapter 6 relates to research goal three (RG-3) and is thus mainly geared towards answering the question of "how new crowd-based mechanisms such as ICOs and tokens can be used to create and govern novel entrepreneurial ecosystems". To answer this question, the chapter is divided into two sections. In section one (Chapter 6.1), I explore ICOs and how they can be used to create new types of services and businesses. In my research, I identify three archetypes of ICOs that either yield in the creation of financial services, consumer-centric services, or the creation of new platforms. In section two (Chapter 6.2), I explore the case of Ethereum, an entrepreneurial blockchain-based platform ecosystem. Based on this case, I derive a token framework and a future research agenda that explain how tokens can be used to govern the co-creational activities of multiple actors in decentralized platform ecosystems.

Chapter 7 is the concluding chapter and is comprised of three sections. In section one (Chapter 7.1), I summarize the findings of my thesis and discuss how these findings relate to each other. In section two (Chapter 7.2), I discuss the theoretical and practical implications of the research presented in this thesis. The chapter ends with concluding remarks as well as a discussion of future research directions (Chapter 7.3). For an overview of all chapters see Figure 1.

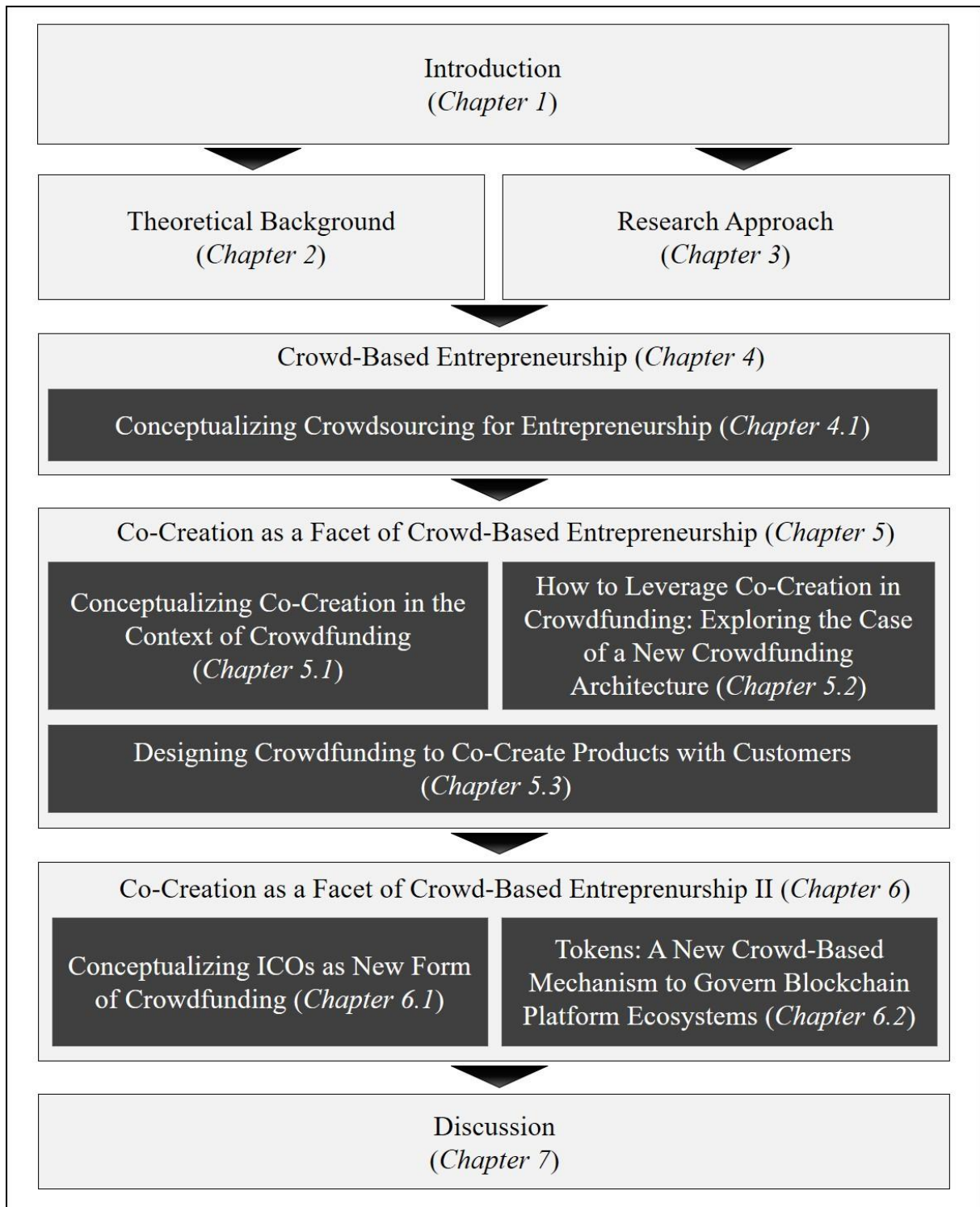


Figure 1. Thesis Overview
(Source: Own depiction)

1.3 Overview of Publications in Relation to Research Goals

The underlying thesis is based on 7 publications, each of which contributes to answering one of the outlined research goals. Table 1 illustrates a list of all the publications contained in this thesis including information on the corresponding chapter of the publication, the name of the publication, the research goal of the publication, my individual contributions to the publication as well as corresponding outlet metrics. Concerning the outlet metrics, I decided to use VHB JOURQUAL 3 (JQ3) and the WI-Journal list 2008 of the Wissenschaftliche Kommission für Wirtschaftsinformatik (WKWI) since these constitute two commonly accepted standards among business and business informatics scholars.

Chapter	Publication	Research Goal	Individual Contributions	Outlet Metric
4	Dellermann, D., Lipusch, N., & Ebel, P. (2017): Entrepreneurship at the Interface: How Crowdsourcing Can Support Opportunity Creation. In: Academy of Management Annual Meeting (AOM). Atlanta, Georgia, USA.	RG-1	Introduction, Previous Work, Analysis, Research Agenda, Conclusion	JQ3: - WKWI: -
5.1	Lipusch, N., Dellermann, D., Oestereiß, S., & Ebel, P. (2018): Innovating Beyond the Fuzzy Front End: How to Use Reward-Based Crowdfunding to Co-create with Customers. In: Hawaii International Conference on System Sciences (HICSS). Waikoloa, Hawaii, USA.	RG-2	Introduction, Theoretical Background, Conceptual Basis, Research Approach, Analysis of the Results, Future Research, Conclusion	JQ3: C WKWI: B
5.2	Lipusch, N., Dellermann, D., Bretschneider, U., Ebel, P., & Leimeister, J. M. (2019): Radically Rethinking the Way Crowdfunding Works: The Case of JumpStartFund and the Hyperloop. In: International Journal of Entrepreneurial Venturing (IJEV).	RG-2	Introduction, Related Work, Methodology, Analysis of the Findings, Conclusion & Implications, Limitations & Future Research	JQ3: B WKWI: -
5.3	Lipusch, N., Dellermann, D., Bretschneider, U., Ebel, P., & Leimeister, J. M. (2nd round under review): Designing for Crowdfunding Co-creation: How to Leverage the Potential of Backers for Product Development. In: Business & Information Systems Engineering (BISE).	RG-2	Introduction, Theoretical Background, Research Approach, Design, Evaluation, Conclusions, Limitations & Future Research	JQ3: B WKWI: A

6.1	Lipusch, N., Dellermann, D., & Ebel, P. (2019): Managing Initial Coin Offerings: Towards a Taxonomy of ICO Processes. In: Hawaii International Conference on System Sciences (HICSS). Maui, Hawaii, USA.	RG-3	Introduction, Related Work & Conceptual Background, Methodology Findings, Conclusion, Limitations & Future Research	JQ3: C WKWI: B
6.2	Lipusch, N., Dellermann, D., Ghazawneh, A., Ebel, P., & Leimeister. J. M.: A New Kind of Boundary Resource – How Crypto Tokens Govern Blockchain Platform Ecosystems. Submitted to: Journal of the Association for Information Systems (JAIS).	RG-3	Introduction, Related Literature & Conceptual Basis, Methodology, Case Analysis & Results, Discussion, Conclusion & Contribution	JQ3: A WKWI: A

Table 1. Overview of the Publications of this Thesis

1.4 The Big Picture

As mentioned in the introduction of this thesis, the main goal of this dissertation is to explore how digital infrastructures, in particular crowd-based infrastructures, can unlock new innovation potential among start-ups by facilitating new forms of value co-creation between entrepreneurs and customers as well as various actors (e.g., third-party developers and users) of entrepreneurial platform ecosystems. Each paper in this thesis arose from a specific research interest that evolved emergently during my dissertational journey. Because of this, each of the following papers explores different facets and aspects of the research goals that we introduced above.

Looking at these individual papers more holistically, they provide a better understanding of how crowd-based infrastructures shape entrepreneurial innovation at different levels

of abstraction. To provide the readers with a sense of how the different topics introduced above relate to each other, I employ the metaphor of a bathtub (see Figure 2).

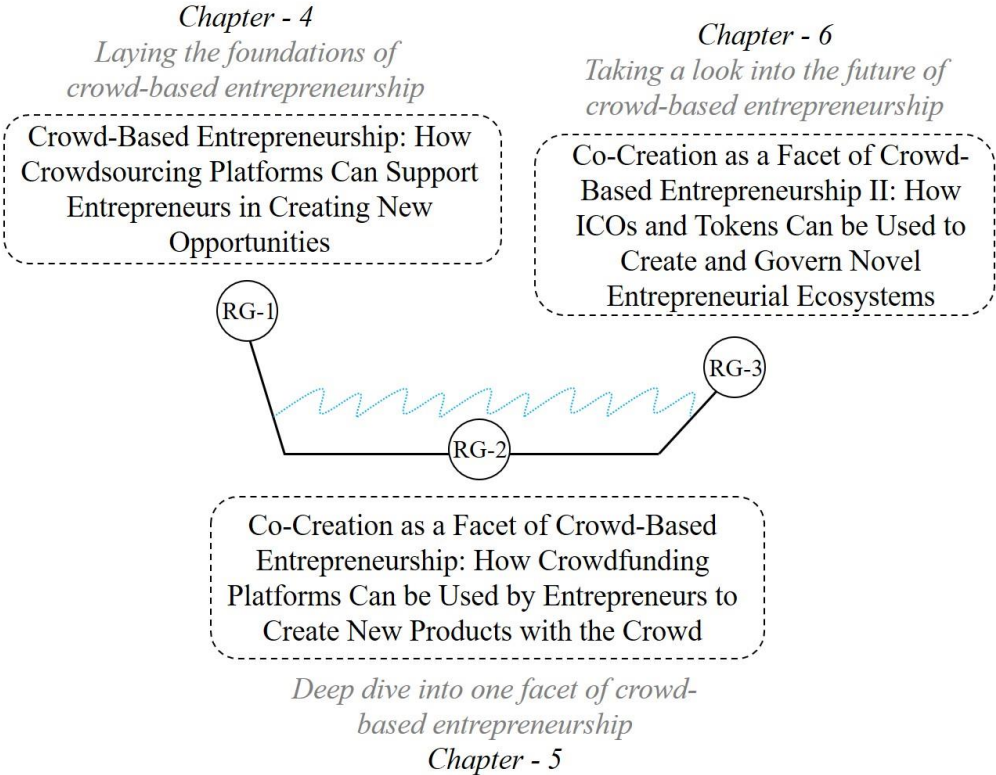


Figure 2. Overview of the Big Picture
(Source: Own depiction)

The starting point of this metaphor constitutes Chapter 4 in which I briefly and concisely cover the foundations of crowdsourcing for entrepreneurship which lay the basis for the subsequent chapters. I do so by linking the concept of crowdsourcing to the entrepreneurial opportunity creation theory. Hence, I have labelled this chapter “Crowd-Based Entrepreneurship: How Crowdsourcing Platforms Can Support Entrepreneurs in Creating New Opportunities”.

After laying the foundations for crowdsourcing in the context of entrepreneurship, the thesis takes a deep dive to explore one facet of crowd-based entrepreneurship in more detail (this corresponds to the floor of the bathtub). Hence, in Chapter 5 I focus on the co-creational potential of crowdfunding infrastructures and how this potential can be unlocked to innovate with the crowd. I have labelled the associated and overarching chapter as “Co-Creation as a Facet of Crowd-Based Entrepreneurship: How

Crowdfunding Platforms Can Be Used by Entrepreneurs to Create New Products with the Crowd”.

Chapter 5 is followed again by a transition that allows me to take on a more abstractive and distant perspective on the co-creational potential of crowd-based infrastructures. Therefore, in Chapter 6 I focus on the exploration of new crowd-based mechanisms (ICOs and tokens) and the role they play in governing co-creational activities of multiple platform actors thereby facilitating the development of novel entrepreneurial platform ecosystems. I have labelled the overarching chapter as “Co-Creation as a Facet of Crowd-Based Entrepreneurship II: How ICOs and Tokens Can Be Used to Create and Govern Novel Entrepreneurial Ecosystems”.

Chapter 2

Review of the Theoretical Background

2 Theoretical Background

The sections (in Chapter 4 to Chapter 7) introduced in this thesis draw on the broader concept of digital infrastructures. In the following sections, I elaborate on digital infrastructures and their role in supporting innovation as well as the role they play in the context of entrepreneurship. I conclude this chapter by outlining potentially interesting research gaps at the intersection of crowd-based infrastructures and entrepreneurship.

2.1 Digital Infrastructures: From Basic Support Structures to Innovation Engines

Digital infrastructures are inextricably linked to development of modern-day organizations. While digital infrastructures were originally developed as stand-alone systems to support certain processes within a company, today they have become an integral part of any company's operations. Hence, digital infrastructures can be defined as basic information technologies and organizational structures, along with the related services and facilities necessary for an enterprise or industry to function (Tilson et al. 2010). The importance of digital infrastructures as a backbone for a company's operations is also underpinned by research. Early research on digital infrastructures mostly focuses on exploring the architectural and technical characteristics of such infrastructures and how they change the structure, organization, and inner workings of companies (Hanseth and Monteiro 1997; Hanseth et al. 2012). For example, research by Ciborra (1996) shows how digital infrastructures change a company's identity by destroying some of its core competences while at the same time pushing the company along new technology trajectories. The findings of this research further suggest that to fully understand the flexible potential inherent to new technological trajectories, a new more dynamic research perspective is needed that looks at organizations as platforms that provide structures flexibly in accordance with an organization's needs. A similar finding is reported by Orlikowski (1996) who shows how the introduction of a new information technology leads to changes in the situational practices of organizational actors. The research suggests that digital infrastructures change the nature and texture of work, patterns of interaction, distribution of work, evaluation of performance, forms of accountability, nature of knowledge and mechanisms of coordination within the adopting organization. Further research by Hanseth and Lundberg (2001) suggests that one important antecedent to successfully implement a digital infrastructure within a company is to create an adequate understanding of the context in which digital

infrastructures are established. To reach such an understanding, the authors suggest the active involvement of users when designing and implementing such infrastructures (Hanseth and Lundberg 2001). Although early research acknowledges the importance of taking into account the outer context when establishing and using digital infrastructures, it primarily views infrastructures as an organizational bounded IT artifact that is controlled by a single entity, namely the firm (Sidorova et al. 2008; Zvilichovsky et al. 2015; Eaton et al. 2015; Tilson et al. 2010). The main problem with such a view is that it fails to capture the full potential of such infrastructures that are more dynamic, boundless, and flexible as initial research would suggest (Katz and Shapiro 1994).

As infrastructures started to grow and expand beyond organizational and industry boundaries, the notion of digital infrastructures moved away from stand-alone digital systems that support an organization's operations and processes to vastly interconnected and inter-reliant systems that support interactions across company boundaries (Braa et al. 2007). This is also reflected by more current research which mostly focuses on the openness of these infrastructures and how this openness is related to a company's innovation capabilities (Yoo et al. 2012; Barrett et al. 2015; Tiwana et al. 2010). For example, research by Chesbrough (2006) suggests that digital infrastructures ease knowledge flows inside and outside of the company thereby acting as a catalyst of innovation. Hence, these knowledge flows can be used by companies either to find innovative solutions to internal problems or to facilitate innovative solutions outside the company by commercializing unleveraged knowledge to outside innovators. A similar finding is reported by Boudreau (2010) showing that digital infrastructures play a crucial role in facilitating collaborative processes with customers which often result in user-initiated and user-driven innovations. Popular examples of such infrastructures are knowledge sharing and work execution platforms, crowdsourcing, crowdfunding, virtual worlds, digital makerspaces, and social media which facilitate a company's capability to co-create new products and services with outside innovators (Boudreau 2010; Bresnahan and Greenstein 2014; Gawer and Cusumano 2014; Parker et al. 2016; Tiwana et al. 2010). Further research suggests that digital infrastructures do not only change how companies innovate but they also change the nature of innovation itself from a clearly bounded and defined outcome to a more distributed and generative one (Henfridsson et al. 2014; Nylén and Holmström 2015; Yoo et al. 2012). Research by Ghazawneh and Henfridsson (2013), for example, shows how shared and malleable platform resources (so-called platform boundary resources) can be used to support

activities of different innovation actors across a platform. The result of these resources are new innovative platform ecosystems that foster unprecedented innovation among platform actors by empowering them to create their own products and services as well as allowing them to share these products and services with others (Hanseth and Lyytinen 2010; Lyytinen et al. 2016).

2.1.1 Crowdsourcing

One special instantiation of digital infrastructures that is particularly conducive to co-create value and innovate with external users is crowdsourcing platforms. Crowdsourcing constitutes a still very young phenomenon that is defined as:

“...a type of participative online activity in which an individual, organization, or company with enough means proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task. The undertaking of the task, of variable complexity and modularity, and in which the crowd should participate bringing their work, money, knowledge and/or experience, always entails mutual benefit. The user will receive the satisfaction of a given type of need, be it economic, social recognition, self-esteem, or the development of individual skills, while the crowdsourcer will obtain and utilize to their advantage that what the user has brought to the venture, whose form will depend on the type of activity undertaken” (Estellés-Arolas and González-Ladrón-De-Guevara 2012).

The main principle behind crowdsourcing is that “diversity trumps ability”. The main notion behind this principle is that in certain contexts a diverse crowd of people is more capable of solving a problem than individual experts are alone (Surowiecki 2004). Hence, crowdsourcing describes a problem-solving approach that seeks to mobilize the competence, expertise and resources from a broad range of people to solve a problem faced by an individual, or an organization of any other entity (Brabham 2008; Prpic and Shukla 2013). To do so effectively, crowdsourcing makes use of so-called crowdsourcing platforms.

At the heart of these platforms are new communication and information technologies that make it economically viable to engage with a geographically dispersed group of people (Beaulieu et al. 2015; Haas et al. 2014). By doing so, crowdsourcing follows the broader trends of user innovation and open innovation in which individuals are no longer perceived as passive browsers but as active contributors and co-creators of value (Hippel

1986, 2005; Chesbrough 2006). In recent years, crowdsourcing developed as a new problem-solving mechanism in various domains. Popular examples include Eli Lilly who used crowdsourcing to develop new groundbreaking pharmaceuticals. After successfully employing crowdsourcing internally, Eli Lilly decided to make their approach available to the broader public through a spin-off called InnoCentive (Lakhani and Panetta 2007). InnoCentive is nowadays a general purpose crowdsourcing platform that is used to solve a variety of problems in different industries ranging from chemistry, food & agriculture, information technology, engineering & design, math & statistics to physics. Other examples include IBM's Innovation Jam and LEGO's Ideas who created their own crowdsourcing platforms with the aim of developing new business ideas by leveraging their customers' knowledge (Bjelland and Wood 2008; Schlagwein and Bjørn-Andersen 2014). Further examples suggest that crowdsourcing's potential goes beyond commercial purposes and interests. Ushahidi, for example, developed a crowdsourcing platform that is used by the crowds to report human crisis and violations against human rights (Okolloh 2009). In doing so, the platform helps to solve important humanitarian problems.

Besides its practical adoption in recent years, crowdsourcing has also received increased attention from researchers. Early research shows that crowdsourcing is an effective search strategy to find solutions to problems that are outside a company's domain knowledge (Lakhani et al. 2013; Jeppesen and Lakhani 2010; Boudreau and Lakhani 2013). Popular examples include research by Jeppesen and Lakhani (2010) who show that the most innovative solutions are provided by solvers who possess knowledge that is located at outside boundaries of a focal problem field. A similar finding is reported by Boudreau and Lakhani (2009) showing that problem-solving success is associated with the ability to attract specialized solvers with a range of diverse scientific interests. Likewise, Boudreau et al. (2011) find that adding competitors increases the likelihood that at least one competitor will find an extreme-value solution. The intuitive rationale behind these findings is that external sources of innovation are characterized through more diverse expertise which not only results in the provision of more ideas (through expanding the search scope) but also in the provision of more diverse ideas (Dahan and Mendelson 2001; Terwiesch and Ulrich 2009; Bingham and Spradlin 2011). Hence, increasing the number of ideas leads to more diverse ideas, which ultimately increases the odds of finding ideas that are considered as novel and truly innovative by sponsors. More recent research suggests that crowdsourcing is not only an effective search strategy to obtain innovative ideas, but that this approach can be used by companies to

develop new products and services in a co-creational effort with users (Majchrzak and Malhotra 2013). For example, research by Piller et al. (2011) shows that crowdsourcing, besides allowing companies to gather valuable customer feedback on existing offerings, can be further used by companies to actively integrate customers in the company's innovation processes. To enable this, however, active integration crowdsourcing systems must be designed in a way that they allow users to partake in the iterative development and design of new products or services (Piller et al. 2010). This finding is also supported by West and O'mahony (2008) who suggest that to effectively use crowdsourcing for innovation, existing crowdsourcing systems need to employ collaborative processes that facilitate interactive content development and that allow the evolution of knowledge over time. Finally, research by Füller et al. (2011) explores a user's co-creation experience on the content contributed by participants. Their findings suggest that people's co-creation experience (i.e., users' task enjoyment, task competence, and their sense of community belonging) significantly influences the quantity and quality of innovation outcomes.

2.1.2 Crowdfunding

Crowdfunding is defined as *“a collective effort by people who network and pool their money together, usually via the Internet, in order to invest in and support efforts initiated by other people or organizations”* (Ordanini et al. 2011).

Crowdfunding is part of crowdsourcing and as such part of the broader open innovation phenomenon (Chesbrough 2006). Like crowdsourcing, it is defined by an open call through the web. However, the main focus of crowdfunding does not lie on the crowd's capabilities but on its resources in the form of capital (Schwienbacher and Larralde 2010). Thus, the main idea of crowdfunding is to get people to donate or invest small amounts of money that are then aggregated to a larger investment sum. The investments collected through this mechanism are usually used to finance new ventures. Because of this, crowdfunding is often compared to other start-up financing methods such as venture capital or bootstrapping. The average investment totals reached by this funding method usually lie between US\$5,000 - US\$200,000 which is why crowdfunding is often considered to fill funding gaps that lie between bootstrapping and venture capital (Beaulieu et al. 2015).

Like crowdsourcing, the main enabler of crowdfunding is digital infrastructures, i.e., platforms. These platforms employ new information and communication technologies

(ICTs) that take an important role in mediating the relationship between capital seekers and capital givers. In doing so, these platforms take over important functions of traditional financial intermediaries such as risk transformation, lot size transformation, and information transformation (Rysman 2009; Haas et al. 2014). Beyond that, these platforms also facilitate the creation of new markets as they allow entrepreneurs to more efficiently match the supply and demand among geographically and culturally dispersed users (Malone et al. 1987; Bakos 1991, 1998; Mahadevan 2000).

Current research on crowdfunding mainly revolves around three topics. The first topic overlaps with foundational research on crowdfunding that is mainly concerned with defining the concept of crowdfunding as well as distinguishing different types of crowdfunding. Popular examples denote research by Bradford (2012) who distinguishes four types of crowdfunding, namely donation-based, reward-based, lending-based and equity-based crowdfunding (a detailed description of these crowdfunding types is provided in Chapter 5.2). A more general distinction is provided by Haas et al. (2014) who distinguishes for-profit, not-for profit and hedonic crowdfunding models. The second and probably biggest research topic is mainly concerned with success factors of crowdfunding. For example, a study by Mollick (2014) shows that an entrepreneur's probability of successfully raising money via crowdfunding is dependent upon factors such as project quality and the size of the entrepreneur's social network. Further research suggests that crowdfunding success is positively related to the use of interactive media such as videos (Mollick 2014), the regular use of updates and comments (Xu et al. 2016; Kuppuswamy and Bayus 2018; Clauss et al. 2018), and the use of social media (Giudici et al. 2013; Mollick and Kuppuswamy 2014; Thies et al. 2014; Lukkarinen et al. 2016; Courtney et al. 2017). Another major research topic concerns the motivation of crowdfunding actors. Popular examples include research by Gerber and Hui (2013) and Bretschneider and Leimeister (2017) showing that users are not only driven by egotistical and financial motives but also by social motives. Thus, the research findings indicate that people engage in crowdfunding for a variety of reasons. Popular reasons are because they want to help others or because they like the project and the team behind it. The same holds true for entrepreneurs who partake in crowdfunding not solely to obtain funds but also because they want to create awareness of their project, form new connections with people, gain approval from customers and learn new entrepreneurial skills (Gerber and Hui 2013).

Beyond the three research topics I identified above, there is also a small number of studies hinting at crowdfunding's potential beyond funding. This new research topic suggests that crowdfunding has certain properties that make it conducive to innovate with customers. Research by Belleflamme and Lambert (2014), for example, suggests that crowdfunding is not only a funding mechanism but can also be used to obtain feedback from users and to validate a company's ideas with potential customers. Similarly, research by Brem et al. (2017) shows that crowdfunding democratizes innovation by allowing companies to integrate customers in the large-scale commercialization of their products and services. Further research by Stanko and Henard (2016) suggests that users want to be actively integrated into a company's innovation activities during crowdfunding. Moreover, their research shows that crowdfunding campaigns that integrate their customers in innovation activities during crowdfunding are more likely to be commercially successful (Stanko and Henard 2017). The findings above provide initial evidence that crowdfunding might be a promising tool for new ventures to facilitate innovation by drawing on the capabilities of an external crowd.

2.2 Digital Infrastructures in the Context of Entrepreneurship

Digital infrastructures have not found inroads to entrepreneurial research until very recently (Nambisan 2017). Prior research on entrepreneurship has covered a broad range of topics from individual traits of entrepreneurs (Hmieleski and Baron 2009; Fauchart and Gruber 2011), to external and institutional constraints (van de Ven 1993; Manolova and Yan 2002; Vaillant and Lafuente 2007) to intuitional factors and firm-level orientations that are constitutive of the formation of new ventures (Baker and Nelson 2005; Chandler and Hanks 1994; Lumpkin and Dess 1996; Schjoedt et al. 2013). One thing all these studies share is that they treat the entrepreneur and entrepreneurial actions as a focal point of analysis (Davidsson et al. 2001; Gregoire et al. 2006). In recent years, this focus started to change and the role of digital technologies became more prevalent in entrepreneurship research. For example, Matlay and Westhead (2005) show that advancements in ICTs facilitate the emergence of new types of organizations that are led by digital entrepreneurs and their virtual teams. A similar finding is reported by Serarols (2008) who shows that digital technologies bring forward new kinds of entrepreneurs. In contrast to conventional entrepreneurs, these so called dot.com entrepreneurs do not only conceive digital technologies as an extension of their business (e.g., a new distribution channel) but as the core of all their business operations (Serarols

and Urbano 2008). This notion is also supported by Jiwa et al. (2005) who consider e-entrepreneurs as new types of entrepreneurs who practice their entrepreneurial skills within the digital realm. While these early studies treat digital technologies as a mere context of entrepreneurship, more recent studies suggest that these technologies have certain transformative properties that change how entrepreneurship is conducted. For example, Azkarate and Croasdell (2013) show how a social media platform (Twitter) facilitates social interactions among Italian businessmen thereby fostering the generation and development of new business ideas. Similarly, Fischer and Reuber (2011) show how social interactions via Twitter change how entrepreneurs realize new business opportunities.

Following this prior research at the intersection of entrepreneurship and digital technologies, Nambisan (2017) recently came up with their seminal paper on digital entrepreneurship in which they investigate how digital infrastructures change the nature of entrepreneurship. In their paper, they argue that digital infrastructures will change entrepreneurship in two major ways. First, digital infrastructures will make entrepreneurial outcomes and processes less bounded. In terms of outcomes, this relates to the fact that digital products and services, due to their openness and extensibility, are in a constant state of flux in which they continuously evolve (Garud et al. 2008; Yoo et al. 2010). Popular examples include platforms that through so-called boundary resources such as application programming interfaces (APIs) and software development kits (SDKs) allow platform actors to recombine and redefine existing platform functionality (Zittrain 2006; Ghazawneh and Henfridsson 2013). This generativity leads to platforms that favor unprecedented innovation outcomes. In terms of processes, this relates to the fact that digital technologies change the temporal and spatial conditions of entrepreneurial activities thereby leading to greater levels of flexibility and nonlinearity into how actions unfold (Huang et al. 2017). Popular examples include 3D printers that allow entrepreneurs to rapidly prototype new products and services and experiment with them by sharing them with users and other entrepreneurs (Aldrich 2014). Second, digital infrastructures change the locus of entrepreneurial agency. Thus, digital infrastructures allow the engagement and involvement of a broader, more diverse set of actors in value creating activities. At the heart of this are digital infrastructures that allow effectively engaged actors across company boundaries with different goals and motivations and interests to uncover new entrepreneurial opportunities. Popular examples are digital infrastructures—such as crowdfunding systems (Mollick 2013), digital 3D printing systems and digital makerspaces (Smith et al. 2013; Rayna et al. 2015), and social media

platforms (Fischer and Reuber 2011) which have led to more collective ways of pursuing entrepreneurship (Aldrich 2014).

With their notion of digital entrepreneurship, Nambisan et al. challenge existent entrepreneurial theories that consider entrepreneurship a linear process in which an individual entrepreneur or a clearly defined group of entrepreneurs develops a novel business idea or solution (Eckhardt and Shane 2003; Sarason et al. 2006). Consequently, new research is needed to better address the new entrepreneurial realities that are induced by digital infrastructures. One theory that seems to be particularly suited to do this is the “opportunity creation” theory (Alvarez et al. 2013) which suggests that entrepreneurial opportunities shape the course of an evolutionary and social process (i.e., the entrepreneurial opportunity is gradually shaped by the social environment in which it is situated) (Garud and Karnøe 2003). Another strategy concerns the adoption of theories outside the entrepreneurial realm (e.g., IS theories) as these might be better suited to more suitably explain phenomena that are situated at the intersection of information technology and the social world. Such theories must allow the joint consideration of social constructs (e.g., the entrepreneur, customers, the crowd, etc.) and technology-related constructs (e.g., platforms) to offer critical insights into how entrepreneurial actions and interactions are shaped by the use of digital technologies (Shepherd 2011). One example includes the theoretical lens of co-creation which might help to understand how novel value gets co-created between entrepreneurs and the crowd on digital platforms. Similarly, theoretical concepts such as boundary resources may give valuable insights into how IT resources facilitate distributed entrepreneurial actions thereby promoting the generation of novel entrepreneurial ecosystems.

2.3 Crowd-Based Infrastructures in the Context of Entrepreneurship and Innovation

While we have outlined recent research developments of digital infrastructures (i.e., crowdsourcing and crowdfunding) and their role in entrepreneurship research, relatively little is understood about crowd-based infrastructures in the context of entrepreneurship and how these infrastructures support entrepreneurial innovation. Against this background, we regard crowd-based infrastructures as a special form of digital infrastructure that affects entrepreneurship in a unique and idiosyncratic way and therefore requires special research attention. In what follows, I briefly elaborate on potentially interesting research gaps at the intersection of crowd-based infrastructures and entrepreneurship.

As already outlined above (see Chapter 2.1.1), most of the current crowdsourcing research revolves around crowdsourcing platforms in the context of large and established organizations and how these organizations can use these infrastructures to find innovative solutions for their internal problems (Brabham 2008). Relatively little research has been conducted on crowdsourcing in different contexts and domains (West et al. 2006). This also applies in the context of entrepreneurship. Thus, there is practically no knowledge about how existing crowdsourcing platforms can be used to support novel entrepreneurial opportunities and entrepreneurial innovation. Another interesting research gap concerns the consideration of entirely new crowdsourcing participation architectures (West and O'mahony 2008; Majchrzak and Malhotra 2013) and the requirements they must afford to entrepreneurs and the crowd to jointly develop new products and services. This is also acknowledged by current crowdsourcing research which suggests that existing crowdsourcing systems are inadequate in supporting more complex processes such as collaborative idea evolution. For example, research by Majchrzak and Malhotra (2013) suggests that current crowdsourcing systems favor idea generation over idea evolution, thereby neglecting the potential of the crowd to effectively advance and elaborate on existing ideas. A similar view is provided by Blohm et al. (2013) who note that while crowdsourcing platforms often produce a large number, they lack adequate mechanisms for analyzing these ideas and developing them further. The result of this is a vast pool of immature ideas and crude concepts that are never developed to market maturity. Against this background, research must consider new and more effective participation architectures that support more flexible collaboration processes with users along the entire value chain. This might be particularly important for entrepreneurial processes that often require multiple iterations and refinements of ideas to arrive at the final product or service (Blank 2013).

The same holds true for crowdfunding research. Although crowdfunding emerged and has been explored in the entrepreneurial realm (Schwienbacher and Larralde 2010) its role as an entrepreneurial support tool beyond funding has only received very little research attention (see Chapter 2.1.2). Notable research includes studies by Belleflamme et al. (2014), Stanko and Henard (2017) and Brem et al. (2017), suggesting that crowdfunding can be used by companies to actively integrate users in their innovation activities. Despite this evidence, there is still no understanding on how to systematically use existing crowdfunding systems to co-innovate with customers. Similarly, research on alternative crowdfunding models and participation structures and how they support

entrepreneurs in their innovation-related activities is practically absent in current crowdfunding research. This is also supported by Belleflamme et al. (2013) who suggest that research on more flexible, alternative crowdfunding models is needed as such models are better suited to support new ventures innovation needs and capabilities. Despite this evidence, most crowdfunding research still revolves around standardized crowdfunding models which cannot be adapted to individual entrepreneurs' needs and hence inhibit the creation of new innovative business models. Against this background, new crowdfunding research must consider new crowdfunding models as well as new crowdfunding participation architectures and explore how they can be used to leverage the innovation capabilities of the crowd that go beyond mere funding.

Finally, existing crowdsourcing and crowdfunding research completely ignores the broader ramifications of these digital infrastructures. Thus, most research explores single platforms in isolation without considering how such platforms relate to the formation of entire platform ecosystems (Kuppuswamy and Bayus 2018; Ahlers et al. 2015; Mollick 2014). This is peculiar since current research seems to suggest that the main innovation potential of these digital infrastructures lies in its boundlessness which facilitates unprecedented innovation outcomes (Tilson et al. 2010; Tiwana 2013; Ghazawneh and Henfridsson 2013). Against this background, new research must consider how crowd-based infrastructures and their underlying mechanisms shape and govern the creation of new entrepreneurial ecosystems.

Chapter 3

Overview of the Research Approach

3 Research Approach

This thesis follows a pragmatic research understanding (Morgan 2007; Patton 1990; Tashakkori and Teddlie 1998; Creswell and Creswell 2017). Pragmatism offers the advantage that the researcher does not have to commit to a particular research philosophy. This means that the researcher has freedom of choice to select whatever method, technique and procedures serve him best to achieve a certain research goal. I chose this particular research approach since it offers the most flexibility in exploring novel research phenomena that are little understood and not well defined. Since most of the topics covered within this thesis fit these criteria, the pragmatic view came in handy as it allowed me to make flexible use of methods in accordance with the individual research needs of this thesis.

To explore my phenomenon of interest, I made use of methods such as qualitative research, quantitative research and DSR (Tashakkori and Teddlie 1998; Venkatesh et al. 2013; Venkatesh et al. 2016). Each method applied in this thesis serves the purpose of answering a particular research question and is therefore tied to the methodological requirements that are induced by that research question. In regard to the general research procedure applied in this thesis, I started each chapter with a conceptual study. The main reason for this is that conceptual studies are perfectly suited to outline and provide a basic overview of a new phenomenon or topic. For example, I start Chapter 5.1 with a conceptual study that I use to outline the co-creational potential of crowdfunding platforms for new product development activities with customers. Each conceptual study is followed by a case study. I use case studies as they allow me to explore novel phenomena in more detail and provide me with a means to empirically validate the concepts that I previously introduced (in the course of my conceptual studies). For example, in Chapter 5.2 I explore the case of JumpStartFund, a unique crowdfunding platform. Based on this case, I derive a model that provides the readers with an empirical explanation on how crowdfunding platforms must be designed and used to innovate with customers. In addition to conducting conceptual studies and case studies, I also conducted studies in which I employed a DSR approach and experimental research. For example, in Chapter 5.3 I use DSR to derive new design elements with the aim of facilitating customer engagement in product development activities in the context of crowdfunding. To test the effects of the design elements, I employ an experiment.

In the following sections, I cover each of the research methods employed within this thesis in more detail.

3.1 Qualitative Research Methods

Qualitative research methods are usually employed in situations when the phenomenon of interest is little understood (i.e., when no prior research has been conducted on the phenomenon) (Roethlisberger 1977) or when the phenomenon is not suited to be explored by quantitative measures/means (i.e., phenomena which are characterized through multiple and complex interactions that are difficult to explore with a statistical model) (Bonoma 1985). Popular examples of qualitative research methods include ethnographic studies, case studies, focus groups, and interviews, among others. While each of these methods employs its own set of procedures and techniques, they share some common characteristics that define qualitative research and set it apart from quantitative research (Hatch 2002; Marshall and Rossman 2011; Creswell and Creswell 2017).

Qualitative research usually takes place in natural settings which means that it is conducted in the field. This allows researchers to observe their phenomenon of interest where it occurs and to collect data directly where it emerges. Another important characteristic of qualitative research concerns the active role that researchers take in the research process (Bhattacharjee 2012). This is usually expressed by the fact that qualitative researchers make use of their own research tools and procedures and closely interact with their environment. In regard to data collection and analysis, qualitative researchers usually examine a small number of cases. To do so they employ partially structured or unstructured data collection methods that allow them to examine a certain phenomenon in more depth. To analyze the collected data, qualitative researchers further make use of multiple data sources that they triangulate to increase the validity of their results. Data sources include interviews, observations, documents, and audiovisual information, among other data types. Another characteristic of qualitative research is that it is highly reflective. Consequently, qualitative research takes into consideration how background, culture and other contextual factors may affect the interpretation of research findings. This makes qualitative research particularly conducive to theory formation as it allows the researcher to provide a more holistic view on a certain research phenomenon (Creswell and Brown 1992).

The most commonly employed qualitative research method in this thesis is single case studies. They differ from multiple case studies in that they revolve around a single case that is covered in great depth and detail. While single case studies were originally conducted in many disciplines such as psychology, sociology, political science, anthropology, social work, business, education, nursing, and community planning they have also found their way into the domain of information systems (Benbasat et al. 1987). According to Benbasat et al. (1987), single case studies constitute a promising research strategy in the field of information systems as this field is characterized through the rapid emergence and evolution of new technologies that are little explored. This also applies to the research phenomenon explored within this thesis (i.e., crowd-based infrastructures in the context of entrepreneurship) about which there is little understanding to date. Hence, in order to get insight into the topic of crowd-based entrepreneurship, I focused on the analysis of individual cases in which the phenomenon first came to light (in the scientific literature such cases are commonly referred to as extreme cases) (Yin 2008). For example, in Chapter 5.2 I explore the case of a unique crowdfunding platform to derive new knowledge on how these digital infrastructures must be used and designed for a start-up to be able to effectively leverage the innovation potential inherent in the crowd. Similarly, in Chapter 6.2, I use a single case study to explore how tokens – as newly emerging crowd-based platform mechanisms - govern the development of new entrepreneurial platform ecosystems. In both of the above examples, the case approach allows me not only to derive new theoretical insights but also to validate the assumptions of earlier studies (i.e., my conceptual studies) (Cepeda and Martin 2005; Lowman and Kilburg 2011).

3.2 Quantitative Research Methods

Quantitative research approaches are usually employed in research settings that are characterized through pre-existing knowledge and structured data. Hence, quantitative researchers usually draw on existing theory to explore possible cause-effect relationships in large empirical data (Recker 2013). Popular examples of quantitative research include experiments, surveys and statistical models. While each of these methods employs its own set of procedures and techniques, they share some common characteristics that define quantitative research and set it apart from other research approaches (Campbell and Stanley 1966; Creswell and Creswell 2017).

One characteristic of quantitative research approaches is that they are highly deterministic, meaning that they follow clearly defined procedures in answering a

certain research question. Hence, quantitative research usually starts out with defining a hypothesis that is then tested using experiments or clearly defined statistical models. Moreover, quantitative research approaches are highly representative as they explore phenomena that are based on large sample sizes. To be able to do so, these approaches rely on structured and standardized data collection methods such as, for example, surveys that allow the gathering and analysis of large quantities of data. This contrasts with qualitative research methods that usually rely on small samples and are only representative of a limited number of cases as opposed to a whole population. Furthermore, quantitative research usually takes place in controlled settings. This means that studies are carefully planned and designed so that the chance of confounding influences remains as low as possible. Popular measures employed to achieve this goal are strict experimental plans and survey instruments that have been tested in prior research studies. This is in contrast to qualitative research approaches in which instruments and procedures are sometimes developed or adapted along the way of inquiry. Another important aspect of quantitative research concerns the researcher's neutral role. For example, in the case of experiments, researchers usually adhere to strict behavioral guidelines when interacting with experimental groups. The main reason for this is to keep the influence of the experimenter on the groups as low as possible. One other characteristic of quantitative research concerns the high reliability and the high internal validity of the results. While high reliability refers to the replicability of results, the internal validity refers to the conclusiveness of results. Both measures are considered relatively high in quantitative research which is usually the result of the tightly controlled research settings that are constituents of this research paradigm (McGrath 1981; Creswell and Creswell 2017).

One quantitative research approach I used within this thesis is experiments. Experiments are used to study the effects of certain treatment or intervention on a certain outcome. In doing so the experimenter provides a specific treatment to one group (i.e., the treatment group) while withholding it from another (i.e., the control group). To account for other possible differences in groups, subjects are assigned randomly to one of two or even more groups (Campbell and Stanley 1966; Cook and Campbell 1979; Boruch 1998; Field and Hole 2002; Keppel and Wickens 2004; Lipsey 1990; Thompson 2006). In recent years, experiments also found their way into information systems research where they are commonly used to explore the effects of digital artifacts on human behavior (Hevner et al. 2004; Ernst et al. 2016; Niehaves and Ortbach 2016). To explore the effects of a new crowdfunding participation architecture, I decided to make use of

an experiment myself (see Chapter 5.3). The chosen approach allowed me not only to test if my design affects user behavior but also to explore in more detail how it affects user behavior.

3.3 Design Science Research

The third research approach I used within this thesis is design science research (DSR). While DSR has its roots in the domain of engineering (Archer 1981; Peffers et al. 2007), in recent years DSR has also been acknowledged as a useful research paradigm by information system researchers. In the field of information systems, DSR refers to a systematic framework that is used to “create and evaluate IT artifacts intended to solve identified organizational problems” (Hevner et al. 2004).

Generally, DSR follows a dual approach that is comprised of a relevance and a rigor cycle. While the relevance cycle is geared toward exploring a real world problem based on which a solution is going to be designed, the rigor cycle reflects existing knowledge that can be used to inform and create a solution to the problem. A researcher applying DSR switches back and forth between both cycles to iteratively arrive at a useful solution. Beyond this basic distinction, there are different DSR approaches that can be found in the literature (Hevner et al. 2004; Vaishnavi and Kuechler 2004; Peffers et al. 2007). For this thesis, I rely on the prototypical approach of Vaishnavi and Kuechler (2008) who distinguish 5 process steps (see Figure 3).

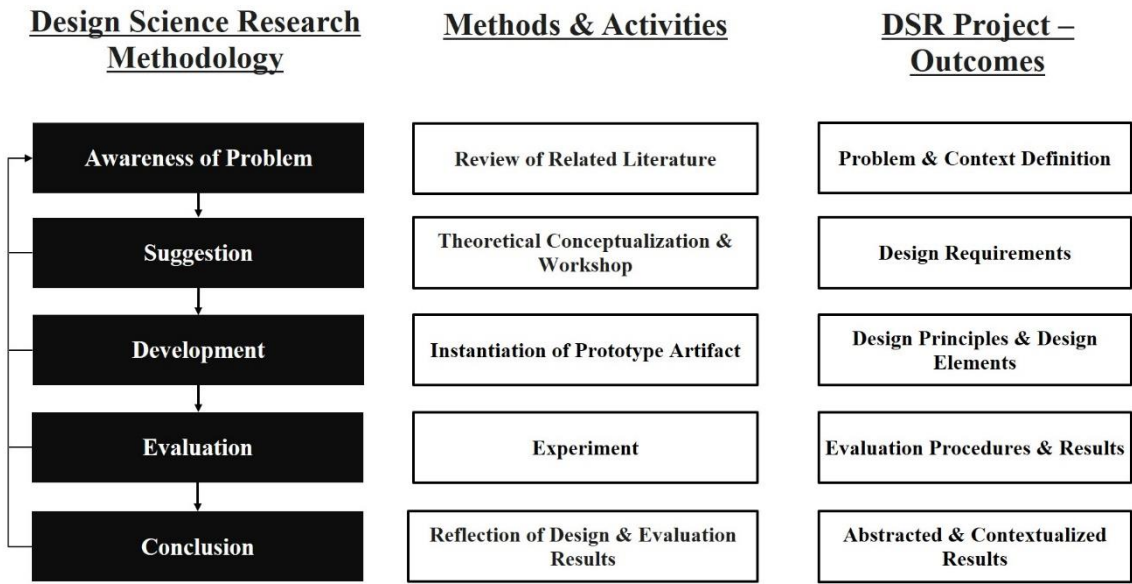


Figure 3. Design Science Research Process
(Source: Vaishnavi and Kuechler, 2015)

The first process step (i.e., awareness of the problem) is used to create awareness of the problem. A typical action taken within this step is to conduct workshops with problem owners or to identify problems from reviewing the related literature. In the second step (i.e., suggestion), the objectives for a possible solution are suggested. One way to approach this step is through workshops in the field that can be used to elaborate the problem and to match possible solutions to the pre-specified problem (this would correspond to the relevance cycle). Another way to tackle this step is to rely on existing theoretical concepts and notions that can provide a possible solution (this would correspond to the rigor cycle). The third step (i.e., development) concerns the actual development of a solution, which usually takes the form of an artifact that is supposed to solve the problem at hand. Depending on the nature of the problem, artifacts can take on different forms. For example, artifacts can take the form of actual IT artifacts (e.g., a recommender system) or they can take the form of process models (e.g., a process model for how to conduct agile innovation). Likewise, approaches to derive these artifacts also differ. For example, one way to develop an IT artifact might be to use a particular SDK. On the other hand, when the goal is to develop a process model, approaches such as design thinking (Plattner et al. 2009) or the lean start-up method (Ries 2011) might be better suited. The final step concerns the evaluation of the instantiated artifact. Possible actions within this process step include the selection of methods (e.g., experiment) to evaluate the artifact and to define adequate criteria for evaluating it (Venable et al. 2016).

Beyond its goal to obtain a solution to a real world problem, another important aim of DSR is to derive meta knowledge from the process of creating that solution (Gregor and Hevner 2013). The main purpose of this meta knowledge is to provide other researchers with a guide on how to come up with solutions to similar types of problems. Depending on the goal and design of the DSR approach used, meta knowledge can take on different forms. One example is so-called design principles which, due to their prescriptive nature, are often referred to as nascent design theories. Another example is full-fledged design theories which are more explorative in nature (Gregor and Hevner 2013) (see Table 2).


Level of Specificity	Contribution Types	Example Artifacts
	Level 3: Well-developed design theory about embedded phenomena	Design theories (mid-range and grand theories)
	Level 2: Nascent design theory—knowledge as operational principles/architecture	Constructs, methods, models, design principles, technological rules
	Level 1: Situated implementation of artifact	Instantiations (software products or implemented processes)
<p style="text-align: center;">More abstract, complete, and mature knowledge</p> <p style="text-align: center;">More specific, limited, and less mature knowledge</p>		

Table 2. Design Science Research Contribution Types

(Source: Gregor and Hevner, 2013)

For this thesis, I used DSR to design a new crowdfunding IT artifact (see Chapter 5.3). The main motivation behind my design was to improve existing crowdfunding systems by facilitating co-creation among users. Applying a DSR approach to do so helped me in two ways. First, it allowed me to design and evaluate the artifact (also see Chapter 5.3). Second, the DSR approach allowed me to derive a nascent design theory in the form of design principles which provide other researchers with prescriptive knowledge/design implications on how to design such artifacts themselves.

Chapter 4

Laying the Foundations of Crowd-Based Entrepreneurship

4 Crowd-Based Entrepreneurship: How Crowdsourcing Platforms Can Support Entrepreneurs in Creating New Opportunities

Purpose

The purpose of this chapter is to introduce the concept of crowdsourcing platforms and to explore their role in creating new entrepreneurial opportunities. Therefore, I review existent literature on entrepreneurial opportunity creation based on which I identify several challenges that entrepreneurs face during the creation and realization of their opportunities (e.g., limited and biased social resources, a lack of resources and a lack of demand-side knowledge). In the follow sections, I explore how crowdsourcing platforms can be used to address these challenges. The findings of my research indicate that crowdsourcing platforms support entrepreneurial opportunity creation in several ways. For example, crowdsourcing platforms provide entrepreneurs with new ways to objectify and make sense of their opportunities. Hence, entrepreneurs can use such platforms to draw on heterogenous knowledge and feedback of a broad range of people (e.g., the market) to determine the viability of their ideas. Moreover, crowdsourcing platforms provide entrepreneurs with new ways to mobilize external resources. Thus, entrepreneurs can use such platforms flexibly and draw on the skills and resources of the crowd. Taken together, the results of this chapter suggest that crowdsourcing platforms are a valuable innovation mechanism in the context of entrepreneurship that supports entrepreneurs not only in the formation of new opportunities (i.e., opportunity objectification) but also in the realization of these opportunities (i.e., opportunity objectification).

Role in Dissertation

The findings of this chapter have a dual role. First, they allow me to lay the foundations of crowdsourcing in the context of entrepreneurship. By doing so, I introduce crowdsourcing platforms as a special kind of IT infrastructure within the realm of digital entrepreneurship and provide a first empirical explanation for how these platforms influence entrepreneurial opportunity creation. Second, the findings of this chapter allow me to identify interesting future research avenues. These research avenues form the basis for the succeeding chapters of this thesis in which I explore one special facet,

crowd-based entrepreneurship (i.e., the co-creational potential of crowd-based infrastructures), in further detail.

4.1 Conceptualizing Crowdsourcing for Entrepreneurship

The findings of this section were previously published by Dellermann, D., Lipusch, N., & Ebel, P. (2017) at the Academy of Management Annual Meeting in 2017. The study is conceptual in nature and examines how different types of crowdsourcing can support the entrepreneurial opportunity creation process, thereby suggesting a future research agenda.

4.1.1 Introduction

In the era of digital economy, IT is becoming the enabler of novel products, services, and business models. Technological advances such as mobile computing, 3D printing, or cloud computing enable the creation of novel opportunities for entrepreneurs. What is particularly important for infusing digital technology into various innovations is the blurring of traditional industry boundaries, the distribution of heterogeneous knowledge, and control (Yoo et al. 2012).

Digital innovation therefore becomes increasingly generative and frequently makes the outcomes of an entrepreneurial effort agnostic as they emerge through a social construction of various actors within innovation networks (Lyytinen et al. 2016). Therefore, digital technology has inherently changed the nature of entrepreneurial processes and outcomes as the entrepreneurial agency becomes increasingly distributed among a heterogeneous set of actors with diverse goals, motives, and capabilities (Nambisan 2017).

One theoretical perspective on entrepreneurship that aims at explaining both myopic outcomes of entrepreneurial efforts and the distribution of the entrepreneurial agency is the creation view of opportunities (Alvarez and Barney 2007; Alvarez et al. 2013; Wood and McKinley 2010). This growing body of research suggests the iterative social interaction between entrepreneurs and interested stakeholders and the evolutionary nature of opportunities to be idiosyncratic for emergent entrepreneurial opportunities (Garud and Karnøe 2003; Dimov 2010).

Opportunities are thereby not assumed to be objective in the market that can be discovered by entrepreneurs. Rather, they are endogenously created by actions and the

enactment of an entrepreneur who seeks to actively exploit opportunities to design new products or services. Thus, they are usually achieved in a multistage, iterative, and interactive process of the entrepreneur with the social environment. Opportunity creation thereby encompasses not only the development of a single product but rather the development of an entire firm (Sarasvathy 2001; Alvarez and Barney 2007; Alvarez et al. 2013).

Following this logic, the opportunity creation process of an entrepreneur has two main idiosyncrasies. First, as opportunities do not exist until they are created by the entrepreneur, the decision-making context is highly uncertain. Neither possible outcomes nor the probability of such are known. Entrepreneurs are therefore not able to predict the outcome of the opportunity creation process as opportunities cannot be fully observed a priori. Rather, the initial opportunity must be enacted in the market and with other stakeholders to observe their reactions (Alvarez and Barney 2007). Second, the beliefs, actions (at the individual level of an entrepreneur), required resources and capabilities (at the firm level of a start-up) are dynamic and steadily evolving through social interactions as the entrepreneur tests their thoughts about an opportunity by enacting it with the social environment and receiving feedback and enabling learning (Mukerji and Schudson 1991). Social interactions therefore provide the mutual social development of a viable opportunity idea rather than sourcing novel objective ideas. The consensus building among the entrepreneur and stakeholders, for instance potential customers or investors, iteratively constructs a common understanding of the value of the opportunity (Alvarez et al. 2013).

Although uncertainty about the market demand in entrepreneurial activities and the need for an iterative development of opportunities is a popular theme in practically oriented literature (Ries 2011; Blank 2013), research in the field of entrepreneurship provides little evidence of how to deal with such circumstances. Popular approaches to dealing with such conditions are gathering feedback from peers, family members, or friends or validating one's idea by consultants (Tocher et al. 2015). However, these approaches also include certain limitations that result from the limited social capital or social competence of entrepreneurs. For instance, limited access to social resources, homogeneity of knowledge among peers, or biased responses might reduce an entrepreneur's chances of receiving reasonable feedback and persuading a reasonable number of stakeholders of the viability of the opportunity to gain access to further valuable resources that support the entrepreneur in enacting the opportunity (Alvarez et

al. 2013). Furthermore, the demand-side knowledge of potential customers is frequently not accessible (Nambisan and Zahra 2016).

One possible way to integrate such demand-side knowledge into the development of novel opportunities can be found in the open innovation literature on crowdsourcing. Crowdsourcing enables socially constructed co-creation by providing scalability, diversity, and flexibility beyond the boundaries of an entrepreneur's social network (Howe 2008; Leimeister et al. 2009; Schlagwein and Bjørn-Andersen 2014; Blohm et al. 2016). While current literature seems to suggest that crowdsourcing is a powerful tool to search and identify innovative solutions, I argue that crowdsourcing can also be applied to entrepreneurial opportunity creation. Thus, crowdsourcing might serve entrepreneurs in co-creating opportunities with potential market stakeholders and observing how consumers respond to their actions as well as giving them more flexible access to human resources (e.g., crowd work) or financial support (crowdfunding). Given the unique characteristics of opportunity creation as an emergent and uncertain process of iterative development fostered by social interaction and the important role of crowdsourcing in other contexts, I propose the crowd as a suitable mechanism to exchange around boundaries and stimulate the entrepreneurial opportunity creation process across the interface. I argue that the social interaction with a heterogeneous crowd benefits entrepreneurs by providing access to social resources, reducing uncertainty about the objective value of an opportunity, and ensuring iterative development, learning, and resource support.

In this paper, I therefore address two key questions associated with the potential role crowdsourcing might play in the entrepreneurial process that goes beyond the development of a single product but rather involves the organization of an entire firm and focuses on the evolutionary process of the iterative development of an initial idea. First, how can the crowd address the requirements and limitations of previous approaches to successful opportunity creation? And, what are the benefits and possible applications of crowdsourcing and thus fields for further research?

The contribution of my work is threefold. First, I contribute to research by explaining how opportunities emerge from interactions between entrepreneurs and their social environment (Alvarez and Barney 2007; Alvarez et al. 2013; Tocher et al. 2015) and on the cognitive perspective of opportunity creation and enactment (Grégoire et al. 2011) by highlighting the role of leveraging external heterogeneous social resources in

objectifying and enacting an opportunity. I argue that crowdsourcing supports the entrepreneur in socially constructing and developing their initial idea to successfully create wealth by integrating new resources and fresh perspectives across the interface. Thereby, I extend previous research on the role of social resources by showing the benefits of crowdsourcing during the different phases of the opportunity creation process to overcome the limitations of previous research (Tocher et al. 2015). Second, I contribute to the emerging literature stream of digital entrepreneurship (Nambisan 2017) by showing how the affordances of digital infrastructures make the boundaries and agency of entrepreneurial processes less bound. I therefore introduce a new field for entrepreneurship research, which requires further consideration due to its enormous potential: crowdsourcing for supporting entrepreneurship by expanding the scope of open innovation and crowdsourcing to entrepreneurship research. Thus, I show how entrepreneurs might leverage the crowd to gain access to resources outside the boundaries of their networks and create opportunities by applying digital technology for fluid entrepreneurial processes and agencies (Nambisan 2017). Finally, my research contributes to the literature stream of crowdsourcing by emphasizing the potential role of the crowd in entrepreneurship. I put a constructivism lens on the entrepreneurial process by proposing that crowdsourcing cannot only be the source of creative ideas, as in previous studies, but also serve the purpose of sense making between the entrepreneur and the social environment to further develop and construct opportunities via social interaction.

4.1.2 A Creation Perspective on Entrepreneurship

The opportunity construct is one of the most pivotal concepts in the field of entrepreneurship (McMullen and Shepherd 2006; Davidsson 2015). In general, an opportunity is defined as a desirable situation in the future that is independent of the current resources of the entrepreneur (Stevenson and Jarillo 2007). Researchers in the academic field of entrepreneurship, however, have different notions of the nature of such opportunities. The literature distinguishes between two perspectives, the discovery view (Shane and Venkataraman 2000) and the creation view (Alvarez and Barney 2007; Alvarez et al. 2013; Alvarez et al. 2014) on opportunities.

The discovery perspective uses a critically realistic view to perceive opportunities as objective and formed by exogenous shocks to existing markets and industries (Shane and Venkataraman 2000; Shane 2003). Opportunities are therefore discovered by the alert entrepreneur who aims at creating wealth (Kirzner 1979). From such a perspective,

decision making is risky. This means that both possible outcomes and their probabilities can be derived from the information that objectively exists in the environment, for instance, through customer surveys (Alvarez et al. 2014). Research on the discovery process identified the role of social interaction with the environment (e.g., market, customers) as a rather simple accelerator of opportunity recognition than an active influencer of the development of such opportunities (Wood and McKinley 2010). For instance, approaches such as idea sourcing (Leimeister et al. 2009) help the entrepreneur in revealing an opportunity that is “waiting to be recognized” and tools such as customer surveys support the assessment of the probability of an opportunity’s success. Outside actors and the environment therefore function as a source for novel and creative ideas.

On the other hand, opportunity creation theory (Alvarez and Barney 2007, 2010; Alvarez et al. 2013) applies an evolutionary realism lens and is based on the view that reality is socially constructed. To become meaningful, opportunities must be enacted as part of the social world (Weick 1993). This perspective implies that opportunities are not existing independently of the entrepreneur but emerge from the iterative actions undertaken to create novel ways to achieve wealth (Sarasvathy 2001). Market disruptions are therefore not caused by exogenous changes but created endogenously by the actions of entrepreneurs (Wood and McKinley 2010). The opportunity creation perspective proposes that entrepreneurs should follow multiple and iterative developmental stages to fully enact an opportunity (Haynie et al. 2009). First, during the opportunity objectification stage, entrepreneurs start a sense-making process to validate the viability of their conceptualized idea by gaining feedback (Wood and McKinley 2010). Second, in the opportunity enactment stage, the entrepreneur builds stakeholder support by signaling the value of the opportunity and persuading the social environment of the value of the opportunity (Alvarez and Barney 2007; Tocher et al. 2015). Entrepreneurs create opportunities based on their individual beliefs and perceptions, imagination, and social interaction with the environment (Alvarez et al. 2014). Contrary to the discovery view, the decision-making context is highly uncertain and requires incremental and intuitive decision making as entrepreneurs create context-specific knowledge where none previously existed (Alvarez et al. 2013). The probability of future success is unknown as neither information about supply nor demand exists before the opportunity is enacted (Sarasvathy et al. 2010). Thus, opportunities are emerging as entrepreneurial actors wait for a response from their actions (e.g., testing it in the market) and then adjust their beliefs accordingly. The creation process is iterative, and the opportunity co-evolves with the surrounding environmental context in which it is

embedded. Opportunities, therefore, are co-created by the entrepreneur, customers, and other stakeholders (Garud and Karnøe 2003). The initial idea at the beginning of such a process is agnostic and represents the early thoughts of an entrepreneur rather than an objective discoverable opportunity. Opportunities can only be fully understood when they are enacted through interactions with the market. Initial ideas are therefore frequently reassessed, pivoted, or abandoned before the entrepreneur can finally create wealth (Ojala 2016). The social environment, for instance potential customers, investors, or the market in general, functions as a feedback provider and helps to further develop the opportunity rather than constituting a source of objective knowledge. Opportunities are therefore co-created by the entrepreneur, customers, and other stakeholders (Alvarez et al. 2013). Emerging opportunities represent a consensus achieved during social interaction that shows what the actual market needs and other stakeholders, for instance investors, are willing to support. Therefore, entrepreneurs engage in an iterative learning process and try to persuade potential stakeholders of their initially vague ideas (Alvarez and Barney 2007). The entrepreneur then creates the market for the opportunity by assembling actors who are interested in it (Sarasvathy 2001). In this context, entrepreneurs create and subsequently develop their business under conditions of high uncertainty. Following this logic, I focus on opportunity creation theory as our theoretical lens.

4.1.3 The Opportunity Creation Process and Key Concepts

In defining opportunity creation, I adopt a constructivism lens following the three-stage model of Wood and McKinley (2010) (see Figure 4). The opportunity creation process thereby starts when an entrepreneur conceptualizes a potential future business idea based on individual social experiences and the formation of its cognitive evaluation of such reality (Wood and McKinley 2010).

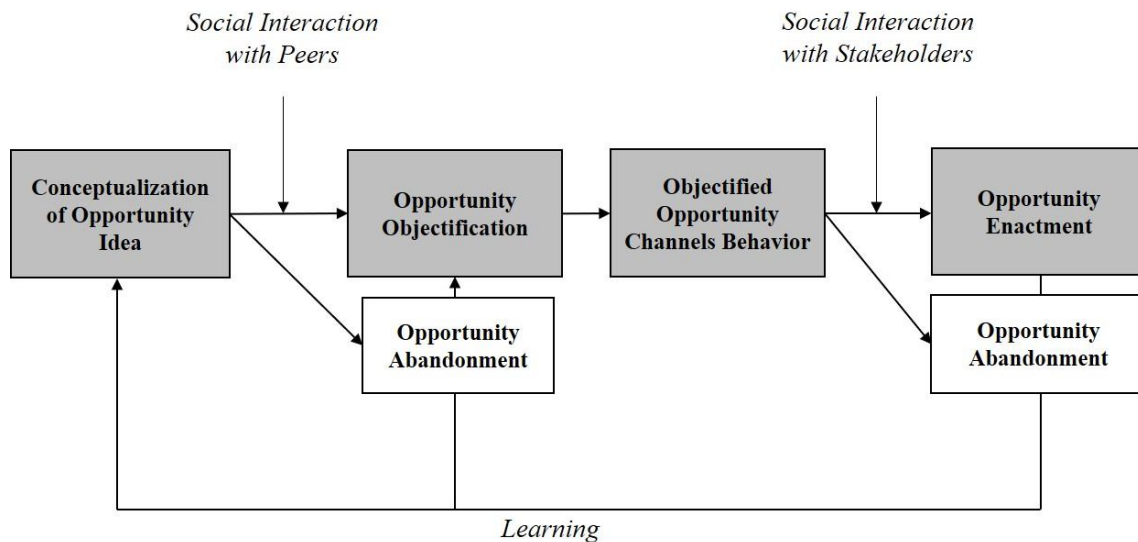


Figure 4. The Opportunity Creation Process
 (Source: Own depiction adapted from Wood & McKinley, 2010)

After the entrepreneur imagines an opportunity idea, the objectification as an act of sense making starts by interacting with the social environment to verify initial beliefs (Weick 1993). In this early stage of opportunity creation, the entrepreneur is confronted with a high level of uncertainty regarding the prospect of a possible business idea. To reduce such uncertainty, the entrepreneur aims at validating his or her beliefs by enacting with the social environment. During this phase, the entrepreneur interacts with peers to test the viability of the idea and reduce uncertainty. Typically, entrepreneurial actors rely on peers such as friends, family members, or other contacts within their direct social network due to their instant availability. However, the value of feedback from peers that is provided in the process of sense making is highly dependent on their experience in this field, industry, or entrepreneurial practice in general (Dubini and Aldrich 1991). Feedback from peers may be both informal, for instance, when provided in conversations, or formal by using meetings. Independent from the form of feedback, entrepreneurs attempt to create consensus within these social interactions to gather information about whether their initial idea and beliefs represent a real and viable opportunity. This process transforms an idea that was previously formed in the mind of the entrepreneur into an objectified opportunity or abandons it if consensus cannot be achieved. Thereby, the objectification of an opportunity reduces an entrepreneur’s perceived uncertainty (Wood and McKinley 2010).

Once the opportunity is objectified, the entrepreneurs minimize their individual uncertainty regarding the value of the business idea. Therefore, their beliefs and actions

will become guided by the opportunity idea. In the next step, the entrepreneur actively explores and leverages ways to capitalize on the opportunity (Alvarez et al. 2013). Following the logic of constructivism, the engagement of the social environment is required. To this end, the potential founder needs to engage and gain solid traction among stakeholders. In doing so, they expand their scope beyond the directly related peer group and obtain access to further resources; for instance, financial or human capital that allow them to fully exploit the envisioned opportunity and are critical for the opportunity creation process (Wood and McKinley 2010).

At the heart of opportunity enactment, an entrepreneur needs to create a shared view and a shared understanding of the future idea among all involved stakeholders. In concrete terms, this involves intense and dynamic interactions with stakeholders. This can take on several forms such as negotiations with investors, contacting employees, surveying potential customers, or searching for new technologies that might help to fulfill the opportunity. In this process, the entrepreneur needs to convince stakeholders of the potential idea, thereby increasing the odds of opportunity enactment (Alvarez and Barney 2010). The interaction with others, mostly people within their network, can help entrepreneurs shed new light on the truth associated with an objective opportunity (Wood and McKinley 2010). Thus, the potential value of an opportunity can only be observed and understood after the entrepreneur has acted and thereby stimulated reaction from the market and gained validation from the market (Alvarez et al. 2013). In doing so, an entrepreneur can observe customer responses to products and services, which allows him to identify a possible divergence between an idea and actual customer perceptions and needs (Alvarez and Barney 2007). If an entrepreneur finds significant divergence, she/he may change the idea in a process of iterative actions and reactions until he receives a market fit or he might abandon the idea altogether. During this process, an idea develops iteratively until it adapts to market needs and an opportunity is finally created. Furthermore, entrepreneurs draw on their social contacts to gain access to key resources such as potential employees or investors that support their idea. Such resources are crucial to fully turn the opportunity idea into a new venture (Wood and McKinley 2010).

4.1.4 Entrepreneurial Actions to Facilitate Opportunity Creation

The central concept within the opportunity creation process is uncertainty. In this context, uncertainty regards the objective value of an idea, the needs of stakeholders, and the outcome of this iterative process (Alvarez et al. 2013). Contrary to risks, where

decision makers can estimate the possible outcomes and the probability of such outcomes associated with a decision, uncertainty implies neither the possible outcomes associated with a decision nor their probability to occur (March and Zur Shapira 1987; Knight 1921). In the context of entrepreneurship, the concept of uncertainty has a dual role. For instance, the entrepreneur has only insufficient information about responses from the market or other stakeholders regarding a novel technology-based value proposition. On the other hand, stakeholders such as potential investors perceive uncertainty or doubts about the actual value of the idea (McMullen and Shepherd 2006). For a successful opportunity creation process, entrepreneurs should reduce both their individual uncertainty to objectify an opportunity and the uncertainty of their stakeholders to further develop the initial idea and get potential stakeholders on board. Reducing the uncertainty of the environment enables the creation of a potential market as well as provides access to further resources, for instance human capital or investments (Haynie et al. 2009).

Opportunity creation theory indicates three central concepts to reduce uncertainty in the entrepreneurial process: social interaction, iterative development, and learning. The starting point of each creation process is uncertainty. Therefore, entrepreneurs use social interaction with their peers, customers, and other stakeholders to reduce such uncertainty by gathering feedback. The uncertainty about their opportunity is reduced until opportunities can be objectified and their enactment can occur (Wood and McKinley 2010). Next, these social interactions lead to iterative changes in the beliefs and mental models about the initial opportunity and finally enable the entrepreneur to create wealth. Therefore, the opportunity emerges, and ideas, products, or entire business models are continuously reassessed, pivoted, or even abandoned (Ojala 2016). Creation theory assumes that the entrepreneur should rely on experiments, gathering feedback, remaining flexible, and learning rather than focusing on pre-existing knowledge (Mintzberg 1994). In the context of the opportunity creation process, learning from feedback and the iterative development of the idea is generally more important than strategic planning. Therefore, tacit learning in a path-dependent process becomes the major source of competitive advantages for entrepreneurs (Alvarez and Barney 2007).

To leverage these approaches to reducing uncertainty, entrepreneurs engage in several entrepreneurial actions (Wood and McKinley 2010). During the opportunity objectification stage, entrepreneurs focus on their individual sense making of the viability of their idea and the iterative development based on the responses from their

actions, usually from the market. In the next step, entrepreneurs persuade interested stakeholders of the viability of their idea and mobilize resources to enact an opportunity (Alvarez and Barney 2007) (see Figure 5).

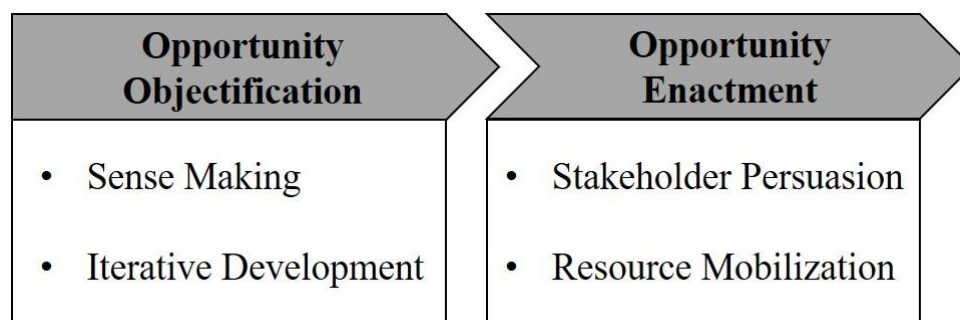


Figure 5. Entrepreneurial Actions in the Opportunity Creation Process
 (Source: Own depiction adapted from Alvarez & Barney, 2007 and Wood & McKinley, 2010)

Based on these entrepreneurial activities, previous research in the context of opportunity creation emphasized the value of an entrepreneur’s social resources to objectify and enact an opportunity (Wood and McKinley 2010). Access to social resources enables an entrepreneur to create novel business opportunities, which may not be generated without social interaction with the environment. Contrary to the discovery view, which assumes social interaction to rather be a source of critical information, the constructivist approach of opportunity creation theory implies an evolutionary process ranging from an initial vague idea to a fully enacted entrepreneurial opportunity that is shaped by social interaction (Tocher et al. 2015). The actions of an entrepreneur are therefore heavily influenced by the creativity and judgment gathered through social interaction (Foss et al. 2008). However, leveraging the entrepreneur’s individual social capital to fully exploit the possible value of social interaction has its limits for several reasons that I will outline in the following section.

4.1.5 Limitations of Previous Approaches to Support Opportunity Creation

Social interaction is vital to success in entrepreneurship (Clercq and Voronov 2009; Khaire 2010). Most obviously, a lack of social capital or competence, which previous research proposes as a crucial resource for opportunity creation (Tocher et al. 2015), is therefore a common threat for entrepreneurs that prevents them from making sense of the viability of an opportunity or gaining access to external resources that are required to transform an opportunity idea into a novel venture. Following this logic, it would be

nearly impossible to objectify and enact an opportunity if entrepreneurs lack social competence or capital.

Second, if entrepreneurs explain their ideas to their related peers and ask for feedback on the value of the possible opportunity, they will probably face several traps. For instance, the entrepreneurs might encounter a self-selection bias by choosing peers that are very likely to support their thoughts and beliefs. Moreover, direct associates will more likely tend to overestimate the viability of an opportunity and therefore lead to biased results of the feedback process (Burmeister and Schade 2007). This fact can create a misleading sense of security that might result in the threat of wrong market moves (Lechner et al. 2006). On the other hand, closely related stakeholders might also face severe biases in the phase of enactment. Previous studies showed that, for instance, venture capitalists tend to evaluate start-ups with a high level of similarity regarding their industry, educational background, or personal characteristics more favorably (Franke et al. 2006). This similarity bias can potentially lead to disastrous funding decisions.

Third, during the objectification process, entrepreneurs need access to experienced peers who are also capable of further evaluating and developing the initial ideas (Foss et al. 2008). Therefore, an entrepreneur needs social ties to experts who support the process of confirming if a conceptualized idea is viable to adopt it to a potentially viable idea or even completely reject the opportunity (Wood and McKinley 2010). The major constraint that entrepreneurs face here is the fact that they frequently only have limited contacts and social capital. Moreover, the peers within their direct networks might not necessarily be experts in the required field. For instance, they might not have enough business knowledge, technological expertise, or simply not enough entrepreneurial experience. This problem is particularly important if the entrepreneurs attempt to converge industry boundaries with their ideas and therefore require experts from various branches (Tocher et al. 2015). Without access to such social resources, an entrepreneur has only little chance to reduce uncertainty and finally objectify the idea (Haynie et al. 2009). However, even if they have access to a small network of social contacts, they might face representativeness bias by relying on and generalizing from small samples rather than comprehensively surveying a large number of experts (Fischhoff et al. 1977). Limited access to social resources can further have crucial effects on the success of the opportunity enactment as entrepreneurs tend to recruit employees or obtain funding from their individual social network (Hsu 2004).

Fourth, and directly related to this fact, is the problem of strong ties in the entrepreneur's network, which might lead to a limited heterogeneity of knowledge (Burt 1997; Granovetter 1985). To successfully enact an opportunity, the deep prior experience within one field needs to be balanced with heterogeneous knowledge and insights to enable valuable feedback and learning (Alvarez et al. 2013; Weick 1993). In creating opportunities, closely relying on knowledge and experts from directly related industries or markets may make it difficult to gather valuable feedback. For instance, novel ideas that diminish traditional industry boundaries or disrupt markets require evaluation/information from heterogeneous sources and therefore social interaction with experts from various fields (Mukerji and Schudson 1991). However, previous research provides strong evidence that entrepreneurs tend toward interacting with contacts from closed networks that often provide only little additional information to the entrepreneur's beliefs during the objectification of an idea (Ruef et al. 2003). Therefore, information about customers' needs and desires is frequently not accessible as well (Nambisan and Zahra 2016).

Finally, the flexibility of required resources represents a certain issue in the creation context of fully enacting an opportunity (Alvarez and Barney 2007). Such a flexibility of resources is particularly manifested in human resource practices and financing. First, entrepreneurs frequently do not know which skills they require to exploit their opportunity, as the outcome of the process is highly blind or myopic (Campbell 1960). Therefore, hiring individuals becomes challenging as the requirements can expand or change in a short time exceeding the human capital of employees (Alvarez and Barney 2007). Second, entrepreneurs must obtain financial resources to realize an opportunity (Baeyens and Manigart 2003). However, the context of creating opportunities is highly uncertain due to the lack of information. Therefore, it is difficult to explain the nature and value of the opportunity that is being exploited to traditional sources of capital such as banks and venture capital firms (Bhide 1992). Consequently, using peers and potential stakeholders within an entrepreneur's social network might be insufficient in providing the required flexibility of resources for creating an opportunity.

Therefore, this approach provides only limited support for reducing uncertainty and socially constructing an idea during opportunity objectification and enactment. Lacking proper social resources during the opportunity creation process therefore represents the major reason many entrepreneurial efforts fail (Tocher et al. 2015) (see Table 3).

Phase	Entrepreneurial Action	Limitation of Previous Approaches
Objectification	<i>Sense making</i>	<ul style="list-style-type: none"> • Limited social resources • Biased social resources • Homogeneity of social resources
	<i>Iterative development</i>	<ul style="list-style-type: none"> • Lack of demand-side knowledge
Enactment	<i>Persuasion of stakeholder</i>	<ul style="list-style-type: none"> • Limited social resources
	<i>Resource mobilization</i>	<ul style="list-style-type: none"> • Limited access to external resources • Lack of flexibility

Table 3. Limitations of Support for Opportunity Creation

To overcome the limitations of previous approaches to opportunity creation, crossing the boundaries of an entrepreneur via crowdsourcing offers tremendous possibilities to enable interaction with potential customers, experts, and other stakeholders by minimizing transaction costs and providing broad access to heterogeneous social resources. I therefore propose that crowdsourcing, which has proven to be a valuable concept in other contexts, is a valuable approach for entrepreneurs to reduce uncertainty and interact with their social environment as it provides access to heterogeneous knowledge from diverse sources and flexible resources.

4.1.6 Previous Work on Crowdsourcing

One special instantiation of using a demand-side approach by interacting with a firm's environment (Priem 2007) in the process of developing new products and services is crowdsourcing. Crowdsourcing has been developing as part of the greater open innovation movement and is thus increasingly used by firms to innovate or outsource tasks (Poetz and Schreier 2012). It was originally considered as a new form of organizing work and denotes the act of taking a task once performed inside an organization and broadcasting it via an open call to individuals outside the organization (Howe 2008). The underlying rationale suggests that a large diverse crowd of independent strangers performs better in certain types of challenges than a small number of experts. At the heart of the concept are new information systems that allow the leveraging of networks and therefore innovate with users outside one's association (Brabham 2013).

Prominent applications of crowdsourcing include idea generation (Ebner et al. 2009; Leimeister et al. 2009), idea evaluation (Blohm et al. 2016; Magnusson et al. 2016), co-

creation for new product development (Girotra et al. 2010; Poetz and Schreier 2012), crowd testing (Leicht et al. 2016), crowdfunding (Mollick 2014), or crowd work (Durward et al. 2016). Firms that apply crowdsourcing benefit from the heterogeneous and diverse crowd, which can provide the ability to discover creative solutions or solve problems. Interaction with the crowd enables firms to discover novel customer requirements and user input for ideas, thereby representing a “voice of the customer” (Griffin and Hauser 1993; Dahan and Hauser 2002). Therefore, crowdsourcing provides both need-based information (i.e., what is the problem?) as well as solution-based information that guides companies in finding out what a potential new product or service should do (Hippel 2005; Terwiesch and Ulrich 2009). On the other hand, the crowd can be used to gain access to external resources, such as human capital, to recruit freelancers with a specific expertise (e.g., expertise in PHP or Java) to fulfill a certain job (e.g., programming a webpage) or to finance products, investment projects, or entire companies (Mollick 2014).

One field of application that has not been examined by crowdsourcing scholars so far is the context of entrepreneurship. The only exception is crowdfunding, which has been demonstrated to be a viable funding alternative for entrepreneurs who might not be able to acquire funding through traditional funding channels. Apart from that, the literature on crowdsourcing for socially constructing entrepreneurial opportunities is still nascent. However, crowdsourcing provides a suitable way to support opportunity creation and overcome the limitations of previous approaches. One might argue that the reason for this is that the value of crowdsourcing for entrepreneurs is obvious in that it does not significantly differ from other contexts. However, research so far has mainly dealt with crowdsourcing at a surface level. Thus, crowdsourcing has been mainly considered as a tool for ideation, commenting, and voting. One aspect that has been frequently ignored is that crowdsourcing can also be used as an idea development tool that can effectively support idea evolution through various stages of entrepreneurial maturity (i.e., from idea to prototypes and business models). However, we argue that applying crowdsourcing to entrepreneurial challenges requires an entirely different perspective that can do more than just help companies with problems at the fuzzy front end of innovation (i.e., ideation).

4.1.7 Crowdsourcing for Opportunity Creation

Based on this argumentation, I build on the process model of opportunity creation by Wood and McKinley (2010). This process includes the stages opportunity

conceptualization, opportunity objectification, and opportunity enactment. During the conceptualization of an opportunity, entrepreneurs rely on their individual beliefs and experiences (Wood and McKinley 2010). The term “search” as applied in idea communities has little or no meaning in opportunity creation theory as the agency of an individual entrepreneur is essential during this phase (Alvarez and Barney 2007). I will therefore focus on the latter two steps during which social interaction becomes central and the entrepreneurial actions as discussed in the previous chapters.

Building on previous work on the role of social resources in this process (Tocher et al. 2015), I argue that crowdsourcing facilitates opportunity objectification by providing entrepreneurs with social resources to engage in a sense-making process. I show that such heterogeneous feedback provides several benefits compared to the knowledge of peers and facilitates the iterative development of an opportunity. After the opportunity is objectified, I argue that crowdsourcing supports the opportunity enactment by signaling the market viability of an opportunity, therefore reducing stakeholders’ opportunity-related uncertainty, which arises in the consensus-building stage. Finally, I posit that crowdsourcing facilitates extended access to resources such as human capital or funding to fully enact an opportunity.

4.1.8 Opportunity Objectification

4.1.8.1 Sense Making

The objectification of an opportunity is a sense making process through which entrepreneurs validate the value of an imagined business idea by interacting with knowledgeable peers (Tocher et al. 2015; Wood and McKinley 2010). This sense making activity supports an entrepreneur in developing an initially vague idea into a clearly articulable vision (Weick 1993). Therefore, social interaction provides feedback from peers that might either confirm the viability of the idea, help the entrepreneur to adapt it, or even reject the envisioned opportunity (Alvarez et al. 2013; Ojala 2016). Thus, the opportunity objectification process highly depends on an entrepreneur’s access to social resources such as a group of experienced peers who provide feedback (Foss et al. 2008). If access to such social resources is missing, entrepreneurs lack criticism and advice from their social environment that would reduce individual uncertainty and objectify an opportunity (Haynie et al. 2009). The limited social capital or social competence of entrepreneurs thus makes it difficult to objectify an opportunity idea (Tocher et al. 2015). In this case, using the crowd provides several benefits for

entrepreneurs. Crowdsourcing provides access to social resources through scalable IT infrastructures such as platforms (Howe 2008). Therefore, using crowdsourcing for the sense making process of objectification offers a cost-efficient and rapid way to gain access to the social environment while the anonymity of the crowd supports the entrepreneurs in enlarging their social contacts without any high demand for the ability to effectively interact with others (Baron and Markman 2003). Crowdsourcing enables entrepreneurs to test assumptions about their idea with a potential market and therefore enables gathering feedback on the viability of an opportunity (Poetz and Schreier 2012). In this context, crowdsourcing platforms (e.g., Amazon Mechanical Turk) can be leveraged to extend an entrepreneur's social network, which can be used for sense making and idea objectification. Thus, I argue:

Proposition 1: Crowdsourcing provides access to social resources to engage in sense making, thus enhancing opportunity objectification.

To objectify their opportunity idea during the sense making process, entrepreneurs strongly rely on directly related peers (Ruef et al. 2003; Stam and Elfring 2008). Previous research shows that entrepreneurs tend to interact with social networks mainly consisting of bonding ties to family members or friends (Tocher et al. 2015). Trust and common norms within such closed networks frequently lead to biased decision making (Carolis and Saporito 2006). Furthermore, feedback by such homogenous networks provides only limited additional insights that help entrepreneurs to validate their assumptions (Lechner et al. 2006). Therefore, entrepreneurs need access to so-called bridging ties (Putnam 2001), which provide heterogeneous knowledge and feedback (Tocher et al. 2015). In this context, crowdsourcing provides a suitable way to bridge the interface of an entrepreneur's existing social network for accessing heterogeneous valuable knowledge (Howe 2008; Leimeister et al. 2009). Integrating a heterogeneous crowd into the entrepreneurship process therefore provides access to social resources that are characterized by both strong heterogeneity and anonymity. This enables the entrepreneurs to create their opportunity by using the "wisdom of crowds" and related benefits (Surowiecki 2004). The access to such social resources via crowdsourcing provides potential support for the opportunity creation process by enabling evaluation and feedback from potential customers and other stakeholders, therefore reducing uncertainty. Previous research in the field of new product development shows users' appropriateness as "raters" for new product and service ideas (Magnusson et al. 2016). Therefore, one highly important benefit of crowdsourcing is the crowd's ability to

provide both user needs (i.e., demand-side knowledge) and product trends (i.e., supply-side knowledge) (Ozer 2009), which is central for opportunity creation (Nambisan and Zahra 2016).

Therefore, a crowd that has diverse sources of information and expertise can provide more accurate collective forecasting than experts (Mannes et al. 2012). The crowd not only provides access to social resources that are not limited to the entrepreneur's peers but also to the benefits of the heterogeneity of the crowd's knowledge (Jeppesen and Lakhani 2010). Apart from access to further social resources that extend the entrepreneur's social network, using a heterogeneous and anonymous crowd instead of peers provides further valuable benefits for the opportunity creation process (Hippel 2005; Poetz and Schreier 2012). The crowd is more suitable in preventing self-selection biases as their anonymity ensures more valid and objective feedback on the opportunity idea compared to peers, individual experts, or start-up consultants within closed social networks. The feedback of the heterogeneous crowd rather represents the "voice" of a potential market and therefore results in a higher level of validity that reduces the threat of an entrepreneur's overestimation of the value of an idea (Magnusson et al. 2016). Approaches such as crowd voting or crowd testing on established platforms enable entrepreneurs to gather feedback on the viability of an idea by leveraging bridging ties. Furthermore, social resources from the crowd support an entrepreneur's sense-making process by reducing representativeness biases (Burmeister and Schade 2007). By challenging their assumptions and beliefs with potential users, the entrepreneurs gather information about the value of their opportunity, the demand-side, and the level of the product-market fit, therefore reducing their individual uncertainty. As crowdsourcing enables the entrepreneurs to use feedback from a large number of people, the threat that they must generalize and make decisions based on small samples is minimized. Hence, the access to social resources from a heterogeneous and anonymous crowd has tremendous potential to support the opportunity creation process, thus enhancing opportunity objectification. Therefore, I argue:

Proposition 2: Crowdsourcing provides access to heterogenous and diverse knowledge to engage in sense making, thus enhancing opportunity objectification.

4.1.8.2 Iterative Development

Apart from validating an entrepreneur's individual beliefs, the objectification process requires the continuous modification of the opportunity idea until consensus on the

viability of an opportunity is achieved (Alvarez et al. 2013). To obtain consensus among the social environment, entrepreneurs must adapt their initial opportunity idea based on the feedback gathered from social interactions (Haynie et al. 2009; Dimov 2011). Although the entrepreneur might be confident that the idea is valuable, this belief might not be shared by the social environment, leading to iterative changes and adaptations of the idea based on the input from the social environment (Cooper 2007). This iterative and evolving process of idea feedback, adjustment, and rejection or adoption continues until consensus is achieved and the opportunity idea is finally objectified during complex social interactions between entrepreneurs and their social environment (Dimov 2011; Wood and McKinley 2010). Thereby, crowdsourcing provides support for further developing an idea by testing the opportunity idea in the market and iteratively co-creating it with the crowd. Testing allows the entrepreneurs to gather information about the “voice of the customer” (Dahan and Hauser 2002; Griffin and Hauser 1993). In the context of opportunity creation, it provides a rapid and cost-efficient way to aggregate data about the reactions of the market, feedback of functionality, or the customers’ perception of a solution. This allows the entrepreneurs to integrate feedback and further develop an initial idea or prototype to fully enact the opportunity (Breland et al. 2007). Moreover, entrepreneurs might actively engage a crowd of potential stakeholders in the co-creation process of the opportunity. Contrary to previous approaches that focus on the initiation of innovation efforts by the crowd and a linear flow back to the firm (Leimeister et al. 2009), the starting point of crowdsourcing for entrepreneurship lies with the entrepreneur and leads to an iterative exchange to further develop the opportunity together with the crowd. Interaction with potential stakeholders might relate to solution-based information and enable the entrepreneur to understand what a potential new product or service should do and therefore complements the entrepreneur’s technological knowledge (Hippel 2005). For the context of entrepreneurship, it is particularly important that such co-creation does not only lead to creative solutions but to achieving a high level of market fit and viability to create a successful new venture. Thus, during the selection of a crowd for feedback and co-creation, the entrepreneur should balance expert knowledge that can assess the feasibility of an opportunity and supply-side knowledge to provide a high level of customer benefits (Poetz and Schreier 2012). Unlike traditional crowdsourcing efforts that discover novel product ideas, the testing and co-creation of an opportunity is not limited to early-stage ideas or even products. Rather, the development of an opportunity includes different stages ranging from an initial idea to a minimum viable product, a business model, and finally a novel

venture (Ojala 2016). Thus, the integration of crowdsourcing is required during various phases of this process. In this context, previous research showed that apart from the co-creation potential for ideas or prototypes, a crowd is also capable of designing and developing novel business models (Ebel et al. 2016). Consequently, crowdsourcing is a valuable approach to validate, co-create, and iteratively develop an opportunity through multiple stages of the process. I thus assume:

Proposition 3: Crowdsourcing facilitates an entrepreneur's ability to maintain continuous dialogue with social resources to co-create the opportunity through multiple iterations of development.

4.1.9 Opportunity Enactment

4.1.9.1 Stakeholder Persuasion

Following Wood and McKinley's (2010) process of opportunity creation, once an entrepreneur's opportunity-related uncertainty is reduced during the sense-making process, the entrepreneur will start to obtain resources that are required to enact the opportunity (Alvarez and Barney 2007; Tocher et al. 2015). During the opportunity enactment, the entrepreneur aims at building stakeholder support to transform the objectified business idea into a new venture (Wood and McKinley 2010). Therefore, it is important for the entrepreneur to reduce the uncertainty of potential stakeholders (e.g., customers, investors, and suppliers) regarding the viability of the opportunity to gain solid traction and achieve resource commitment (Jawahar and McLaughlin 2001; Dimov 2011). To reduce such stakeholder uncertainty, entrepreneurs share the knowledge about their opportunity, signal the value of their proposed idea, and create a shared understanding among their environment (Alvarez et al. 2013; Alvarez et al. 2014). In this context, leveraging the crowd provides several benefits to enacting an opportunity. Apart from reducing the entrepreneurs' uncertainty about the value of their beliefs, crowdsourcing enables minimizing potential stakeholders' uncertainty and persuades them of the true value of an opportunity idea. The feedback of the crowd functions as a "voice" from the potential market (Dahan and Hauser 2002). Therefore, mechanisms such as crowd voting signal the responses and thoughts of potential customers and reduce the stakeholders' uncertainty if the idea is objectively valuable (Magnusson et al. 2016). Moreover, crowdsourcing campaigns can help the entrepreneurs in creating an early sense of urgency for their opportunity idea and creating awareness as well as commitment among potential customers. One example for this can be found in the case

of funding. Typically, venture capital investments serve as influential signals to stakeholders by proposing that a start-up is valuable (Hellmann and Puri 2002; Baum and Silverman 2004). In this context, crowdfunding has proven to be a common mechanism applied in the entrepreneurship context. From the perspective of opportunity creation theory, however, crowdfunding grants benefit beyond access to financial resources. The funding behavior of investors, in this case the crowd, may function as a gatekeeper that provides an early evaluation of the opportunity idea. For instance, Mollick and Nanda (2015) showed that the funding of democratic individuals is equal to the expert evaluation of ideas and therefore provides valuable insights to reduce stakeholders' uncertainty regarding an opportunity. Crowdsourcing supports the opportunity enactment process by reducing potential stakeholders' uncertainty about the viability of an opportunity, building a shared understanding within a potential market environment, and thus gaining traction among stakeholders by signaling the value of the opportunity. I therefore propose:

Proposition 4: Crowdsourcing supports the entrepreneur to reduce stakeholder uncertainty and persuade stakeholders to support by signaling the value of the opportunity.

4.1.9.2 Resource Mobilization

As I noted before, opportunity enactment calls for social resources that are larger in size and more diverse than the peers who helped the entrepreneur objectify the idea (Jawahar and McLaughlin 2001; Wood and McKinley 2010). Thus, for an entrepreneur to successfully realize an idea, access to a wide and varying base of actors is of crucial importance (Tocher et al. 2015).

In a creation context, entrepreneurs are often confronted with a very dynamic environment that makes the exploitation of opportunities difficult to accomplish. For example, due to the high uncertainty inherent to opportunities, entrepreneurs often need to adapt their product and service offers at short notice in line with dynamic market developments. This presents entrepreneurs with the challenge of hiring certain employees flexibly and for rather short periods of time. Because of this, entrepreneurs need new organizations of work that allow them to periodically and flexibly hire people with a special expertise. This becomes even more important if ventures face monetary constraints, as is typical for start-ups. One way to address entrepreneurs' needs for more flexible and short-term employment relationships is crowd work (Durward et al. 2016).

Thus, platforms such as Freelancer allow an individual to look for freelancers with a wide variety of skills without incurring the high costs associated with the rigidity of long-term employment relationships.

Similarly, dynamic environments, as usually encountered during opportunity creation, are usually associated with high risks. However, in such situations of high risks, traditional external sources of capital - including banks and venture capital firms - are unlikely to provide financing for entrepreneurs (Bhide 1992). Under these conditions, the problem of finding sources of capital is not information asymmetries, it is simply the lack of information. Thus, entrepreneurs in such situations are not capable of reliably presenting economic facts, such as the risks associated with an opportunity, that are required by external capital providers to assess the viability of a new business and therefore a start-up's probability to repay its debts.

One possible solution to circumvent this shortage of capital is to make use of more flexible forms of financing. For example, a common method used to finance early entrepreneurial endeavors is bootstrapping. In bootstrapping, entrepreneurs finance activities with their own wealth, or the wealth of those closely associated with them—the triumvirate of “friends, family, and fools” (Bhide 1992). However, while this source of capital is a common method in entrepreneurial financing, it is usually restricted to small amounts of money.

One way to address these capital shortages that entrepreneurs inadvertently face is crowdfunding. Crowdfunding is thereby a very versatile tool that through the distributed collection of small sums among many funders can amount to relatively large investment sums granted to the entrepreneur. Even more, crowdfunding is a form of financing that is characterized by a low degree of informational requirements, which makes financing accessible even to entrepreneurs who undergo opportunity creation. In addition to that, crowdfunding provides several other advantages. Thus, it can be used as a method of market research to validate consumer demands as well as a method to gather valuable user feedback to align the product with existing market demands (Gierczak et al. 2015).

Proposition 5: Crowdsourcing facilitates access to a diverse base of prospective stakeholders to mobilize resources.

Crowdsourcing provides a rapid and cost-efficient way to aggregate data about the reactions of the market, feedback of functionality, or the customers' perception of a

solution (Ries 2011; Blank 2013). By challenging initial assumptions and beliefs with potential users, the entrepreneur gathers information about the value of the opportunity and the level of its product-market fit, therefore reducing individual uncertainty by validating such assumptions (Alvarez and Barney 2007). The feedback of the heterogeneous crowd therefore results in a higher level of validity that reduces the threat of an entrepreneur’s overestimation of the value of an idea. As crowdsourcing enables the entrepreneur to use feedback from a huge number of people, the threat that he must generalize and make decisions based on small samples is minimized. Vice versa, the feedback from the crowd can also function as signaling that the opportunity is desirable for the market (Tocher et al. 2015). Thereby, crowdsourcing helps the entrepreneur to overcome limitations such as limited access to or homogeneity of social resources. Furthermore, crowdsourcing provides valuable potentials for the iterative development of the opportunity by offering access to flexible resources (see Table 4).

Phase	Entrepreneurial Action	Benefits of Crowdsourcing
Objectification	<i>Sense making</i>	<ul style="list-style-type: none"> ▪ Heterogenous knowledge ▪ Representativeness of feedback
	<i>Iterative development</i>	<ul style="list-style-type: none"> ▪ Demand-side knowledge ▪ Rapid user feedback
Enactment	<i>Persuasion of stakeholder</i>	<ul style="list-style-type: none"> ▪ Signaling of market viability ▪ Integration of stakeholders
	<i>Resource mobilization</i>	<ul style="list-style-type: none"> ▪ Access to flexible human resources and skills ▪ Access to flexible financing

Table 4. Benefits of Crowdsourcing for Entrepreneurial Actions

4.1.10 Directions for Further Research

My discussion shows that crowdsourcing and the opportunity creation perspective in entrepreneurship research can be aligned to support the continuing dialogue between entrepreneurs and their social environment to engage in an interactive learning process, thus objectifying and enacting an opportunity in a co-creative manner (Alvarez et al. 2013). The ideas advanced in this article highlight several interesting research questions for interdisciplinary fields of research in entrepreneurship.

4.1.10.1 Research Theme 1: The Role of Open Innovation in Strategic Entrepreneurship

One related topic in the field of strategic entrepreneurship is the potential role open innovation might play in supporting and enabling entrepreneurial efforts. While the literature on open innovation for incumbent firms is extensive (Chesbrough 2006), little is known about this pathway of innovation within the field of entrepreneurship. However, recent technological trends such as the emergence of digital platforms require open approaches for entrepreneurs to create opportunities (Nambisan and Sawhney 2011; Nambisan 2017). Thus, a more co-creative and open orientation of entrepreneurship is required (Alvarez et al. 2015). Therefore, my argumentation about the role of crowdsourcing for opportunity creation reveals two interesting directions for further research: mobilizing and leveraging external resources and the role of customer centricism. First, previous research showed that resource constraints are one of the central issues of entrepreneurial failure (Shane 2003). Thus, research on open approaches in entrepreneurship might examine how entrepreneurs can leverage external resources (e.g., human resources and external knowledge) to start learning how to acquire all required resources through open innovation (Blank 2013). The second direction for further research lies in the need for enhanced customer centricism (Priem 2007; Demil et al. 2015; Nambisan and Zahra 2016). Thus, future research should focus on deepening the understanding of the role of customer integration into the early phases of entrepreneurial efforts.

4.1.10.2 Research Theme 2: The Role of Entrepreneurial Agency in Crowdsourcing

Another interesting field for further research is the role of a fluid entrepreneurial agency in less predefined and distributed entrepreneurial actions among a heterogeneous set of participants, as in the case of crowdsourcing (Nambisan 2017). The process of opportunity creation with a distributed entrepreneurial agency among the entrepreneur and the crowd might lead to emergent roles (Faraj et al. 2011). For instance, during different phases of the creation process, either the entrepreneur or the crowd might start sense making or adapting the opportunity idea based on feedback. Further research might therefore focus on the dynamics of entrepreneurial agencies in crowdsourcing for opportunity creation. Moreover, the nature of an opportunity and its relation to entrepreneurial agency are a valuable starting point for research. As previous literature on innovation in online communities showed, ideas can become disembodied (i.e., independent) from their authors and the context in which they were created (Faraj et al.

2011). This might lead to generative outcomes that may lie beyond the entrepreneur's control and aspiration, leading to debates on how to proceed or the right way to enact the opportunity. Thus, further research should examine the role of such tensions and how to deal with them by focusing on heterogeneous opinions and goals in distributed entrepreneurial agencies. Furthermore, a valuable pathway for entrepreneurship research is providing a deeper understanding of how entrepreneurial cognition and decision making occurs when collectives are involved (Nambisan 2017). How do entrepreneurial agents select, assume quality, or integrate heterogeneous feedback from the crowd, especially when such feedback is diverging from an individual entrepreneur's assumptions?

4.1.10.3 Research Theme 3: Participation Architectures for Crowdsourcing for Opportunity Creation

The next theme for further research is the exploration and design of participation architectures that enable the iterative co-creation of an opportunity and the evolution of an entrepreneurial idea over time, as previous research rather focused on the generation and discovery of novel ideas than the evolutionary co-creation of an entrepreneurial opportunity (Majchrzak and Malhotra 2013). Therefore, it is important to explore the participants, governance, and technological affordances of crowdsourcing for opportunity creation. First, further research should examine who participates in such entrepreneurial co-creation processes. Which new participant roles emerge when agents such as customers or investors (e.g., in crowdfunding) are empowered to be co-creators? And what are their intentions, motives, and goals to participate? Second, research on governance in crowdsourcing should explore what determines the nature and structure of the participation and contribution of collective entrepreneurial agents (Nambisan 2017). How can fluid boundaries of communities be managed? Or, is traditional community management even relevant in such settings when entrepreneurial agents want to verify their assumptions and beliefs through potential customers? Moreover, it is important to research appropriate incentive mechanisms to share, for instance, future revenue or reward contributions. Finally, future research regarding this theme might explore the role of technological affordances such as experimentation, reviewability, and recombination of entrepreneurial opportunities. Thus, it is, for example, crucial to understand adequate mechanisms and tools to provide feedback. Furthermore, the optimal amount of feedback, the heterogeneity of knowledge, or the number of iterations is a promising field for future research efforts.

4.1.10.4 Research Theme 4: Design Oriented Research on Crowdsourcing for Opportunity Creation

From a methodological perspective, interdisciplinary research on the topic of crowdsourcing for opportunity creation might consider design-oriented research approaches (Hevner et al. 2004; Peffers et al. 2007). This research paradigm has been studied well in the information systems literature and provides enormous potential for the field of (digital) entrepreneurship (Venkataraman et al. 2012; Nambisan 2017). Design science offers a deeper understanding of the design process of an artifact (i.e., the technological solution for a problem) and provides the possibility of creating systems that do not yet exist, such as in the case of crowdsourcing for opportunity creation. Therefore, this approach proposes the possibility of designing and building systems that enable the integration of crowdsourcing into the process of opportunity creation. Such possibilities might be, for instance, the development of tools to validate entrepreneurial assumptions and business models (Ries 2011) or systems to enable online co-creation between entrepreneurs and the crowd. Thus, such research can inform practical orientation while maintaining theoretical rigor (Gregor and Hevner 2013). Thus, the methodological approach of design science provides a valuable direction for further research (Dimov 2016) that is particularly relevant for the topic of crowdsourcing for opportunity creation.

4.1.11 Conclusion

In this paper, I argue that integrating crowdsourcing into the entrepreneurial opportunity creation process provides access to heterogeneous social resources. Crowdsourcing therefore offers entrepreneurs the possibility of leveraging supply-side knowledge (Ozer 2009), demand-side knowledge about customer needs and desires (Nambisan and Zahra 2016), and flexible external resources (Howe 2008). Entrepreneurs are thus able to objectify their opportunity idea by starting a sense-making process and iteratively developing their opportunity. Furthermore, entrepreneurial agents can enact the opportunity by applying crowdsourcing to persuade interested stakeholders and mobilize external resources.

The aim of my research is not to discriminate the discovery view of opportunities (Shane and Venkataraman 2000; Shane 2003) or the potential role crowdsourcing might play in identifying market imperfections through idea sourcing (Leimeister et al. 2009). Rather, I argue that the emergence of new digital infrastructures (Nambisan 2017) provides a promising approach to opening the boundaries of entrepreneurial processes and

integrating the social environment into the iterative and evolutionary creation process of emergent opportunities (Garud and Karnøe 2003; Alvarez and Barney 2007; Alvarez et al. 2013). Therefore, my discussion shows possible applications of crowdsourcing during different stages as well as entrepreneurial actions to support the creation process and points toward interesting themes for further research.

My contribution is noteworthy for several reasons. First, I contribute to the discourse in entrepreneurship about how opportunities emerge from the interactions between entrepreneurs and their social environment (Alvarez et al. 2013; Alvarez and Barney 2007; Tocher et al. 2015). I also contribute to the cognitive perspective of opportunity creation and enactment (Grégoire et al. 2011) by highlighting the role of leveraging external heterogeneous social resources in objectifying and enacting an opportunity. For this purpose, I show how crowdsourcing may overcome the limitations of previous approaches, such as interacting with peers to open the boundaries of entrepreneurs' existing social networks or integrating demand-side knowledge (Nambisan and Zahra 2016) into the creation of entrepreneurial opportunities, and provide possible applications during different stages of the creation process.

Second, I contribute to the emerging literature stream of digital entrepreneurship (Nambisan 2017) by showing how the affordances of digital infrastructures make the boundaries and agency of entrepreneurial processes less bound. I therefore introduce the topic of crowdsourcing for opportunity creation as a promising field for further research and propose a research agenda that may guide future efforts. I particularly argue for interdisciplinary research that might include the fields of strategy, information system and cognitive entrepreneurship scholars and suggest design-oriented research (Hevner et al. 2004; Hevner 2007) on crowdsourcing for opportunity creation. Such design-oriented research might be especially interesting to ensure the practical relevance of the entrepreneurship discourse.

Finally, I provide very practical applications of crowdsourcing in the creation process that may guide both institutions that support entrepreneurial talent (e.g., incubators and accelerators) and entrepreneurs themselves to use novel, customer-centric, and cost-efficient approaches across the interface to gather rapid feedback and flexible skills to create wealth.

Chapter 5

Exploring Co-Creation as a Facet of Crowd-Based Entrepreneurship

5 Co-Creation as a Facet of Crowd-Based Entrepreneurship: How Crowdfunding Platforms Can Be Used by Entrepreneurs to Create New Products with the Crowd

Purpose

The purpose of this chapter is to explore co-creation as a facet of crowd-based entrepreneurship and to investigate how it can be leveraged by entrepreneurs to fully unlock the innovation potential of the crowd. Therefore, I define co-creation in the context of reward-based crowdfunding and distinguish it from other co-creation methods in related domains. Based on this definition, I develop a co-creation framework that can be used to explain how the crowd can be systematically integrated in a startup's product development activities at different stages of a crowdfunding campaign. The findings of my research indicate that crowdfunding platforms allow entrepreneurs to integrate the crowd throughout the whole product development process (i.e., both in the early and late phases of innovation). Following these findings in the second part of this chapter, I provide empirical evidence for how companies can leverage the co-creational potential inherent to crowdfunding platforms to innovate with the crowd. I thereby explore the case of JumpStartFund, a unique crowdfunding platform, based on which I derive a conceptual model for a new crowdfunding participation architecture that encourages co-creation among entrepreneurs and the crowd. Furthermore, I discuss the model's implications in regard to entrepreneurial innovation and success. In the third and final part of this chapter, I explore the design of a novel crowdfunding participation structure and examine how it affects users' willingness to engage in product feedback and support (i.e., funding). To this end, I use a DSR approach combined with an experiment. The findings of this chapter suggest that the employment of a novel crowdfunding participation structure (i.e., external endorsements, participatory updates and voting mechanisms) has a positive effect on users' likeliness to support a campaign's product through increased feedback and funding.

Role in Dissertation

The findings of this chapter play a dual role. First, they allow me to zoom in on co-creation as a facet of crowd-based entrepreneurship. By doing so, the insights of this chapter provide a detailed understanding of the concept of co-creation and how this concept can be used to fully leverage the innovation potential of crowd-based

infrastructures. Second, the findings of this chapter form the basis of the succeeding chapter of my thesis. By doing so, the insights of this chapter provide the theoretical and empirical foundation to explore another facet of co-creation within crowd-based infrastructures, namely how crowd-based mechanisms such as ICOs and tokens can be used to govern the creation and development of novel entrepreneurial platform ecosystems.

5.1 Conceptualizing Co-Creation in the Context of Crowdfunding

The findings of this section were previously published by Lipusch, N., Dellermann, D., Oeste-Reiß, S., & Ebel, P. (2018) at the Hawaii International Conference on System Sciences in 2018. The study is conceptual in nature and defines crowdfunding co-creation and provides a framework on how to co-create value with customers during reward-based crowdfunding. Additionally, I provide a research agenda on co-creation in crowdfunding.

5.1.1 Introduction

Crowdfunding has gained considerable popularity in recent years (Massolution 2015). Thus, more and more firms use crowdfunding to collect money to develop their business (Haas et al. 2014). Recent research in the field suggests that users of crowdfunding not only participate because of financial interest such as monetary return but because they have a strong interest in the functionality and the use of the product (Bretschneider and Leimeister 2017). One type of crowdfunding that might be particularly suitable to engage potential customers is reward-based crowdfunding (Belleflamme et al. 2013).

The reason for this is that compared to the other crowdfunding types (i.e., donation-, lending- and equity-based crowdfunding) it offers the unique possibility of engaging with potential customers.

That crowds are willing and able to participate in such activities is also supported by research. For instance, Gerber et al. (2012) found that one important motive for people to participate in reward-based crowdfunding is “to make things happen”. In a similar vein, research suggests that campaigns that offer supporters the possibility of participating in the development of a firm’s products and services have significant effects on that firm’s market success (Stanko and Henard 2016).

Although the above findings provide a first hint toward reward-based crowdfunding's potential to harness the crowd for a start-up's innovation activities, research on this topic is still embryonic. Hence, there is very little research to date that discusses reward-based crowdfunding regarding its unique properties (i.e., antecedents) that make it conducive to co-innovate with customers. Furthermore, current research fails to provide an adequate understanding as to how start-ups can systematically use reward-based crowdfunding platforms to harness the co-creation potential of early customers for their innovation activities. Therefore, I propose the following research question:

What constitutes the co-creation potential of reward-based crowdfunding platforms and which interactions and IT functionalities are needed to leverage this potential?

Consequently, the remainder of this paper is organized as follows: First, I cover (Chapter 5.1.2) the theoretical background on crowdfunding; crowdsourcing as well as the relevant literature on reward-based crowdfunding. I then elaborate (Chapter 5.1.3) on the co-creation potential of reward-based crowdfunding by comparing it to other co-creation methods in the realm of open innovation. In chapter 5.1.4, I describe my research approach. Based on the framework proposed by Pedersen et al. (2013), I next discuss (Chapter 5.1.5) what entrepreneurs need to consider to fully leverage the co-creation potential of customers during reward-based crowdfunding. In chapter 5.1.6, I provide an overview of opportunities and challenges regarding co-creation in reward-based crowdfunding. This is followed (Chapter 5.1.7) by outlining promising future research avenues. I end with my conclusion (Chapter 5.1.8).

5.1.2 Theoretical Background

5.1.2.1 Crowdfunding in the Context of Crowdsourcing

In the following sections, I discuss the concept of crowdfunding and how it relates to crowdsourcing as well as its potential to engage customers beyond funding.

Crowdsourcing denotes an IT based mechanism to engage crowds comprised of groups and individuals for completing tasks, solving problems, or generating ideas (Brabham 2008). By using crowdsourcing, companies gain access to a diverse set of knowledge allowing them to attain the critical resources that are necessary to increase their competitive advantage (Hong and Page 2004; Prpic and Shukla 2013). Aside from crowd voting and crowd creation, crowdfunding constitutes one of the main crowdsourcing forms (Howe 2006; Schwienbacher and Larralde 2010; Wieck et al.

2013). Crowdfunding can, thereby, be defined as a company's open call to an undefined group of individuals for the provision of financial resources either in the form of donations, in exchange for a certain number of shares or in exchange for some form of reward/or voting rights (Schwienbacher and Larralde 2010; Belleflamme and Lambert 2014).

Crowdfunding is often used where traditional ways of financing are not available. Within a crowdfunding project, each supporter typically contributes a relatively small amount of money to a certain project. Therefore, intermediary platforms, which provide the necessary technological infrastructure, are used. Based on the reward that supporters receive in return for their funding, four types of crowdfunding can be distinguished: donation-based, reward-based, lending-based, and equity-based crowdfunding (Wieck et al. 2013; Bradford 2012; Frydrych et al. 2014). Reward-based crowdfunding thereby differs from the other types regarding the benefits that investors receive for their financial contribution. Usually these benefits are tangible and take the form of nonmonetary rewards such as the product that is advertised by the campaign, mementos of the campaign, invites to events as well as the appreciation of supporters (Thies et al. 2014). As such, reward-based crowdfunding contrasts with other types of crowdfunding that usually offer no or non-tangible rewards (i.e., donation-based crowdfunding) or even a monetary return (i.e., lending- and equity-based crowdfunding).

Apart from its main function, crowdfunding seems to also hold considerable potential beyond funding. Schwienbacher and Larralde (2010), for example, compare crowdfunding to crowdsourcing thereby implying that firms can use it to obtain ideas and feedback as well as solutions from potential customers to develop and support their corporate activities. A similar view is provided by Belleflamme et al. (2014) which argue that since crowdfunding facilitates direct interaction between entrepreneurs and potential customers, it allows firms to call upon the crowd's expertise and time. In doing so, start-ups can use crowdfunding to actively engage customers in a variety of tasks such as (pre-)sale marketing and market research as well as other activities that facilitate the co-creation of value with their customers (e.g., user innovation and mass customization) (Belleflamme et al. 2010; Gierczak et al. 2015).

5.1.2.2 Reward-Based Crowdfunding and Its Potential Beyond Funding

One type of crowdfunding that is considered particularly suitable to leverage the crowd to generate additional value beyond funding is reward-based crowdfunding

(Belleflamme et al. 2010, 2013, 2014; Belleflamme and Lambert 2014). One reason for this is that reward-based crowdfunding has certain characteristics that make it particularly conducive to engaging with potential customers.

One main characteristic of reward-based crowdfunding is that it usually revolves around consumer goods and services. Therefore, it is perfectly suited to draw upon potential customers as co-creators for a start-up's value-creation process. Another important feature of reward-based crowdfunding is that it is based on a preselling agreement. This means that firms using reward-based crowdfunding allow supporters, due to their financial contributions, to either acquire the rights for a certain product or the rights associated with a certain product (i.e., the product itself or the rewards discussed earlier) even before it has been produced. While such a preselling agreement comes with a certain risk (i.e., that the business runs out of money before product production), it also offers certain chances for firms and customers. Thus, since the product is usually not in production by that time, a new venture can use this arrangement to engage customers in the development and commercialization of their product and service efforts. This in turn allows them to draw on potential customers as a valuable resource for their innovation activities. Finally, compared to equity-crowdfunding, reward-based crowdfunding (compared to other crowdfunding types) is often characterized by low contribution thresholds (i.e., minimum investment sums) which makes it easier for interested customers to participate in such campaigns (Stanko and Henard 2016).

Moreover, recent research lends first empirical evidence that reward-based crowdfunding is in fact suited for firms to harness supporters for value co-creation. Thus, research suggests that users of reward-based crowdfunding not only participate because of financial interest such as monetary return but because they have a strong interest in the functionality and use of a service or a product. Thus, like user motivations in other open innovation contexts they are motivated to participate because they want the product or service to reflect their needs (Bretschneider and Leimeister 2017; Bretschneider et al. 2015). Further research suggests that reward-based crowdfunding platforms can be used as a marketing tool for purposes such as generating direct sales with customers, engaging customers in promotional activities, and generating new product ideas (Brown et al. 2017). Finally, but most importantly, Stanko and Henard (2016) show that feedback obtained from customers is positively related to a firm's innovation focus and product market success.

5.1.3 Conceptualizing Co-Creation in the Context of Reward-Based Crowdfunding

Co-creation marks the shift from traditional market concepts where users are seen as mere consumers to more customer-centric approaches where they are considered to be a source of value creation (Normann and Ramirez 1994; Wikström 1996; Tseng and Piller 2003; Prahalad and Ramaswamy 2004; Piller et al. 2006). At the heart of this transition are new interaction types that allow the transfer of innovative solutions from the users' domain to the companies' domain thereby unlocking new sources of competitive advantage. Consumers can thereby contribute at various stages of a firm's value creation process and those contributions can take on various forms from ideas to early product concepts or marketing campaigns (Gales and Mansour-Cole 1995; Nambisan and Nambisan 2008; Carbonell et al. 2009). While, as I have pointed out, crowdfunding may constitute one example of this growing phenomenon, it is important to note that there are also a few other methods that companies can use to systematically leverage the potential of customers for value creation (Seybold 2006; Tapscott and Williams 2008). Popular examples include lead user workshops, focus groups, idea competitions, idea communities and toolkits for innovation. With crowdfunding representing another solution to co-create value with customers, one might ask how it differs compared to other co-creation methods (Zogaj and Bretschneider 2012). Thus, to provide entrepreneurs with an adequate understanding about the potential benefits of co-creating with customers in reward-based crowdfunding, I precede by comparing it to other co-creation contexts in the realm of open innovation.

In contrast to most open innovation methods mainly focusing on the fuzzy front end (i.e., tasks such as ideation), co-creation in reward-based crowdfunding typically revolves around the later phases of a start-up's product development process (see Figure 6). The reason for this is that reward-based crowdfunding usually revolves around early prototypes or first marketable products, meaning that the focus does not lie on tasks such as ideation but rather on tasks such as product testing, refinement, and commercialization. This has some important ramifications.

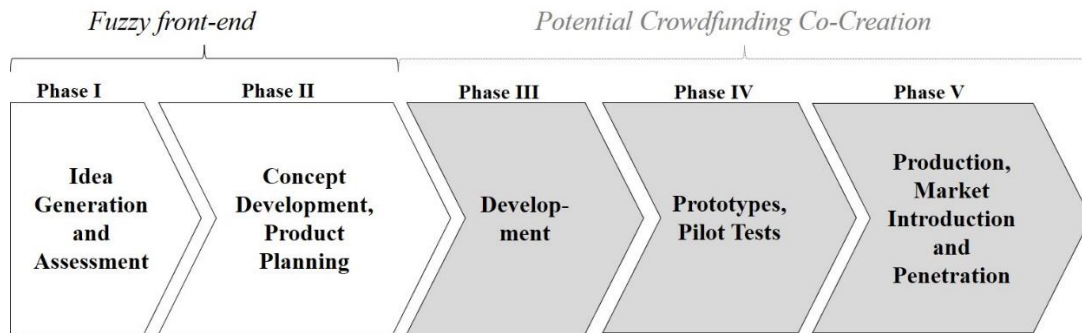


Figure 6. New Product Development Process

(Source: adapted from Herstatt & Verworn, 2004)

Thus, by being able to showcase a first tangible product instead of an idea allows a start-up to co-create with actual customers (also self-selection of individuals) as compared to co-creating with early lead users or experts that are very unlikely to be representative of a company's main market. Naturally, a more advanced offering is associated with lower risk as it is less likely to change and provides customers with a clear notion of what to expect. Apart from that, a full-fledged offering allows users to invest in a campaign not only creatively (i.e., because of joy and fun) but also financially (i.e., because they have a financial interest). It can thereby be argued that people who are ready to invest in the product are also more likely to buy it and therefore might constitute actual customers in the end (Riedl et al. 2010). Moreover, the platform grants access to an existing crowd with certain capabilities

The second difference mainly relates to the assessment quality that pertains to reward-based crowdfunding as a co-creation mechanism. Thus, compared to other co-creation methods (see Figure 7) that are conducted under high uncertainty and restrictive information (i.e., they usually revolve around early ideas that are discussed with a small group), co-creation in the context of crowdfunding offers the potential to co-create with customers under more realistic conditions. The reason for this is the information available to customers during reward-based crowdfunding (Agrawal et al. 2014). Thus, people are not only provided with information about the product or service, but they are also provided with information about the new venture and business model (i.e., the team, partners, and endorsements) that surround the product. Additionally, reward-based crowdfunding platforms also allow the consideration of broader environmental conditions when co-creating with customers as they provide social information such as, for example, the hitherto acquired funding or the opinions and comments of other users (Thies et al. 2014). A further aspect contributing to the high assessment quality of co-creation during reward-based crowdfunding is the provision of information about

different constellations of a firm's value offerings and the related prices, which can be used to gather a more realistic estimate on the demand of the new venture's offering (Belleflamme et al. 2014; Stanko and Henard 2016). Thus, the rich information environment of reward-based crowdfunding allows a new venture to co-create under more realistic conditions thereby also gaining a more reliable assessment of its offerings.

Another advantage of reward-based crowdfunding as a method to co-create with customers refers to the existing infrastructure it offers to firms to co-create with their customers (Prpic and Shukla 2016). This stands in contrast to other methods such as lead user workshops, focus groups, idea communities, or toolkits for user innovation that require significantly higher set-up costs (i.e., a venture must set up these methods on its own), usually without providing entrepreneurs the reach and flexibility that crowdfunding platforms allow. Thus, in the case of reward-based crowdfunding, entrepreneurs are granted access to a group of customers with varying skills and capabilities without incurring the costs of building up a platform from anew. In line with this, using reward-based crowdfunding for co-creation with customers might constitute an approach that is capable of reducing the costs of maintenance (i.e., effort of keeping the group engaged) as compared to using company owned platforms (Prpic and Shukla 2013). In this regard, the usage of a reward-based crowdfunding platform enables start-ups to engage with their supporters in an episodic way without being dependent upon continuous community management activities.

In addition to that, co-creation in the context of reward-based crowdfunding also allows a greater richness of support. Thus, reward-based crowdfunding can be used for a variety of activities such as information search, configuration of products and services, fulfillment, and consumption (Prahalad and Ramaswamy 2004, 2000). Because of this, co-creation in the context of reward-based crowdfunding seems to better reflect the holistic notion of co-creation introduced by Prahalad and Ramaswamy (2004) in so far as it allows customers to individually decide at which stage and by which means (i.e., activities) they want to support a venture's value creation process (Prahalad and Ramaswamy 2004). This stands in contrast to other methods such as, for example, idea communities, idea contests, and lead user workshops that often focus on single activities (e.g., ideation) as well as relying on pre-selection mechanisms to determine which users can co-create at subsequent stages of a start-up's innovation process (see Figure 6). On the other hand, the openness and flexibility of reward-based crowdfunding platforms with regard to co-creation may result in individual contributions that mutually support

and consequently result in a more powerful and effective co-creation mechanism (Jeppesen and Lakhani 2010). Figure 7 provides a comparison of crowdfunding to other co-creation methods in the realm of open innovation methods regarding the just discussed properties.

	Use of Actual Customer Base	Existing IT Infrastructure	Assessment Quality	Richness Of Support
Lead User Workshop	○	○	○	○
Focus Group	○	○	○	○
Ideas Competition	○	◐	◐	◐
Ideas Community	○	●	◐	◐
Toolkits	●	●	◐	◐
Crowdfunding	●	●	●	●
Full Support ●	Partial Support ◐	No Support ○		

Figure 7. Comparison of Co-Creation Methods

5.1.4 Research Approach

To support a better conceptual understanding of co-creation in the context of reward-based crowdfunding as well as to provide a structure for my analysis of the phenomenon, I make use of a framework proposed by Pedersen et al. (2013). The framework which was originally used to examine the phenomenon of crowdsourcing in IS research is comprised of six elements, namely: problem, people, process, technology, governance, and outcome.

However, for my study I slightly adapted the framework (see Figure 8). To this end, I follow a procedure like that proposed by Love and Hirschheim (2017) who had adapted Pedersen’s framework by certain dimensions of Leavitt’s (1961) four component model. Thus, I replace the dimension process by the dimension task. I do so because this

dimension seems to more accurately fit my research goal thereby allowing us to examine my phenomenon of interest at a more granular level. Consequently, I derive the framework depicted in Figure 8 which serves as my starting point to closely examine co-creation during reward-based crowdfunding.

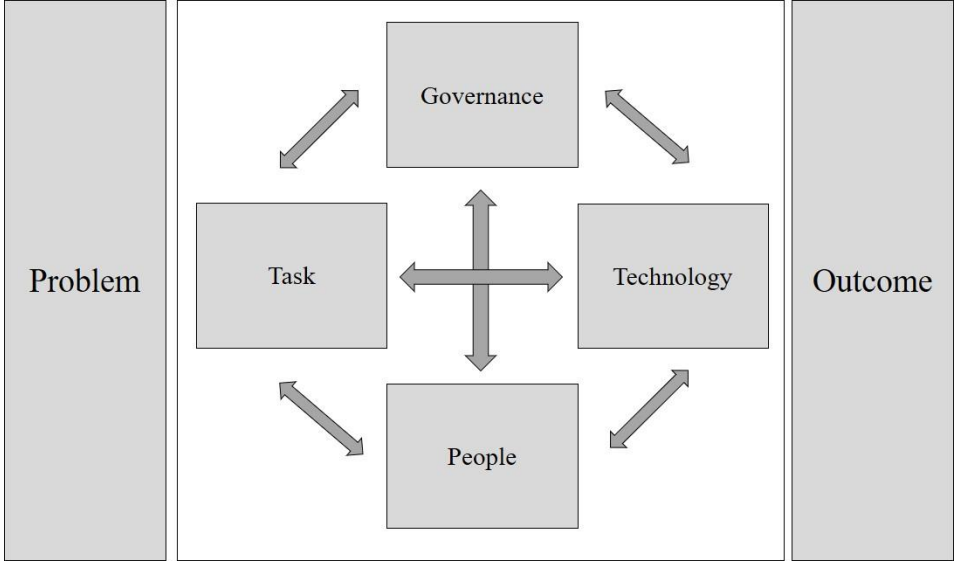


Figure 8. Proposed Research Framework
 (Source: adapted from Pedersen et al., 2013)

As a next step, I apply the derived framework to a typical crowdfunding process (see Figure 9). In this regard, I rely on the process proposed by Beaulieu et al. (2015) who distinguish between 3 phases of a crowdfunding campaign: ex-ante, during campaign and ex-post. Their proposed crowdfunding process covers the last two phases and consists of the following five process steps: discovery, communication, contribution, reward fulfillment and communication. I use this process since it is, as far as my knowledge is concerned, one of the few empirically validated crowdfunding processes published so far. Additionally, the proposed process allows us to examine co-creation in the context of reward-based crowdfunding at a finer granular level as it is enabling us to zoom in at every single process step of the proposed crowdfunding process.

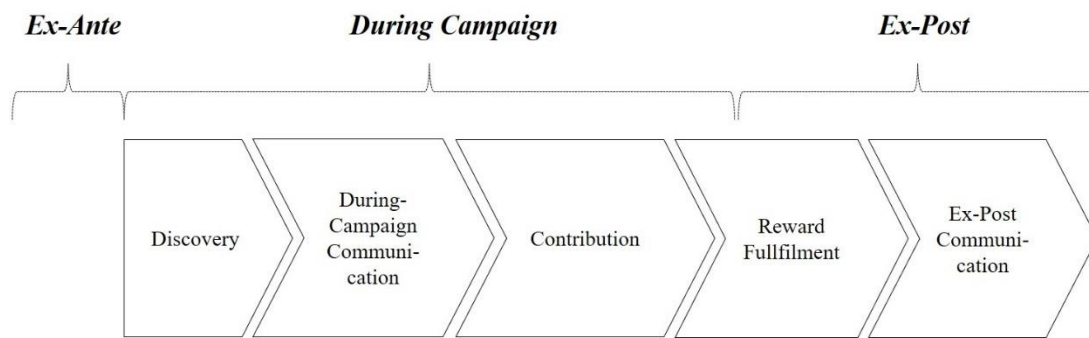


Figure 9. Crowdfunding Process
 (Source: adapted from Beaulieu et al., 2015)

Consequently, for each process step (see Figure 9) I discuss the likely inputs and outputs that are determined by the four dimensions of my framework: task, governance, people and technology. Problems thereby refer to the potential issues faced at each process step and the requirement of certain actions taken to resolve these to achieve a particular outcome. “Tasks” denotes single work steps that can be outsourced to a crowd with the aim of supporting each process step. “Governance” refers to analyzing management related issues such as, for example, the selection of appropriate incentives, task definition and decomposition, quality assurance and community management. “People” denotes the different people involved as well as the roles that individuals take (usually the entrepreneur and a crowd) when engaging in co-creation at the different steps of crowdfunding. “Technology” covers the infrastructure that is required to facilitate co-creation at each process step.

5.1.5 Organizing Co-Creation in Reward-Based Crowdfunding

Examining the process step of discovery, the main problem to be addressed at this stage is to identify potential customers as well as to find out about their respective needs. The main role of the project owner (i.e., usually the entrepreneur) is thereby to test one’s assumptions about the start-up’s offering. The tasks associated with this are the exploration and identification of adequate customers and their needs and the creation of a landing page containing a short and concise representation of a start-up’s offering as well as the formulation of questions that help to validate, test, and refine the offering with the respective customers. The role of a crowd is to discover the offering and to critically reflect if it does meet their requirements. The tasks associated with this concern voting and providing qualitative feedback on a venture’s offering. The technologies involved in this process step are content management systems employing rating and

feedback mechanisms. Those are typically an integral part of a crowdfunding website and can also be used prior to the actual funding phase. Additionally, a company can also make use of external communities to validate its concept in case the offer is geared towards a specific community. Governance at this stage should be preoccupied with setting the expectations right. This means that the project owner has to establish adequate norms that facilitate co-creational activities among users of crowdfunding systems. Moreover, since most users still consider crowdfunding systems as a place for doing investments it is important that the project owner facilitates a mindset of change, prompting users not only to perceive, but also seize crowdfunding's potential beyond funding. The outcome of this process step is feedback that helps a project owner to validate his concept and informs him or her about possible adjustments that need to be made additionally to the firm's current offer. One example of how this discovery step could be arranged is Kickstarter's recently introduced functionality of live streaming that allows entrepreneurs to conduct live product presentations and FAQs with their customers.

One of the main problems that needs to be addressed in the process step of ex-ante communication is to diffuse a start-up's offering among a large crowd of customers by creating awareness and informing them about the product. The role of the project owner is thereby to promote and advertise the venture's campaign among potential customers as well as to get them to promote the campaign themselves. Tasks associated with this are the appropriate selection of methods and tools to identify the most influential customers, thereby creating interesting content in the form of media rich presentations (e.g., imaginative videos) and the use of social media to promote this content. The main role of a crowd is to act as multipliers by promoting the campaign through word of mouth. The tasks associated with this are the use of social media (e.g., Twitter and Facebook) to create awareness, build trust and recommend the offer in one's social network and beyond. The technologies facilitating this process are mainly social media functions that are integrated into most crowdfunding websites and external tools such as, for example, Thunderclap that can help to amplify the viral dissemination through leveraging social network effects. Governance at this point should be preoccupied with the question of how to ensure that customers comply with a firm's larger goal as well as how to ensure rules of conduct regarding communication are followed. Regarding the outcome of this process step, the aim is to achieve viral marketing effects (e.g., positive word of mouth) that help create wide awareness among potential supporters as well as to generate early sales.

Regarding the process step of contribution, the main problem to be addressed at this stage is how to enable and encourage customers to partake in a start-up's value creation process. The role of the project owner at this stage is to clearly communicate what kind of contribution is sought. Moreover, it is his task to organize the co-creational activities of a crowd. One task associated with this is to clearly state how users can contribute (i.e., by engaging in a discourse with other users). Furthermore, it is important to remind people of their role as co-creators as well as to provide them with regular feedback to encourage recurrent co-creation. The role of a crowd is to contribute to a firm's value creation process by making use of their knowledge, skills, and resources. Tasks associated with this are voting, ideating, and engaging in new product development as well as providing financial support. The technologies enabling these different kinds of participation include online payment systems, wikis, forums, Slack and surveys that are usually integrated into the crowdfunding website. Governance at this stage should mainly deal with issues relating to adequate task decomposition and task aggregation (i.e., how individual contributions add up together to deliver the intended value), incentive selection, and management of intellectual property rights and decisions rules. The outcome to be attained is a user's contribution with the aim of helping a new venture in its value creation process. One example of how such a contribution can be arranged is provided by the Coolest Cooler – a state-of-the-art cooling box. Thus, by initiating an open call for participation, the campaign owner asked his potential customers to comment on their most preferred product functionalities. The most frequent comments were finally incorporated into the product's design.

Another area of value creation involves the process step of reward fulfillment. The main problem to be addressed at this stage is to ensure adequate fulfillment of a start-up's offering or the rewards associated with that offering (i.e., to make sure that the reward is getting produced and delivered on time and to the specified terms and conditions). The role of the project owner at this stage is to coordinate all activities (i.e., scheduling, production and delivery) related to the reward fulfillment. Tasks associated with this are the scheduling, production, and delivery of the reward as well as the identification of users that can help to improve a firm's fulfillment process. The role of a crowd is to act as valuable support during the reward fulfillment. Tasks associated with this are the provision of information about new markets, and local deliverers as well as local delivery terms and conditions (customs, taxes, legal terms, etc.). Further tasks include the establishment of contacts (e.g., to local deliverers) as well as the provision of labor. Regarding the technology, it is important to set up a direct communication channel

beyond the platform (e.g., mail) for the exchange of more sensitive information (i.e., business contacts). Moreover, it is important to plan and establish the physical channels that are needed to deliver the offer and the rewards. Governance at this point should be concerned with issues such as how to implement adequate quality assurance mechanisms that help to identify problems regarding reward fulfillment. The outcome of this process step is to attain a crowd-based customer support to guarantee adequate reward delivery. One example that illustrates the above point is the case of the Pebble smartwatch in which a crowd was used to translate regulatory requirements on international customs and tariffs to resolve delays in shipment (Lehner et al. 2015).

If I consider the process step ex-post communication at the end of the crowdfunding process, the main problem that needs to be addressed is to build long lasting relationships with customers to leverage them for further co-creational activities. The role of the project owner is thereby to manage the existing customer base by continuously engaging it. A task associated with this is the handling of customer inquiries (e.g., complaints and warranties). Further tasks include the planning of promotional activities (e.g., online events that inform customers about new offers) with the aim of involving a crowd in the long run. The role of a crowd is to act as advocate and promoter of a firm's offer. Tasks associated with this include the formulation of customer reviews as well as providing evaluations on the products and services provided by the new venture. This is especially important since you want to involve customers as reference customers. The technology involved in this process step includes external websites and communities. Hence, at this stage it becomes increasingly important for start-ups to set up communication channels and routines that can be used to reach customers even after they have left the crowdfunding website. Governance at this stage should deal with the issue of creating adequate community norms (i.e., a sense of belongingness). The outcome to be attained is prolonged customer involvement and support as well as a positive company image. Figure 10 provides an overview of a framework that contains the different process steps and their related dimensions that need to be considered when using crowdfunding to co-create value with customers.

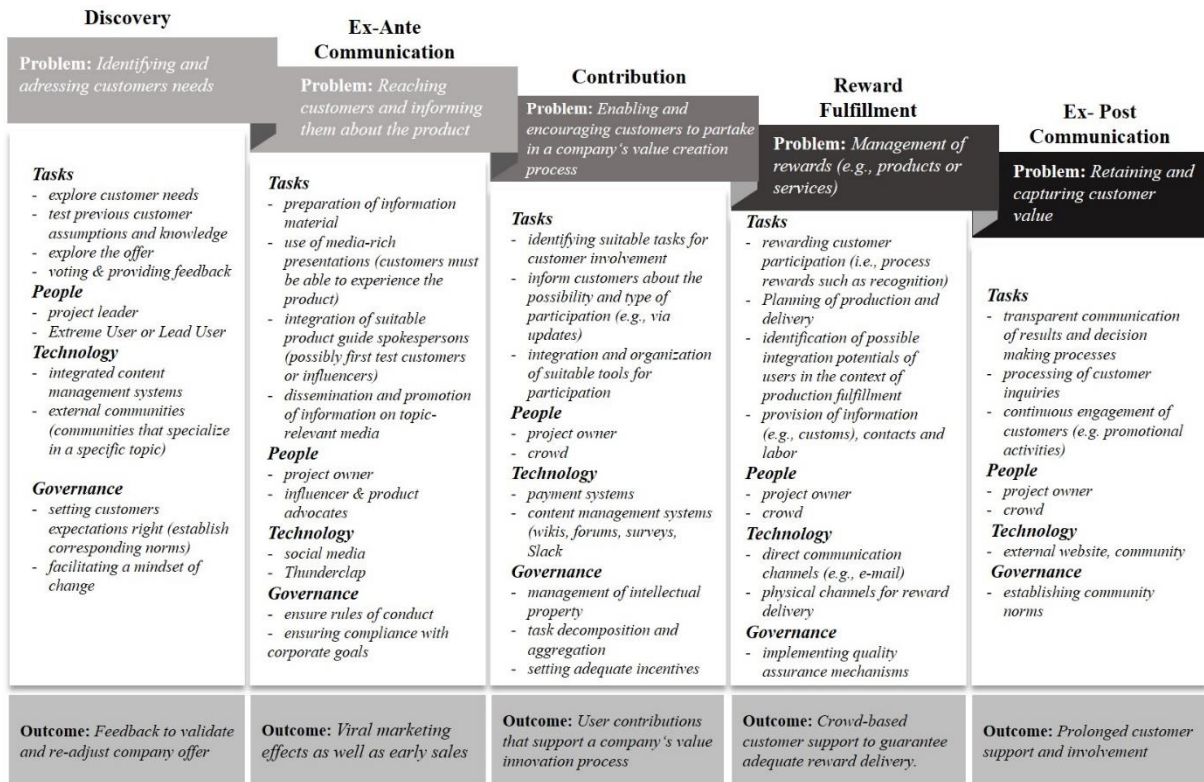


Figure 10. Crowdfunding Co-Creation Framework
 (Source: Own depiction adapted from Beaulieu et al., 2015)

5.1.6 Opportunities and Challenges of Co-Creation in Reward-Based Crowdfunding

One of the main challenges in applying co-creation to the context of reward-based crowdfunding might be that it is not perceived as a co-creation environment. Thus, while most people (i.e., people with a fixed mindset) seem to view crowdfunding as a way to solely raise capital, only a small number of people (i.e., people with a growth mindset) seem to perceive crowdfunding as an opportunity to develop their product with the market (Giones and Oo 2017). This is also underpinned by my literature review suggesting that research on crowdfunding's potential beyond funding is still scarce. Nevertheless, I believe that applying this new co-creation lens could greatly benefit crowdfunding research and practice. Thus, in the recent past, a rising number of crowdfunded start-ups attracted attention through mainly negative headlines. One example is Juicero, a Silicon Valley rooted start-up, that invented a juicer that is apparently not needed to extract the juice from the pre-sold packets. The case of Juicero is thereby representative of a large number of crowdfunding campaigns that simply failed to deliver upon customer expectations. In cases like this, advocating the co-creation potential of crowdfunding might in fact constitute a promising solution. Thus,

getting entrepreneurs to perceive crowdfunding as a holistic development environment might increase their likeliness to use crowdfunding to co-create with potential customers. This in turn might result in products and services that better reflect customers' needs, thereby increasing a start-up's market success. Furthermore, getting entrepreneurs to consider additional benefits of crowdfunding might lead those who previously shied away from using crowdfunding to reevaluate and reconsider their decision.

A second challenge to leveraging co-creation in the context of reward-based crowdfunding might concern the current state of crowdfunding information systems. For example, Gierczak et al. (2015) remarks that there is still relatively little understanding about how IT systems must be adapted to fully leverage the potential of co-creation in crowdfunding information systems. While current systems are theoretically designed to support start-ups at various stages of their value creation process as discussed above, system design might be still too immature to capitalize on the full potential of co-creation in crowdfunding. One example is the commentary and the update functions of crowdfunding platforms that are still used very infrequently by entrepreneurs and supporters (Mollick 2014). The root of this problem very likely lies in the challenge discussed earlier, namely that reward-based crowdfunding is not perceived as a holistic co-creation tool yet. Unfortunately, this fact seems to hold true not only for users but also for designers of such systems. Against this background, it is important to create an appropriate understanding of the proposed concept among designers so that they can develop systems that serve even better the purpose of co-creation. One way for designers to engage people in co-creational activities beyond funding must be to design more flexible participation architectures (Majchrzak and Malhotra 2013). Participation architectures thereby refer to sociotechnical systems and design elements that encourage and integrate contributions made by participants on open online platforms (West and O'mahony 2008; Majchrzak et al. 2013). Such design elements need to consider the evolutionary process of co-creational activities as well as the different motivations of people engaging in these activities. For example, solutions could include the incorporation of multiple tiered rewards along the steps of a venture's value creation process. Thus, to create more efficient crowdsourcing systems, it is important to reward not only the final outcome but also the contributions that led to this step. In other words, crowdfunding systems must be designed to also reward users who contribute through other efforts such as, for example, the provision of ideas, feedback or word of mouth.

5.1.7 Future Research Avenues

Since this research is the first attempt to conceptualize co-creation in the context of reward-based crowdfunding, there is plenty of room for future research. In the following section, I identify three possible research avenues.

Because of its holistic and dynamic nature, co-creation during reward-based crowdfunding is very likely to impose new challenges to managing a crowdfunding process. Thus, firms need to consider new kinds of customer claims regarding the access, transparency and participation to their value creation processes (Prahalad and Ramaswamy 2004; Piezunka and Dahlander 2015). Consequently, successful adoption of this new paradigm will likely require significant changes in a start-up's mindset as well as in its organizational capabilities (e.g., incentives, task structure, management, and intellectual property) (Lakhani and Panetta 2007; Prpic and Shukla 2013, 2016). For example, the start-up Tinker Bots which used crowdfunding for its marketing efforts chose the radical step of engaging its entire team to efficiently manage its crowdfunding campaign (Kunz et al. 2016). As one can see from this example, managing co-creation during crowdfunding often requires a start-up to commit all its resources and achieve a certain goal. However, many start-ups may lack the necessary resources and capabilities to fully manage such a complex and dynamic process (Blank 2013). Thus, strategies on how start-ups can effectively orchestrate this type of co-creation under consideration of resource constraints are an important issue of future research. Firms that plan to interact with crowdfunding platforms must be willing to dedicate a lot of effort, not just toward creating a project that appeals to potential supporters but also to providing these supporters with product fundraising and development updates

The high involvement of users in co-creational activities during crowdfunding may lead to an increased sense of psychological ownership of users over their contributions and consequently a firm's decisions (Pierce et al. 2001; Pitt et al. 2006). By this increased ownership, customers' feelings may also affect a start-up's development plans and activities. Thus, co-creation shifts decision power that was formerly exercised by managers to customers, thereby blurring the boundary between these two groups. While such a strategy can bring benefits to the venture in the form of more engaged customers, it can also backfire if customers start to get too attached to certain decisional outcomes. Thus, prior research shows that companies who employ a high degree of customer integration often face difficulties in altering and changing their operations as well as responding to competitors (Donaldson and Preston 1995). Against this background,

future research is needed to better understand both the positive and negative effects that may accrue from co-creating with customers during reward-based crowdfunding campaigns.

By examining co-creation in the context of reward-based crowdfunding, this research suggests that users form an important source of a new venture's competitive advantage beyond the mere provision of funds. Thus, start-ups that understand how to successfully leverage co-creation during reward-based crowdfunding can gain access to important resources and user capabilities (i.e., skills and knowledge) that can supplement their internal value creation capabilities (Prahalad and Ramaswamy 2000; Jeppesen and Molin 2003; Hippel 2005). However, the final value that is to be derived from these co-creation-based capabilities is likely to depend on attributes such as their distinctiveness and non-imitability. Thus, there might be some customers who provide rather generic resources (e.g., funding) as compared to customers who may provide strategically important and more distinct resources (e.g., information about future trends and possible solution technologies). Against this background, future research should be dedicated to examining different capabilities of co-creators in crowdfunding and examine how each of these capabilities can be deployed to increase a new venture's competitive advantage.

5.1.8 Conclusion

The goal of this research paper has been to introduce reward-based crowdfunding as a new way to co-create value with customers. To this end, I draw attention to certain characteristics of reward-based crowdfunding that make it particularly conducive for start-ups who want to co-create value with customers in later stages of their product development process. Moreover, I provide entrepreneurs with a guideline in the form of a "crowdfunding co-creation framework" that can help them to assess what they need to consider when using reward-based crowdfunding for the purpose of co-creating value with their customers.

5.2 How to Leverage Co-Creation in Crowdfunding: Exploring the Case of a New Crowdfunding Architecture

The findings of this section are published in the International Journal of Entrepreneurial Venturing by Lipusch, N., Dellermann, D., Bretschneider, U., Ebel, P., & Leimeister, J. M. (2019). The study explores the unique case of JumpStartFund to derive a conceptual framework of a new crowdfunding architecture. The conceptual framework is discussed regarding other crowdsourcing architectures and how it influences entrepreneurial success.

5.2.1 Introduction

Crowdfunding has gained considerable popularity in recent years (Massolution 2015). Thus, more and more firms use crowdfunding to collect money to develop their businesses (Haas et al. 2014). Despite crowdfunding's rising popularity, one aspect of the phenomenon that often gets ignored is that some companies fail to successfully develop their businesses (i.e., to deliver their products and services as specified), despite managing to raise sufficient funds. The most recent example is Juicero, a state-of-the-art juicer funded on Kickstarter. The device turned out to be unnecessary to squeeze out the juice packages delivered along with it. Research suggests that start-ups using crowdfunding often encounter problems after the funding is successfully completed. The most prominent problems concern shipping and manufacturing, and changes in scale and scope as well as administrative issues (Lehner et al. 2015; Mollick 2014). While these observations appear to only partly reverse the phenomenon's success story, they seem to uncover a fundamental problem with it, namely the definition of success within the context of crowdfunding.

Possible reasons for this may be that success in crowdfunding is often equated with achieving a certain funding goal. While achieving one's funding target is evidently one, if not the most important, goal of crowdfunding, it is not the only way this mechanism can support entrepreneurship. Recent research seems to suggest that crowdfunding can be used to integrate users in the creation and commercialization of new products and services beyond funding (Brem et al. 2017; Lipusch et al. 2018). Despite these new findings, funding still constitutes the main outcome and benchmark variable for a crowdfunded project's success in research and practice (Moritz et al. 2015). This has important implications for the use and design of crowdfunding systems. Thus, users seem to seldomly perceive how crowdfunding can offer merit beyond funding. As a result of this, users rarely engage in co-creational and communal activities with the aim

of helping a business develop their ideas on current platforms (Giones and Oo 2017). Likewise, current crowdfunding systems are often designed in a way that does not fully support the co-creational potential that is inherent in these systems (Lipusch et al. 2018). This is peculiar, since crowdfunding, like crowdsourcing, offers the potential to leverage the wisdom and the resources provided by a heterogeneous crowd (Prpić et al. 2015). As a result of this, current crowdfunding systems are not able to capture the complexity of entrepreneurial endeavors and account for a business' needs (Belleflamme et al. 2013).

To counter these shortcomings, new crowdfunding models need to be devised that allow for better and more adequate support of entrepreneurs. One way to achieve this may be through the integration of mechanisms that allow to more effectively draw on the resources and competences of the crowd and, thereby, enabling the co-creation of value beyond funding (Richter 2015). This is also supported by research suggesting that crowdfunding practices which enable more active involvement of users allow the entrepreneur to extract additional value from the crowd (Belleflamme et al. 2013). Although these findings provide a first hint for the potential of more active crowdfunding models, an in-depth understanding of what such models may look like and how they specifically differ from standardized models is missing. Thus, the purpose of this paper is to propose a new type of crowdfunding model (i.e., co-creation-based crowdfunding) and to discuss its implications regarding entrepreneurial success. For this purpose, I conducted an illustrative in-depth single case study of JumpStartFund, an extreme case of a novel and active crowdfunding platform that aims at creating a long-term community around projects and fostering continuous collaboration. In particular, I focused on a single case study design by examining the well-known Hyperloop project in detail, which represents the first campaign that was managed on JumpStartFund and tried to develop a novel form of transportation (Yin 2008). To derive an adequate understanding of this case and its underlying model, I propose the following research question:

How can JumpStartFund's crowdfunding model be characterized and how can it help to redefine the success of existing crowdfunding models?

The contribution of this study is threefold. First, I extend existing crowdfunding literature by considering a new crowdfunding model that contributes to a better understanding of more diverse crowdfunding models. Second, my paper contributes to

the discussion of how such a dynamic model may influence and redefine entrepreneurial success within crowdfunding. Third, I also contribute to the broader topic of crowdsourcing by discussing the implications of my model in view of existing research in this context.

5.2.2 Related Work on Crowdfunding

5.2.2.1 Theoretical Background: Crowdfunding Models

Crowdfunding is defined as “a collective effort by people who network and pool their money together, usually via the Internet, in order to invest in and support efforts initiated by other people or organizations” (Ordanini et al. 2011). It is part of the broader concept of crowdsourcing, which refers to a mechanism that is used to outsource problems or tasks to a crowd of people that can solve them more efficiently (Brabham 2008; Schenk and Guittard 2011). At the heart of crowdfunding are intermediary platforms that employ certain web technologies that make it economically feasible to pool small amounts of money from different people to collect a sufficient investment sum.

To distinguish between crowdfunding models, the literature makes use of different conceptualizations. One of the most common conceptualizations discriminates crowdfunding models based on the type of exchange relationships between founders and investors (Zhang 2013). Models are, thereby, generally distinguished between donation-based, reward-based, lending-based and equity-based crowdfunding (Mitra 2012; Bradford 2012; Griffin 2013). In donation-based crowdfunding, users usually donate their money without being eligible for a tangible return (Bradford 2012). Because of this, donation-based crowdfunding is usually appropriate for charity fundraisers. In reward-based crowdfunding, users are usually granted certain benefits in return for their contribution. These benefits are usually tangible and take the form of non-monetary rewards, such as the product that is advertised by the campaign, mementos of the campaign, and invitations to events as well as the appreciation of supporters (Belleflamme et al. 2014; Beaulieu et al. 2015). A model that is very similar and, therefore, usually subsumed under the reward-based model is the pre-purchase model. Like the reward-based model, financial supporters are entitled to a return that is usually the product the entrepreneur is going to produce. Thus, with their contributions, users of reward-based crowdfunding usually pre-purchase the product or service from the entrepreneur. In the case of the lending-based model, which is also often denoted as peer to peer lending, contributors usually act as lenders to borrowers (Lin et al. 2013). In

doing so, lenders provide loans on a temporary basis for which they expect repayment. In some cases, they also expect a financial return in the form of interest rates on top of the principal they loaned. The fourth and last model is the equity-based model or profit-sharing model. In this model, users receive a share of the profits of the business they fund. As such, the model comes closest to investments into securities (i.e., shares or bonds) (Ahlers et al. 2015).

Another conceptualization is provided by Schwienbacher and Larralde (2010), who further distinguish between active as well as passive crowdfunding models. Passive models, thereby, denote platforms that allow only limited involvement of the crowd beyond funding. Hence, these types of crowdfunding models are mainly used by entrepreneurs who seek passive investments and are solely interested in monetary exchange (Schwienbacher and Larralde 2010). One example of such a crowdfunding model is lending-based crowdfunding with its main purpose being the exchange of funds to grant a loan. Active crowdfunding models, on the other hand, allow funders to become active in the initiative next to offering rewards to them. Examples of active crowdfunding models constitute reward-based as well as equity-based models, which allow companies to gather important feedback with regard to products (i.e., the case of reward-based crowdfunding) as well as on the general value of one's business (i.e., the case for equity-based crowdfunding) (Belleflamme et al. 2014).

To position my research, I will focus mainly on active crowdfunding models as this categorization seems to be best suited to contrast and explain my case. I will focus on reward-based and equity-based crowdfunding, which are active crowdfunding models as they allow customers to engage beyond funding. By positioning my study, I can exclude research on crowdfunding models (e.g., lending-based and donation-based crowdfunding models) that do not provide valid reference points for my case. Hence, in the following section, I will provide a short review on the relevant literature regarding active crowdfunding models with emphasis on equity-based and reward-based crowdfunding.

5.2.2.2 Research on Crowdfunding Models

Looking at current research on reward-based as well as equity-based crowdfunding, I was able to identify three main research streams. Most research to date deals with success factors within these crowdfunding models. Mollick (2014), for example, shows that success in reward-based crowdfunding is predicted by the size of social networks

as well as the underlying project quality. Apart from that, research identifies a variety of other success factors, such as the incorporation of videos (Mollick 2014), the regular use of updates and comments (Xu et al. 2016; Clauss et al. 2018; Kuppuswamy and Bayus 2018), the use of social media (Mollick and Kuppuswamy 2014; Thies et al. 2014; Lukkarinen et al. 2016; Courtney et al. 2017), geographical proximity of the funder (Agrawal et al. 2014) and the appropriate setting of funding goals as well as the use of adequate rewards (Cholakova and Clarysse 2015; Moritz et al. 2015; Frydrych et al. 2016; Xu et al. 2016). The second main research stream is concerned with users' motivations in crowdfunding. The most important motives among entrepreneurs to use crowdfunding are to raise funds, to establish relationships with funders and customers, to gain validation and to create awareness as well as to learn something. Investors of crowdfunding, on the other hand, are motivated mainly to gain a reward, to engage with a community, to support creators, to gain recognition from others, to develop a positive self-image and because it is fun (i.e., hedonic reasons) (Gerber and Hui 2013; Haas et al. 2014; Bretschneider and Leimeister 2017). Research further suggests that these motivations differ depending on the crowdfunding model employed. Thus, while investors of equity-based crowdfunding are believed to be driven mainly by economic and profit-oriented motivations, investors of reward-based crowdfunding seem to be guided primarily by hedonic and altruistic motives (Haas et al. 2014). The third research stream is preoccupied mainly with investigating the intermediary function of crowdfunding models. Most research in this regard proposes that one important function of a crowdfunding platform is reducing information asymmetries among users of crowdfunding platforms (Haas et al. 2014; Cumming et al. 2015; Courtney et al. 2017). They do so by relying on certain platform mechanisms that allow the transmission of information, based on which the capital giver can derive the profitability, viability, and risk of the proposed business (Ahlers et al. 2015). This information can take different forms. Examples include direct information, such as the textual description of a company's business, stated reasons for a loan application, and information on the maximum interest rate a user is willing to pay. Other examples include more indirect information (i.e., information from which the quality of a company can be inferred indirectly), such as links to affiliated partners and lead investors (Kim and Viswanathan 2014) and third party endorsements (Mollick 2014; Agrawal et al. 2016; Courtney et al. 2017) as well as the selection of an appropriate funding mechanism (KIA or AON) (Burtch et al. 2015).

A relatively small but slowly developing research stream is preoccupied with the more active properties of crowdfunding models. Part of this research, already discussed in Chapter 5.2.2.1., shows that different types of crowdfunding can be used to extract different kinds of information from the crowd (Belleflamme et al. 2014). More recent research seems to suggest that involving customers in innovation-related activities has important implications for a company's success. For example, research by Stanko and Henard (2017) shows that involving customers in product development during crowdfunding can benefit the market performance of products within such campaigns. This is also supported by my own research, in which I lay out why reward-based crowdfunding is conducive to co-create value with customers beyond funding and also provide a guideline on how to best engage customers in innovation related activities (Lipusch et al. 2018). While the above findings relate primarily to reward-based and equity-based crowdfunding models, I found relatively little research on alternate crowdfunding models and how they involve customers in value-creating activities beyond funding. One exemption constitutes the study by Belleflamme et al. (2013), which examines individual crowdfunding practices (i.e., crowdfunding practices that are conducted through a direct appeal without the involvement of a crowdfunding platform) and which suggests that such models are better suited to extract additional value from the crowd. One reason for this is that entrepreneurs using such a model can decide on their own how to involve users during crowdfunding and, hence, are not constrained by the rules and functionalities of standard crowdfunding models.

From my literature review, I conclude that only little research is devoted to crowdfunding models that lie outside of conventional norms and properties (Ordanini et al. 2011). This is unfortunate, since research seems to indicate that alternate crowdfunding models often employ mechanisms that allow for a more flexible extraction of value from the crowd (Ordanini et al. 2011; Belleflamme et al. 2013). Also, existent crowdfunding research conveys relatively little in-depth understanding as to what such new crowdfunding models may look like and how they may differ from standard crowdfunding models. Furthermore, I note that there is relatively little in-depth understanding about the strategies and architectures that crowdfunding models employ to extract additional value from the crowd and how this value may relate to a company's funding success. My study aims to address this particular research gap by investigating the case of JumpStartFund and the Hyperloop project in depth.

5.2.3 Methodology

To answer my research questions, this paper adopts an exploratory in-depth single case study design (Yin 2008). As the topic of new crowdfunding models has gathered relatively little research interest so far, I choose the case study approach as it is particularly suited to researching new and fast changing topics that have not been theoretically explored much (Benbasat et al. 1987). Specifically, I choose the case of JumpStartFund, a crowdfunding platform that was originally developed for the purpose of realizing the Hyperloop project.

I choose this case for several reasons. First, JumpStartFund's platform uses a unique participation architecture that allows the inference of new knowledge on the design of crowdfunding platforms. Hence, my case represents an extreme one (Benbasat et al. 1987; Yin 2008). Extreme cases usually revolve around phenomena of interest that are prototypical or paradigmatic in nature (Gerring 2006). According to Gerring (2006), such cases are predestined for the theory generation as they usually define new theoretical concepts as opposed to testing existing theoretical concepts. Hence, the goal of my case study is to derive a new theoretical concept in the form of a unique crowdfunding model that is based on the one-sided accentuation of one or more points of views (Weber 2011) on the JumpStartFund platform and the Hyperloop campaign. My research approach allows us to theorize through idealization (Lopreato and Alston 1970) rather than theorizing intended to be valid across many cases. The second reason for choosing my case is the fact that it provides substantial amounts of publicly available data, which allows us to conduct a detailed study of this nature. Hence, the unique case in combination with its rich documentation provides us with the insights and clues that are needed to establish a new crowdfunding model (Baxter and Jack 2008). Following the best practice of qualitative research (Benbasat et al. 1987; Sarker et al. 2013) and with the aim of increasing the robustness of my results, I made use of multiple data sources. Table 5 provides an overview of the data collected and analyzed for this case study.

Data Sources	Collected Material
<ul style="list-style-type: none"> ▪ Press releases, news, announcements, online articles ▪ Case documents <ul style="list-style-type: none"> - Whitepapers, reports and case descriptions - Keynotes, speeches, special events - Campaign database ▪ Platform data (contents, posts, and updates of JumpStartFund) ▪ Social media data (Twitter, Facebook) 	<ul style="list-style-type: none"> ▪ 54 Documents ▪ 19 Documents ▪ 31 Hours ▪ 130 Documents ▪ 428 Entries ▪ 160 Entries

Table 5. Overview of Data Sources for the JumpStartFund Case Study

For my in-depth examination, I mainly rely on secondary data. The use of secondary data allows us to easily access a broad and diverse range of data that would not be possible through other means such as, for example, data collection through qualitative interviews. Thus, while creating my data repository, I made sure to include various sources, so as to be able to draw upon the rich context of my case (Kaplan and Maxwell 2005). My data was collected over a time span of three months (from 22.06.2017 until 30.08.2017) and included press and news releases, case documents, platform data and social media data (see Table 5).

To analyze the collected data, I made use of content analysis, which is defined as a “research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns” (Hsieh and Shannon 2005). Specifically, I used an inductive content analysis. This approach is particularly suited if there is no former or only limited knowledge about a certain phenomenon (Elo and Kyngäs 2008) as it allows new knowledge to be inferred from data without having to rely on preconceived categories and concepts (Kondracki et al. 2002; Mayring 2002). Another characteristic of inductive content analysis is that it moves from the specific to the more general, so that particular instances are observed and then combined into a larger whole or general statement (Chinn and Kramer 1999). This makes inductive analysis particularly suitable to the model and concept generation as it provides a means to better understand and describe phenomena on a broader level.

In analyzing my data, I followed a three-step process that included the coding, categorization and abstraction of my data (Elo and Kyngäs 2008). My process started with an open coding procedure in which I identified important words and text passages

that I enriched through notes and headings to describe those elements. This process was repeated several times to make sure that all important aspects of the content were captured (Burnard 1991, 1996; Hsieh and Shannon 2005). In a next step, I used these notes and headings to freely/inductively (i.e., through interpretation) generate categories (Burnard 1991). Since these categories denote higher level concepts, they helped us to reduce the overall number of elements as well as to group observations that are similar and comparable to each other. My last step included abstraction, which denotes formulating a general description of the research topic through generating categories (Burnard 1996; Polit and Beck 2004). This involved naming and describing the derived categories more formally using content-characteristic words. Moreover, this last process step included another categorization procedure, which I used to converge subcategories with similar events and incidents to form even more abstract or joint categories (i.e., main categories) (Dey 1993; Hsieh and Shannon 2005). This last step was repeated until I arrived at a reasonable categorization.

The analysis and discussion of results was conducted by three independent researchers to increase the robustness of my data. Therefore, each of the three researchers conducted the content analysis on their own before meeting in a group to discuss the results. Differences in categorization occurred in cases where data carried double meaning. For example, the comment “I am a Civil Engineering student from India and I am graduating this year in June and I am eager to be a part of this revolution. Can you tell me how I can help in this?” could indicate a user who wants to work for the project or engage in active feedback. Conflicts like this were resolved through mutual discussion and agreement upon joint categories. As a result of the categorization process, I identified four central categories (i.e., participation architecture, which was composed of interaction design and incentives to innovate, exchange relationships and crowdfunding community actors) that I used to explain my new crowdfunding model.

5.2.3.1 The Platform: JumpStartFund

To derive my new crowdfunding model, I start my analysis by examining JumpStartFund’s platform. JumpStartFund was founded in 2012 by Paul Coleman, Dirk Ahlborn, and Andrew Quintero with the idea to crowdsource the development of the Hyperloop, which constitutes a new transportation technology with the aim of revolutionizing travel. The main idea of the platform is to support the entrepreneur in the different stages of his business’ development from idea to concept to funding. Despite the fact that the platform is often compared to crowdfunding platforms, it also

blends in elements of crowdsourcing and crowd-working platforms. Thus, one factor that sets JumpStartFund apart from other crowdfunding platforms is its unique participation architecture that allows companies to build up a community of supporters around their business as well as engage with them in the co-creation of value beyond funding (i.e., I refer to this as co-creation community). Below, I elaborate on these differences in more detail by comparing JumpStartFund with two standard crowdfunding platforms, namely Kickstarter and SeedInvest, which can also be considered to employ active crowdfunding models (see Table 6).

Crowdfunding Participation Architecture		<i>Standard Crowdfunding Platforms (i.e., Kickstarter & SeedInvest)</i>	<i>JumpStart Fund</i>
Interaction - Design	Participation Threshold	<p>Potential supporter: <i>You have to invest before you can partake in the project (i.e., to be able to comment and to being eligible to certain updates)</i></p> <p>Entrepreneur: <i>The fee is dependent on the amount to be raised (5-10% of the total funding amount)</i></p>	<p>Potential supporter: <i>You can partake without investing. Any crowd member can post comments, engage in discussions or moderation (such as encouragement or starting new threads)</i></p> <p>Entrepreneur: <i>Entrepreneurs have to pay a fixed small amount (US\$10) to post their projects</i></p>
	Resource Exchange	<p><i>The platform provides only limited possibility to exchange resources, mostly in the form of funds or comments</i></p> <p><i>The platform allows the exchange of resources bilaterally</i></p>	<p><i>The platform allows the upload of files i.e., you can exchange resources of different formats (e.g., documents, pictures, and videos)</i></p> <p><i>The platform allows the exchange of resources multilaterally</i></p>
	Participation Structure	<p><i>Participation follows a linear flow and is, hence, not structured.</i></p> <p><i>No Stage Gate (Focus: Back End of Innovation)</i></p>	<p><i>Participation is structured around topics and allows the creation of sub-communities</i></p> <p><i>Stage Gate Approach (Focus: End to End)</i></p>
	Degree of Involvement	<p><i>You can solely participate online</i></p>	<p><i>You are encouraged to get more involved by applying for an actual position in the project</i></p>
Incentives	Incentives to encourage process behaviors that facilitate innovation along the way	<p><i>None</i></p> <p><i>No clear IP usage rights/ Subordinated loan</i></p>	<p><i>A percentage of future revenues is retained and linked to contributions</i></p> <p><i>Clear IP usage rights</i></p>
	Incentives to reward campaign funding goals	<p><i>Reward in the form of product, memento of product or appreciation</i></p> <p><i>A fixed share of profits (equity)</i></p>	<p><i>Option to invest since funding happens towards the end</i></p>

Table 6. Comparison of Crowdfunding Participation Architectures

The first difference relates primarily to the participation thresholds that are required for participation on the platform. The participation threshold refers to the investment that

has to be made upfront in order to participate in the crowdfunding campaign. In the case of standard platforms (e.g., Kickstarter, Seedmatch, etc.), supporters usually have to invest in order to participate in co-creational activities such as commenting or voting on the product or transaction (Stanko and Henard 2017). In the case of JumpStartFund, supporters can join conversations without the necessity of spending a dime. Hence, the low participation threshold at JumpStartFund has the advantage that it allows the participation of users who do not want to pledge money but who want to contribute for other reasons. Possible reasons could be that they simply would like to help, be a part of the community or because they want to be a part of making a project happen or come alive (Gerber and Hui 2013; Bretschneider and Leimeister 2017). One positive side effect of this mechanism is that it allows project initiators to attract a much bigger crowd as it does not only focus on investors but appeals to a much broader crowd of supporters. In addition, such a design allows participants to be gradually drawn in. This means that users who initially participate by providing ideas might be transformed into investors as the campaign progresses and their ownership feelings towards the project increase. The same is true for the participation threshold of support seekers. Thus, usually, support seekers who use conventional platforms have to pay fees that range from four to nine percent of the amount funded and are dependent on the success of the campaign (Mitra 2012). In the case of JumpStartFund, everybody has to pay a fee. However, this fee (i.e., US\$10) is not dependent on the amount being raised and is, thus, relatively small in comparison with the fee of conventional platforms.

The second difference relates mainly to the resource exchange that is afforded by platforms. Regarding the common crowdfunding platforms, idea development and refinement is rather the exception than the norm (Majchrzak and Malhotra 2013; Mollick 2014). Thus, most of the communication taking place on these platforms is usually conducted in the comment and update sections or via social media such as Twitter (Thies et al. 2014). One problem with these communication channels is that they are designed in a way that they allow users to contribute and communicate only through short comments and bilaterally. This in turn inhibits efficient communication with the support seeker and leads to only minimal collaboration among supporters. In the case of JumpStartFund, the platform provides a more flexible architecture to exchange resources related to a project. Hence, people are encouraged and enabled to share their ideas and solutions multilaterally in various forms. They can share their ideas and solutions with each other as well as upload their ideas and concepts in different formats, such as text documents, videos, and sketches. This allows individuals to build on ideas

and to collaborate more effectively since implicit knowledge can be externalized in more efficient ways (Nonaka et al. 1996).

The third main difference relates to the participation structure of the platform. On conventional crowdfunding platforms, participation is mainly structured in a linear way. This becomes most obvious when looking at the comments section where communication is structured in the form of a linear list. One problem with this structure is that comments rarely seem to follow or revolve around a certain topic and if they do, they do so only for a limited amount of time (i.e., until a remote post guides the conversation into a different direction). JumpStartFund provides a more structured approach for supporters and support seekers to collaborate. Thus, besides having a random comments section which can be used to announce news and updates, the platform also features a structured comments section that revolves around certain topics (i.e., mostly problems that need to be solved). The structured comments section features a keyword search function that allows users to easily find topics they are interested in and to which they feel confident to contribute. Moreover, this structuration feature allows individuals to take up and evolve earlier ideas more purposefully. Thus, JumpStartFund's participation structure allows the formation of sub-communities of experts around certain topics and problems and, thereby, fostering the interaction and collaboration of like-minded individuals. Another feature of the participation structure is that JumpStartFund employs a multiple stage gate approach that encourages end to end development of a solution and delays funding towards the end of a campaign cycle. This is in contrast to other platforms that at most offer one validation cycle prior to funding or require a company to start with the funding right away. This means that with the start of a campaign, a support seeker usually only has a limited amount of time to reach their funding goal and, hence, to engage with the crowd. In the case of JumpStartFund, a support seeker has to undergo different stages within the campaign which leaves them with more time to continuously develop their business with the crowd.

The fourth difference mainly relates to the degree of involvement afforded by the platform. On conventional crowdfunding platforms, participation beyond funding and commenting is rarely encouraged. This often results in a very low degree of involvement, which is usually characterized by a single or a limited number of contacts (i.e., when people transfer money or leave a comment). JumpStartFund, besides providing its commentary and community spaces, provides a special form of contact

that allows users to apply for permanent jobs related to the project. In doing so, the contact form provides users with the option to become an actual co-worker in the project that is paid via stock options. Hence, JumpStartFund grants people a higher degree of involvement than comparable platforms.

The fifth difference mainly relates to the incentives that encourage process behavior among users to elicit innovative outcomes. This relates to incentives that do not reward people for a definite end goal (i.e., in the case of conventional crowdfunding platforms this end goal is funding) but considers incentives that are offered for smaller contributions along the way (Majchrzak and Malhotra 2013) and that are supposed to spur innovative behavior among users. While conventional platforms usually lack such incentives (i.e., they only reward financial contributions), JumpStartFund allows companies to employ special incentives that aim to spur more innovative behaviors among users. For example, a fixed share of future revenues (i.e., 10%) can be reserved for community members that answer questions, vote, provide feedback and ideas and engage in other co-creational activities with the aim of helping to develop the company that is seeking support. Apart from that, JumpStartFund provides contributors with clear rules of exchange for intellectual property rights (Hagedoorn and Zobel 2015; Zobel et al. 2017). This is in contrast to other platforms, which may inhibit innovative user behavior by failing to provide adequate information on property rights as well as by employing mechanisms that prevent a fair remuneration of user risks (e.g., subordinated loans) (Klöhn et al. 2016).

The sixth and last difference mainly relates to incentives that reward the end goal of a campaign¹ (i.e., funding). Since JumpStartFund employs a model that delays funding towards the very end, funding represents not only a means to an end but becomes a reward on its own. Hence, JumpStartFund allows companies to offer, as a reward, an option to invest in the company. This is in stark contrast to crowdfunding platforms like Kickstarter and SeedInvest who most commonly employ incentives in the form of non-monetary rewards (i.e., a product, a memento or mere appreciation) or monetary rewards (i.e., a share of the profits) to attract investors to fund their projects.

¹ This constitutes the reward scheme most commonly employed by platforms on the likes of Kickstarter and SeedInvest.

5.2.3.2 The Campaign: Hyperloop

The Hyperloop project was initially proposed by Elon Musk in the year 2013 (Musk 2013) and proposes a new mode of transportation that is composed of a tube or system of tubes through which a pod can travel free of air resistance or friction. The main problem the Hyperloop tries to solve is that of overpopulated highways and cities by proposing a faster mode of transportation (Hyperloop Transportation Technologies 2014). The idea was later taken over by Dirk Ahlborn and Bob di Gresta who decided to realize the Hyperloop. To this end, they founded Hyperloop Transportation Technologies (HTT), which employs a core team of 200 full-time workers, and set up the platform JumpStartFund, which accommodates a large community of crowd supporters (approximately over 500 supporters). Next, I am going to analyze the case of the Hyperloop, which was the first campaign ever conducted on JumpStartFund. I do so to get a better understanding as to how the above discussed participation architecture allows the engagement of a crowd of supporters to help solve common problems associated with the realization of the Hyperloop. To this end, I analyze the campaign content as well as the case documents of the project.

The analysis of the platform content revealed that people were eager to provide feedback in various ways and forms. While a high number of posts revolved around how great the idea is and how this idea helps supporters deal with their daily problems, the data shows that users also engaged in more active forms of feedback. Thus, not only did user posts reconfirm the offer that is made by the Hyperloop, but users also suggested how the offer of the Hyperloop could be extended or improved.

“I travel 75% of the time for work. Even with all the perks I can muster, flying is still tiring. I'd love to have this as an alternative when I'm criss crossing the country. I'm so in”.

“As far as routes in Alabama go, please consider Birmingham in addition (or as opposed) to one in Montgomery. The Birmingham metro area has a population over 1 million. Montgomery, despite being the state's capital, has about 1/3 the population. See http://blog.al.com/wire/2014/03/alabamas_fastest_growing_metro.html”.

“I'd suggest creating a better connection for Texas and Oklahoma to reach Colorado and Utah. The way it's mapped out now, you'd have to go all the way to Chicago and then west, which doesn't make a whole lot of sense to me...”.

Other examples of active feedback include questions that are specifically aimed at validating the concept of the Hyperloop. One user, for example, was particularly concerned with the safety of the proposed concept and posted the following questions:

1. How would the commuters exit the Hyperloop should fire break out?
2. A train travelling at 800 mph (assuming the “train” is travelling at peak speed) would leave none of the travelers alive should the "brakes" fail at the terminal. I know there might not be a head-on collision since each loop would carry one vehicle. Are there any failsafe systems to deal with this rare phenomenon?
3. Would travelling by this method be enjoyable since the travelers would not enjoy fresh air or the surrounding scenery of nature and people?

That active feedback in the form of user validation that plays an important role in the business model of JumpStartFund can also be derived from keynotes of Dirk Ahlborn (i.e., CEO of Hyperloop), who on several occasions mentions the importance of “*users who ask the right questions*”.

“Everybody I have talked to, every scientist said yeah in theory you can do this. So we started out with not caring what anybody said and worked on a feasibility study. But even after that there were always questions coming up...We liked that actually. So anybody who has a doubt ask Dirk. Because those are the things that make us work better. We can check if there is something that we have not looked at or if there is something new (SXSW 2016)”.

“So in our case you want to crowdstorm with a community, you want to ask questions, people can join the team, they can tell us their ideas, their opinions. And its asking the question that makes the difference (SXSWECO 2015)”.

In one instance, Dirk Ahlborn mentions how he validated the routes of the Hyperloop. He, thereby, takes up the example of the route connecting Phoenix and Albuquerque which HTT included in its feasibility study that it crowdsourced with the community.

“We were three times on TV in Albuquerque because Albuquerque was on this map [i.e., the map that was part of the feasibility study]. And people started discussing Hyperloop, Albuquerque and Phoenix. And that is exactly what we wanted. We had some assumptions and we wanted to hear if the people who are actually living there, what is

their opinion...Every time a nay sayer makes a comment we actually look them up, we follow those and take them very serious (Tech Open Air 2015)”.

Further examples show how users engaged in even more active feedback by elaborating on and discussing new technological solutions such as, for example, how to best reduce the friction between the Hyperloop track and the Hyperloop train (e.g., possible solutions include wheels, air bearings, and maglev as well as other forms of levitation).

“A combination of air bearing and quantum levitation makes sense to me for the following reasons; with track inside sandwich only outer shell would take weight, quantum levitation will enable the setting of capsule rotation for cornering and Coriolis, air intake/compression/exhaust will still be needed to obtain speed, air skis are not viable as a support method at stations (no air supply) but levitation is...Thoughts?”.

Another user discusses the solution for a more efficient cooling system of the Hyperloop.

“Cooling is an essential feature in all power devices, but in a near-vacuum with virtually no heat transfer, it becomes a serious challenge...One proposal is to use ice...A better way is to use the water for cooling, and simply dump the steam in the tube. We could use simple evaporators to cool each heat source. The pod would carry 300 litres of water, which ends up the tube as steam, and is then pumped out of the tube at 0.1 kPa into condensers at 4 kPa...There is a real bonus to using steam (water vapour) in the tube instead of air. The speed of sound of steam is 24% faster than air, so there is a useful reduction in aerodynamic drag and Kantrowitz problems”.

Even more, some users engaged in the production of full-fledged solutions to various problems related to the realization of the Hyperloop. These solutions include concepts, prototypes, and white papers on topics, such as capsule aerodynamics, capsule assembly, capsule types, capsule interior, seating arrangements, hovering and propulsion (air, magnetic levitation, and wheels), compressor type (steam vs. air), tube material and construction, tube orientation, pylon design, safety and reliability, station design, luggage handling, route selection, and environmental impact. Most of these solutions can be found on Hyperloop’s open access database that was also created by the community².

² see <https://archive.org/details/hyperloopdatabase?&sort=-downloads&page=2>

Additionally, the analysis of the materials further revealed that people were really eager to participate more actively in the realization of the Hyperloop. Thus, a variety of posts was related to the fact that people wanted to become full-time members on the project. In their posts, people were asking what positions they could apply for and what qualifications are being sought.

“Hello sir, am a graduate of Computer Science, a dynamic and technology enthusiast...Hence, I so much believe in this vision and I have been following it from the very day the theory came out and am eagerly looking forward to be part of this...kindly grant me the opportunity to be part of your team to Change the World”.

“Hello Sir, I am a Civil Engineering student from India and I am graduating this year in June and I am eager to be a part of this revolution. Can you tell me how can I help in this? Eager to know”.

Furthermore, the platform data reveals that people with a variety of skills were interested in becoming full project members; some of whom even indicated that they would be prepared to quit their day job in order to become a full-time worker for HTT.

“Hey everyone...I'm the Head of Product at Beacon, the Uber meets Netflix for private jet travel. And previously led product at Spotify...Seems like I can have an immediate help on the Hyperloop Website and make it more up to date, informative and attractive”.

Professional Architect and Designer – I am a professional architecture and landscape designer...I believe I can help create an attractive Hyperloop.

I want to change careers to be involved with something like this. I am considering electrician, electronics technician, industrial design, or engineering technician. How many jobs for each of those do you think will be created?

That people were highly motivated to join HTT is also remarked by Dirk Ahlborn.

“...not only did they say you guys should do this but they said I want to do this I want to be part of this. So we incorporated a company...and then said everybody who would like to work on this in exchange for stock options...please apply. We got more than 200 applications, got a team together of 100 engineers (SXSWECO 2015)”.

The importance of building up a committed workforce and a community of supporters is also acknowledged by the founders. They, thereby, argue that acquiring resources in the form of human capital (i.e., expertise and skills) should be put first (i.e., human capital should be acquired before acquiring financial capital).

“By building up a community you have people that can help you get to where you need to go. You do not need funding necessarily right from the beginning but you need other resources, you need ideas you have to figure out if what you are building actually makes sense, you need to monetize and all these things can be done with a community (Plug and Play Tech Center 2015)”.

“I am saying this because I have worked with a lot of entrepreneurs and people always think that they need money to start big things. We are a proof that it is not like that... Get other people involved and passionate about and most importantly ask. Cause strangely as soon as you ask someone, hey can you help me, a lot of times they actually do. So we got more than \$12000000 in worth of Right of Way that came right from our community (SXSWECO 2015)”.

5.2.4 Findings

Based on the above overview of the empirical material, I now discuss the meaning of these findings and derive a new crowdfunding model that, due to its characteristics, I label as co-creation-based crowdfunding. Co-creation-based crowdfunding can be considered a highly active crowdfunding model as it fosters the deep and continuous involvement of users. Next, I compare it to standard crowdfunding models like Kickstarter and SeedInvest that allow user integration only to a certain extent, despite being active crowdfunding models.

From my results, I deduce that co-creation-based crowdfunding differs in three important aspects from standard crowdfunding models. The first main difference relates to the participation architecture of my model that can be divided into interaction design and incentives to encourage innovative process behaviors. Regarding the interaction design, co-creation-based crowdfunding provides supporters with the opportunity to flexibly exchange resources (i.e., through supporting multiple formats) multilaterally as well as to become deeply involved in the development and evolution of a certain business (Le and Tarafdar 2009; Richter 2015). To encourage this deep involvement, the model provides mechanisms that allow supporters to apply and become fulltime

workers in a business. This contrasts with other crowdfunding models that allow only bilateral interactions through simple comments and update functionalities as well as rating mechanisms that allow only minimal involvement of supporters. Furthermore, standard crowdfunding models allow only bidirectional interaction among supporters (i.e., usually they allow interaction between the support seeker and the support giver but not between individual support seekers). Regarding incentives to encourage innovative process behavior, co-creation-based crowdfunding offers clear information about IP usage rights. Additionally, co-creation-based crowdfunding makes use of profit-sharing mechanisms that allow the community of crowd supporters to participate in a project's future revenue, based on their contribution. This contrasts with other models that employ more passive mechanisms. For example, reward-based and donation-based models employ mechanisms that are based on recognition and appreciation. Similar mechanisms are employed by lending-based and equity-based models that make additional use of subordinated loans and self-disclosure statements in order to foster trust among potential supporters. Thus, the mechanisms employed by these models differ from co-creation-based crowdfunding in that they are more tentative. Another difference is that they do not specifically aim to encourage innovative process behaviors but are rather designed to encourage additional investments.

The second main difference relates to the parties involved in the crowdfunding initiative. In the case of co-creation-based crowdfunding, the community is composed of supporters with various capabilities and expertise. This contrasts with standard crowdfunding models that address mainly capital contributors (i.e., investors, sponsors, or lenders) or potential customers of a particular business. Additionally, co-creation-based crowdfunding also allows the inclusion of external investors, meaning that a support seeker can collect funds from the crowd as well as from institutional investors (i.e., Business Angels and Venture Capitalists).

The third main difference relates to the exchange relationship between support seeking and support giving agents. Co-creation based crowdfunding allows supporters to exchange value more flexibly. Thus, it allows supporters to not only contribute via funds but also through active feedback and work. Active feedback, thereby, denotes a type of feedback that goes beyond simple statements conveying if somebody likes an idea or not. Rather, active feedback can be considered as a more proactive form such as feedback that is aimed towards deconstructing or validating a certain concept (e.g., specific questions about the feasibility of a certain project or business). Another example

is feedback in the form of proposed solution knowledge (e.g., feasibility studies, white papers, and prototypes). This type of feedback provides enhancement, modification, or new perspectives to inform and guide solution seekers on how to tackle specific problems. Furthermore, as the participation architecture of my model allows the hiring of valuable talent, it also promotes the exchange of work. In doing so, it allows a company to crowdsource expertise and skills that are required to solve complex tasks and to get a business going. Figure 11 provides a comparison of my model with standard crowdfunding models.

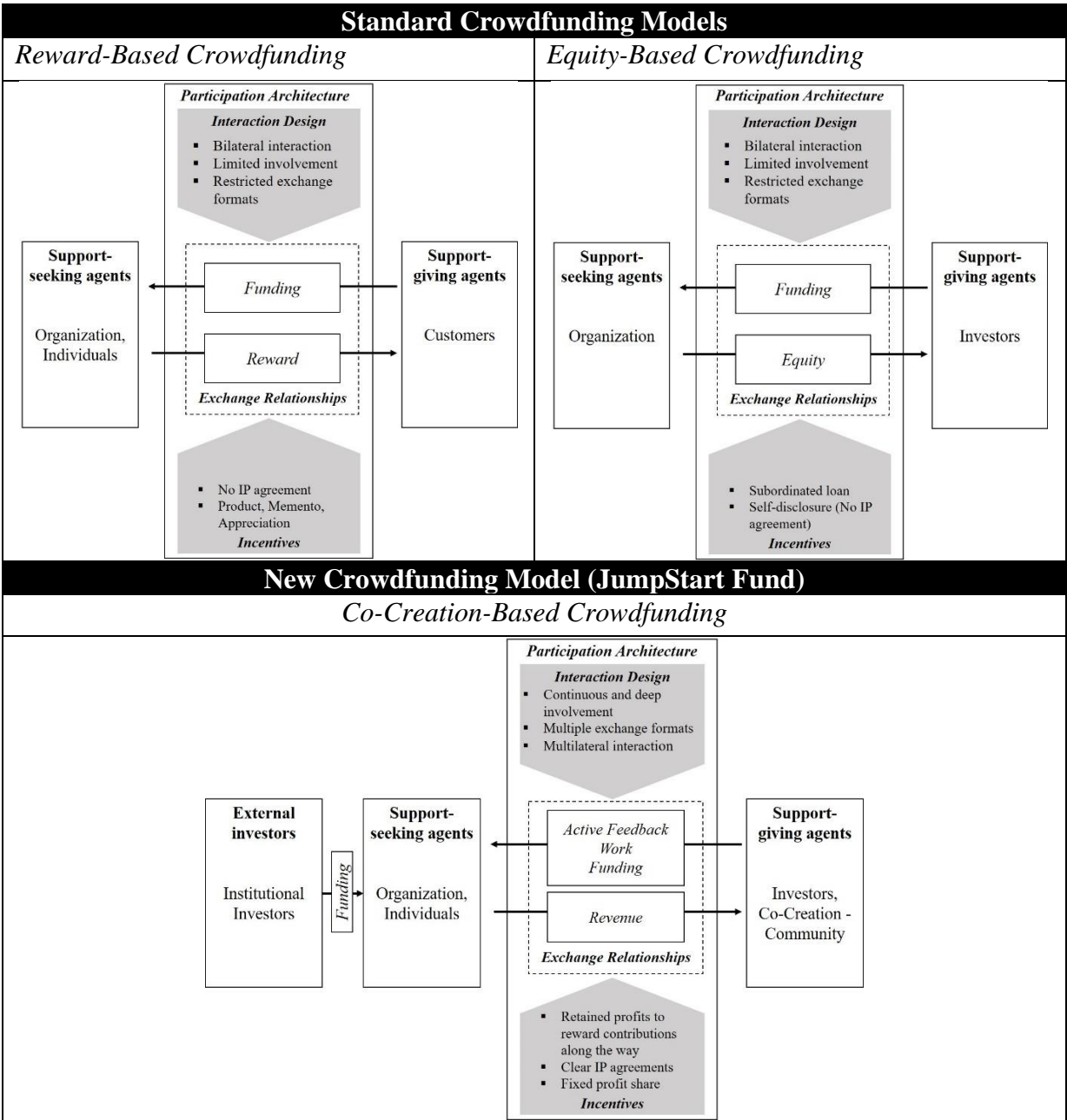


Figure 11. Co-Creation-Based Crowdfunding vs. Standard Crowdfunding Models
(Source: Own depiction)

5.2.5 Conclusion and Implications

In this section, I discuss the findings and implications of my research in more detail. First, my results outline a new crowdfunding model that is more inclusive and dynamic in the sense that it allows entrepreneurs to leverage the resources and competences of a larger crowd of people throughout multiple stages with the aim of iteratively developing their business (Richter 2015). By doing so, I show that my model differs from most common crowdfunding models, which primarily employ selective strategies to distinguish between start-ups that are worthy of financial support and those that are not. One implication of my findings is that further research is needed to explore this interesting field and to extend my knowledge on how more flexible crowdfunding models can be leveraged to fully support a business' needs.

Beyond introducing a new crowdfunding approach and drawing attention to an interesting research topic, in the domain of crowdfunding the proposed model might also have considerable implications for entrepreneurial success within the context of crowdfunding. Thus, the close integration of users has the potential to solve some of the issues that are constituents of current crowdfunding models (Lehner et al. 2015). One example is information asymmetries (Haas et al. 2014), which refer to the fact that one side (most often the crowdfundees) lacks the information to make an informed investment. The proposed model has the potential to reduce information asymmetry as well as information cascades as it allows the inclusion of various experts' views, who, other than investors, may base their decision to support a company not only on the financial prospects of a business but rather on its actual feasibility. This is likely to result in more valid confirmatory or dis-confirmatory information on a business' success potential and, hence, encourage more sensible investment decisions. Moreover, since the new crowdfunding model is designed so that most information accrues before the actual funding stage, it can help companies validate their business models before committing excessive resources to an idea with limited merit. Finally, the proposed model might be more conducive to the development of companies. Thus, companies can use this model to integrate external competences and resources that are needed to conduct their business successfully. Overall, this might result in the development of more sustainable businesses that are capable of delivering their offers more effectively (e.g., without delay) and, thereby, redefining entrepreneurial success in crowdfunding. (Becker et al. 2015).

Apart from that, the results of this paper also have important implications regarding current crowdsourcing research (West et al. 2017). Thus, in line with existing research, my findings imply that complex problems require different and more open forms of crowdsourcing governance (van de Vrande et al. 2006; Afuah and Tucci 2012; Felin and Zenger 2014). This is highlighted by my case of the Hyperloop, which constitutes an example of a large-scale project whose implementation depends on solving a variety of complex interrelated problems that concern different areas of the project (i.e., technological, legal, and economical areas). To address these problems, the founders of the Hyperloop make use of a platform that features a unique participation structure and facilitates extensive knowledge sharing among different actors of the platform. In doing so, the crowdsourcing model employed by the platform guides entrepreneurs not only in their search for solutions but also offers them decisional guidance. Moreover, the proposed model might be particularly conducive to the generativity and the recombination of knowledge creation that is needed to create more efficient crowdsourcing systems (Majchrzak and Malhotra 2013).

5.2.6 Limitations and Future Research

My research is limited by the fact that I employ a single case-study design. Hence, I feel that it is important to note that my findings are very specific to the described case and, therefore, only generalizable to a limited extent (Lee and Baskerville 2003; Thompson 2011; Tsang and Williams 2012). As a result of this, the interpretation of my findings has to be considered carefully. While I imply that my model might be especially suited to help start-ups with the development of large-scale projects, I am aware of the fact that my case number is currently too small to fully support a definite conclusion like that. Hence, further research is needed to explore for which types of businesses and situations my proposed models work best. Another interesting research avenue might concern the managerial implications of these new types of crowdfunding models. Thus, despite the advantages that may be associated with this more dynamic and interactive crowdfunding model, it is also likely to impose new managerial challenges for companies. Thus, the use of this model supposedly requires significant changes in a start-up's mindset as well as in its managerial capabilities. Hence, future research should address the topic of how companies can effectively orchestrate and manage this new type of co-creation-based crowdfunding. Despite the limitations of my research, I believe that my crowdfunding model provides crowdfunding platforms with a promising development path towards a more holistic support environment for start-ups (Le and Tarafdar 2009; Brem et al.

2017). Moreover, I am convinced that further research in this area (i.e., new crowdfunding models) is very likely to provide additional insights to improve and create entirely new crowdfunding systems with added value. Hence, I invite IS researchers to contribute to this exciting new research area.

5.3 Designing Crowdfunding to Co-Create Products with Customers

The findings of this section are under review (2nd round) at the International Journal of Business & Information Systems Engineering as Lipusch, N., Dellermann, D., Bretschneider, U., Ebel, P., & Leimeister J. M. This study employs a DSR approach to design a new crowdfunding information system and to explore its effects on human psychology and behavior. To this end, the study employs an experiment.

5.3.1 Introduction

Crowdfunding has gained considerable popularity in recent years. One of the most popular types is reward-based crowdfunding, in which people can invest money in a venture in exchange for a non-monetary return (Kuppuswamy and Bayus 2015). Interestingly, more and more startups use this form of crowdfunding to showcase their product prototypes to potential customers and to collect money for developing and launching these product prototypes. Despite this trend, relatively little is known about how entrepreneurs can use reward-based crowdfunding to systematically integrate users in their product-development activities. This is peculiar given the fact that crowdfunding, like crowdsourcing, offers great potential for co-creational activities (Majchrzak and Malhotra 2013) between entrepreneurs and backers (i.e., funders of crowdfunding campaigns). This is also supported by research, which suggests that crowdfunding can be used to validate ideas with customers (Mollick 2014; Belleflamme et al. 2014). This is enabled through IT functionalities inherent to crowdfunding platforms that allow entrepreneurs to visually present their business ideas (e.g., video uploads) and to communicate with potential customers (e.g., updates and comments). Further research shows that campaigns that actively engage backers lead to a company's heightened focus on radical product development, thereby significantly affecting the product's future market success (Stanko and Henard 2016, 2017). Despite the evidence that co-creational activities with backers might benefit a company's market success, most research still revolves around crowdfunding's capability as a funding mechanism, thereby neglecting its vast potential as a mechanism for product development.

Because of this, relatively little is understood about how crowdfunding platforms must be designed in order to encourage and foster backer participation in innovation activities such as the co-creation of new products. To address the aforementioned "research-/design -gap" and to examine this phenomenon in more detail, I employ a DSR approach (Hevner and Chatterjee 2011) that aims at designing an IT artifact to encourage co-creation behavior of backers. To create my design, my study applies psychological

ownership theory (Pierce et al. 2003). Accordingly, I address the following research question:

How can new crowdfunding platforms that facilitate backers' co-creation engagement for developing new products be designed?

To answer this question, I 1) set the context of this study by reviewing current literature on crowdfunding and co-creation to define crowdfunding co-creation, 2) determine meta-requirements from the definition of crowdfunding co-creation, 3) derive a meta design to address my requirements based on knowledge drawn from psychological ownership theory, and 4) develop and evaluate an artifact (i.e., design elements) according to this design.

The main contribution of my study is threefold. First, I introduce the concept of crowdfunding co-creation to develop reward-based crowdfunding from a mere method of financing to a more holistic approach for product development. In doing so, I consider crowdfunding platforms as adaptable and evolving artifacts that offer room for improvement (Zhao and Zhu 2014). Second, my design approach contributes to methodological advances in DSR (Niehaves and Ortbach 2016) by establishing and examining a link between the design of my artifact, its effect on human psychology and how this relates to co-creation behavior (i.e., my design goal). Third, this research provides the first examination of individual crowdfunding behavior by examining psychological antecedents to crowdfunding co-creation.

5.3.2 Theoretical Background

5.3.2.1 Current Crowdfunding Research

Crowdfunding has received substantial interest from academics as well as practitioners in recent years (Mollick 2014; Kuppuswamy and Bayus 2015). Most research distinguishes four types of crowdfunding models, which are donation-, reward-, lending-, and equity-based crowdfunding (Bradford 2012; Griffin 2013). The main difference between these crowdfunding types concerns their exchange conditions (i.e., what investors get in return for their investment) as well as the purposes for which they are used. For example, in donation-based crowdfunding, donors are usually not rewarded through a financial or material return, which is why this type of crowdfunding is mostly applied to social or philanthropic projects (Meyskens and Bird 2015). On the other hand, in equity- and lending-based crowdfunding, investors obtain a financial

reward either in the form of interest or a holding in the company (Mitra 2012; Giudici et al. 2012). Because of this, these crowdfunding types are commonly used for commercial purposes such as granting users or companies a loan. The type of crowdfunding that has received most research interest so far is reward-based crowdfunding. Reward-based crowdfunding differs from the other types of crowdfunding in that it rewards users with non-monetary rewards. These non-monetary rewards can take on various forms, such as the product that is advertised by the campaign, mementos of the campaign, invitations to events and the appreciation of supporters (Thies et al. 2014). Entrepreneurs can use this flexible reward scheme to pre-sell³ their products and services as well as to determine customers' preferences and willingness to pay for certain services and products (Mitra 2012; Belleflamme et al. 2014). Because of these unique properties, reward-based crowdfunding is often used by companies that develop new products and services for B2C markets.

Current research on crowdfunding mostly revolves around three major topics, i.e., success factors, user motivations and the intermediary role of information technology (e.g., platforms) in reward-based crowdfunding. The biggest research topic is mainly concerned with investigating success factors of reward-based crowdfunding. For example, a study by Mollick (2014) shows that an entrepreneur's probability of successfully raising money via crowdfunding is dependent upon factors such as project quality and the size of the entrepreneur's social network. Further research suggests that crowdfunding success is positively related to the use of interactive media, such as videos (Mollick 2014), regular use of updates and comments (Kuppuswamy and Bayus 2015; Clauss et al. 2018) and the use of social media (Mollick and Kuppuswamy 2014; Thies et al. 2014; Lukkarinen et al. 2016; Courtney et al. 2017). Another research topic is mainly concerned with motivations in crowdfunding. Popular examples include research by Gerber et al. (2012) and Bretschneider and Leimeister (2017), who can show that backers in crowdfunding are motivated beyond financial return and participate in crowdfunding for reasons such as to help others or to be part of a community. The third research stream is mostly concerned with the intermediary role of crowdfunding platforms and how they manage interactions between different platform actors. A popular example is the research by Haas et al. (2014), who show that crowdfunding platforms have an important role in mediating transactions between capital seekers and

³ Pre-selling refers to a process where users/ backers can acquire the rights for a certain product or the rights associated with a certain product (i.e., the product itself or the rewards discussed earlier) even before it has been produced.

capital givers. Similarly, research by Cumming et al. (2015) shows that IT mechanisms are crucial in efficiently managing information and risk between entrepreneurs and backers.

One thing that all the afore-mentioned research has in common is that it conceives crowdfunding mainly as a funding mechanism. However, there is more recent research suggesting that crowdfunding offers considerable value beyond funding. For example, Stanko and Henard (2016) suggest that crowdfunding offers entrepreneurs the ability to actively integrate backers into a company's innovation activities (e.g., product development activities). Their research further shows that crowdfunding campaigns that integrate their customers in innovation activities during crowdfunding are more likely to be commercially successful (Stanko and Henard 2017). A similar finding is reported by Brem et al. (2017) which shows that crowdfunding democratizes innovation by allowing companies to integrate customers in the large-scale commercialization of their products and services. While these studies provide initial evidence that crowdfunding can be used to interact with customers for reasons other than funding, there is still relatively little understanding as to how existing crowdfunding infrastructures can be used to systematically leverage backers to co-create new products during crowdfunding.

5.3.2.2 The Co-Creational Potential of Reward-Based Crowdfunding

Co-creation denotes an active, creative, and social process that is based on collaboration (Roser et al. 2013), in which companies seek to transfer innovative solutions from customers to a firm (Seybold 2006; Tapscott and Williams 2008). IT plays a critical role in enabling co-creation. Thus, the web offers new possibilities to design virtual environments in such a way that they increase customers' experiences with a product, thereby easing the process for users to co-create new products as well as stimulating their potential to come up with innovative product ideas (Hippel and Katz 2002; Nambisan 2002; Füller and Matzler 2007).

Virtual Ideas Communities (VIC) are a good example for such virtual environments. VICs, where distributed groups of individual customers and product users focus on voluntarily sharing and collaborating on new ideas, are used by firms as a practice for integrating customers into ideation for new product development (Di Gangi and Wasko 2009; Bayus 2013; Bretschneider et al. 2015). Such VICs provide certain IT functionalities for idea uploading, storage, commenting, and visualization, which means that in VICs customers can post their ideas, vote for presented ideas and comment on

other customers' ideas and thereby help improve ideas in a collaborative manner (Bayus 2013; Bretschneider et al. 2015). Other examples that have been shown to effectively support the co-creation of ideas include toolkits for innovation (Hippel 2001), idea competitions (Schweitzer et al. 2012) and forums (Di Gangi and Wasko 2009).

Since crowdfunding shares a lot of functionalities with the above-mentioned tools – for example, it provides users with functionalities to upload and update their business ideas and to receive feedback on them – I believe that it offers a promising environment for entrepreneurs to collaborate with users on the development of new products. One type of crowdfunding that is particularly conducive to engaging users in such co-creational activities is reward-based crowdfunding (own research). One of the main reasons for this, as I already mentioned earlier, is reward-based crowdfunding's focus on consumer products as well as its flexible reward and selling agreements that allow companies to collect customer preferences before the product goes into mass production. Beyond these characteristics, reward-based crowdfunding also features certain characteristics that differentiate it from other common co-creation methods. In contrast to other co-creation methods that rely on potential customers or proxies of real customers, reward-based crowdfunding allows entrepreneurs to gather feedback on products and services from actual customers (i.e., customers that like the idea or the respective product so much that they are prepared to buy it before it is made available). Furthermore, crowdfunding allows for co-creating in a far more realistic environment. The main reason for this is that crowdfunding revolves around companies with actual prototypes. Also, since crowdfunding allows users to make a preliminary financial commitment, it might provide startups with more reliable feedback regarding customers' actual purchase intentions (Belleflamme and Lambert 2014). This is beneficial compared to other methods such as VICs that exclusively deal with mere ideas. Finally, crowdfunding combines the best of two worlds as it can be used as a tool to collect creative product ideas (Gerber et al. 2012) as well as a tool for product funding.

5.3.2.3 How to Leverage the Co-Creational Potential of Reward-Based Crowdfunding

While reward-based crowdfunding seems to offer a lot of advantages in terms of co-creating new products with customers, its potential in this regard does not seem to be fully utilized by current crowdfunding platforms. This is also reported by current research suggesting that comments and updates are rarely used throughout crowdfunding campaigns. This is peculiar, since current research suggests that the

number of comments is a positive predictor of crowdfunding success (Mollick 2014). Further research seems to imply that the active integration of users – one way to do so could be through more interactive communication – has a significant effect on a company’s market success (Stanko and Henard 2017). Despite this evidence, more interactive co-creational activities have received almost no research attention so far. I believe that functional fixedness is one reason why a lot of companies still fail to leverage the full potential of the crowd and the feedback that comes with it (Adamson 1952). Thus, users of crowdfunding platforms might be fixated on crowdfunding’s purpose as a funding mechanism without considering the possibilities it offers beyond this functionality (Giones and Oo 2017). Against this background, it can be argued that existing platforms fail to create an environment that encourages participants to engage in more interactive co-creation (Nambisan 2002; Füller and Matzler 2007) such as, for example, product development activities. This leads me to propose my first design requirement:

DR1: *Crowdfunding platforms should encourage backers to provide feedback on the products and services of entrepreneurs.*

While active involvement in the form of allowing customers to give feedback serves as an important community benefit it also serves a wider purpose, namely to increase customers’ willingness to pay (Belleflamme and Lambert 2014). Thus, one of crowdfunding’s main benefits and distinguishing characteristics compared to other crowdsourcing approaches is the financial support that emerges from the crowd. For example, Belleflamme et al. (2014) define crowdfunding as an open call to an undefined group of individuals for the provision of financial resources. Thus, in contrast to the broader concept of crowdsourcing, where the focus lies on obtaining solution knowledge from a dispersed crowd of individuals, in crowdfunding the main focus lies in obtaining funds from a dispersed crowd of individuals. It is these funds that put a company into a position to take the actions that are required to solve the problem that is proposed by a crowdfunding initiative. Another advantage of this incorporated funding mechanism is that it allows a company to capture a user’s actual (purchase-) intentions and preferences more accurately (Belleflamme et al. 2014). I thus argue that a study that focuses on co-creation in crowdfunding must evidently capture the element of monetary support. This leads me to propose my second design requirement:

DR2: *Crowdfunding platforms should encourage backers' intention to increase their financial support in a project.*

Combining my two design requirements, I derive at the concept of crowdfunding co-creation that I regard as a dual value proposition, constituting funding as well as feedback. Crowdfunding co-creation thereby represents the design goal that the solution developed throughout this paper must satisfy.

5.3.3 Research Approach

To address the aforementioned design requirements, I pursue a DSR approach (March and Smith 1995; Hevner and Chatterjee 2011). I choose this approach as it has been shown to be an effective method to design IT artifacts that solve real world problems (March and Smith 1995; Peffers et al. 2007; Hevner and Chatterjee 2011). One problem often encountered in the information systems discipline concerns the inefficient utilization of current systems (Doukas et al. 2010). The paper at hand deals with a problem of such kind as it aims to construct and evaluate an IT artifact to facilitate co-creation in the context of existing crowdfunding systems. Therefore, my study follows the general DSR process proposed by Vaishnavi and Kuechler (2004) who distinguish between awareness of the problem, suggestion, development, evaluation, and conclusion. In what follows, I provide an overview of the actions I undertook at each process step as well as their corresponding outcomes (see Figure 12).

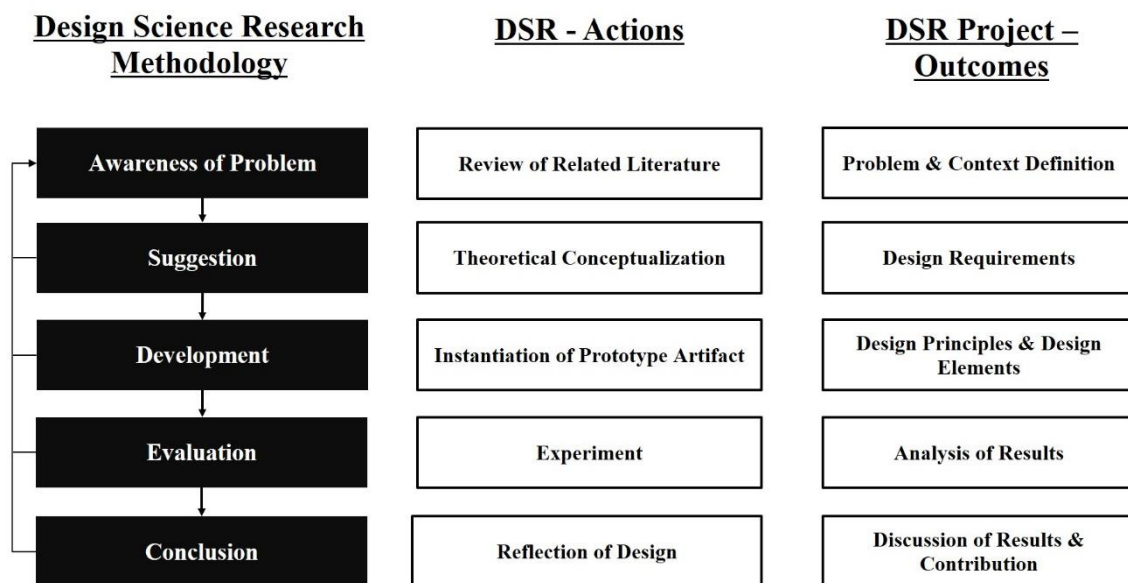


Figure 12. General Design Science Research Approach
(Source: adapted from Vaishnavi and Kuechler, 2004)

In order to create *awareness of the problem* (i.e., my theoretical background), I start my DSR process by reviewing literature on the topic of crowdfunding and by establishing the role of reward-based crowdfunding in the context of other co-creation methods. Based on this, I *suggest* a definition of crowdfunding co-creation from which I derive my design requirements. To arrive at the *development* for a possible solution, I follow a theory-driven design approach. My starting point thereby constitutes psychological ownership, which acts as my kernel theory to explain psychological perceptions and behavior of individual backers. Building on my kernel theory, I discuss three concepts that enhance psychological ownership and match these with solution knowledge derived from related literature to arrive at design principles. The design principles further guide us in the development of a more concrete instantiation (i.e., design elements) of my IT artifact. Finally, I *evaluate* my artifact (i.e., my design elements) in an experiment (i.e., evaluation). I *conclude* my design process by discussing the implications of my design for research and practice. Regarding the evaluation of my design elements, I refer to the framework proposed by Niehaves and Ortbach (2016) (see Figure 13). I follow this approach as it helps us to address a common shortcoming of current DSR approaches, namely to overcome the conceptual gap that is often existent between the design of an artifact and its intended design goal (Niehaves and Ortbach 2016). Thus, while current theory informed design approaches can mostly show that a design has a certain effect, one question that is often neglected by these approaches is “how” these effects unfold. I thereby mainly distinguish between the design model which mostly constitutes cause-related aspects of an artifact (i.e., theories and knowledge used to inform design as well as the actual design), and the measurement model which mainly constitutes effect-related aspects of an artifact (i.e., the outcome of the design as well as how the outcome occurs). Thus, by following this approach, I am not only able to explain how theory helps us to arrive at my design, but I can also show if my design works as intended (i.e., as it was reflected by theory). In other words, I cannot only show how psychological ownership theory informs the design of my artifact (i.e., design elements), but I am also able to explain how my artifact in turn influences backers’ psychological ownership feelings (as operationalized by Avey et al. (2009)) and how these feelings mediate (i.e., the effect) the outcome for which my design is aiming (i.e., crowdfunding co-creation).

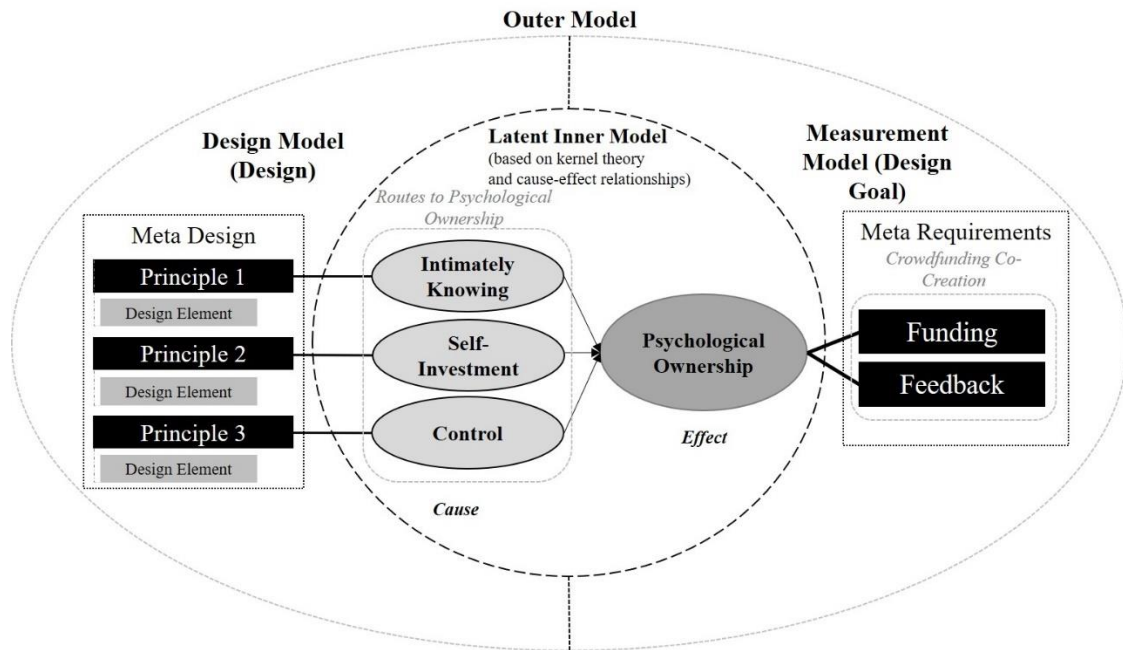


Figure 13. Proposed Research Model
 (Source: adapted from Niehaves and Ortbach, 2016)

5.3.4 Development of a Solution

5.3.4.1 Translating the Concept of Psychological Ownership into Design Principles

To devise a solution that addresses my meta design requirements, I further discuss the design of a new IT artifact that aims at increasing crowdfunding co-creation on crowdfunding platforms as a case. As mentioned before, I define crowdfunding co-creation as a combination of funding and feedback that is provided by backers. Although I argue that crowdfunding platforms offer an infrastructure that would theoretically enable co-creation (see Chapter 5.3.2.2), principles that encourage backers to engage in co-creational activities more frequently are missing. To this end, I draw on the psychological ownership theory (POT) (Pierce et al. 2003) as a guiding concept to inform the design of a suitable solution. I choose this theory for two main reasons. First, psychological ownership has been shown to be an important antecedent of human effort and commitment, driving human behavior in various contexts, among them also the field of IS. Second, psychological ownership might be particularly helpful in the context of reward-based crowdfunding where factual ownership of products is often delayed due to pre-selling agreements. Hence, I believe that psychological ownership offers a promising route to create the ownership feelings that are needed for customers to commit and engage in the co-creation of new products during crowdfunding. Hence, in the

following section, I briefly elaborate on the concept of psychological ownership that I use to derive adequate design principles that help us to progress my artifact toward a more concrete solution (i.e., an artifact prototype that can be evaluated).

Psychological ownership developed as an extension of the endowment effect (Thaler 1980; Kahneman et al. 1991) and suggests that factual ownership of an object is not necessary to elicit ownership feelings toward that object. Consequently, psychological ownership refers to a state of mind or feeling that makes people perceive a certain target as theirs despite not factually owning this target. These psychological ownership feelings in turn have important psychological as well as behavioral consequences. In regards to the psychological effects, people have been shown to strongly identify with and attribute increased value toward objects for which they developed these feelings (Thaler 1980). In terms of behavioral implications, psychological ownership has been shown to be strongly associated with favorable behaviors of workers regarding their tasks and their organization. Research thereby showed that people with high levels of psychological ownership are more likely to engage in extra-role behavior that benefits the organization as well as exhibit more commitment and loyalty toward their organization (Avey et al. 2009). Likewise, literature from the marketing field suggests that psychological ownership feelings lead people to value a product more highly, which is reflected by their higher willingness to pay for such a product (Fuchs et al. 2010). I therefore argue that to address my design requirements (i.e., to increase peoples' likeliness to engage in co-creational activities) on a psychological level, my design must enhance the psychological ownership of backers.

While research seems to suggest that psychological ownership feelings positively influence peoples' behavior, to the best of my knowledge, information on how to systematically design systems that foster such feelings is nascent. In order to develop such a system, I rely on the three main concepts that constitute psychological ownership theory (Pierce et al. 2003), namely “coming to intimately know the ownership target”, “investing oneself in the ownership target” and “controlling the ownership target”.

Intimately Knowing:

The concept of “intimately knowing” relates to the fact that strong ownership feelings toward objects often emerge from a lived relationship with these objects (Beaglehole 1932; Weil 1952). What is meant by this is that people develop strong ownership feelings toward things with which they regularly engage, interact, and associate. In line

with this, it is argued that such feelings emerge as part of an ongoing process of association in which individuals accumulate information about the object to be owned. The more information individuals accumulate about the ownership target, the greater their feelings of ownership and hence the attachment to the object (Rudmin and Berry 1987; Beggan and Brown 1994). Building on this notion of getting to intimately know an object, I argue that a crowdfunding platform must allow users to get to know a campaign's product in order to be motivated to engage in co-creational activities regarding that product. Since the web makes it difficult to "feel, touch and try" (Jiang and Benbasat 2004) a product, it is important to create a virtual product experience (Nambisan 2002). Creating such an experience usually goes beyond consuming information that is single-handedly provided by the creator of the product (e.g., web-based product manuals or videos), but entails discovering the product through multiple and heterogenous information sources. Thus, similar to an online shopping experience, users of a crowdfunding platform must be given the chance to gradually acquire information about a product and compare this information against other information sources. In line with this, I propose the following design principle:

DP1: *New CPs must provide users with rich and multiple sources of a product's information to positively influence crowdfunding co-creation among them.*

Self-Investment:

The concept of "self-investment" (Rochberg-Halton 1980) relates to the fact that I develop strong ownership feelings toward things I do. The most prominent analogy to understanding this concept of self-investment might be the relationship between work and psychological ownership. In this regard, philosophers argue that there is a strong relationship between labor and ourselves in a sense that I feel strongly attached to what I create, shape or produce (Locke and Laslett 1988). Since labor entails my physical and psychologic effort as well as a certain time investment, the outcome of my labor contains much of ourselves, which naturally leads individuals to develop high ownership feelings toward these outcomes. However, self-investment not only refers to work-related outcomes, but can also take on several other forms such as investing thoughts and ideas in an object. Building on this idea of self-investment, I argue that it is important that crowdfunding platforms enable forms of self-investment to positively influence the co-creational efforts of users toward a certain product. Therefore, I argue that crowdfunding platforms have to act as "engines for creation" (Ondrejka 2007). This means that

crowdfunding platforms need to be interactive (Williams and Cothrel 2000; Kohler et al. 2011) in a sense that they encourage co-creation behavior among users. This is especially important in crowdfunding systems where users often do not perceive the opportunity to create value beyond funding (Giones and Oo 2017) (see Chapter 5.3.2.1). Consequently, new design elements of crowdfunding platforms have to encourage users to engage in co-creational activities beyond funding. This leads us to propose the following design principle:

DP2: *New CPs must provide ways to encourage users to state their preferences, thoughts, ideas, and feedback on the campaign's product to positively influence crowdfunding co-creation among them.*

Control:

The concept of “control” relates to the fact that ownership feelings often emerge toward objects that I exert control over (McClelland 1951; Furby 1976; Compeau and Higgins 1995). Furby (1976), for example, remarks that the more people can exercise control over an object, the more they perceive the object as part of themselves. This notion is also supported by early research indicating that objects that can be manipulated are more likely to be regarded as part of the self than objects for which this is not the case (McClelland 1951; Prelinger 1959). Building on this notion of control, I argue that crowdfunding platforms must not only enable and encourage co-creation, but need to make users feel that they are in control of the outcome of their co-creation process (Nambisan 2002) in order to motivate their participation. While it can be argued that self-investment might promote such feelings of control among users, this must not necessarily be the case. This can have several reasons. For example, users might feel that they cannot influence the ultimate outcome of their co-creation activities. Thus, just because people are provided with the opportunity to give feedback does not mean that their feedback is adequately acknowledged by the company that is seeking feedback nor that it is integrated into the company's product. To address this problem, new design elements of crowdfunding platforms must allow users to effectively participate in decisions regarding the product design (Bandura 1997). In line with this, I propose the following design principle:

DP3: *New CPs must allow users to effectively participate in decisions influencing the final product outcome to positively influence crowdfunding co-creation among them.*

5.3.4.2 Design Elements to Address My Design Principles

In order to address the first design principle, the crowdfunding platform must provide future backers with multiple and heterogenous sources of information about the startup's products to allow users to get to intimately know their offering. However, as startups typically do not have a long-standing history, very little information about the startup's offering is publicly available. This leads to the users of existing crowdfunding platforms depending on the information provided by the founding team, which naturally results in a very one-sided and narrow presentation of the start-up's offerings which is problematic. Even in cases where initial reviews or reports on the start-up's products are already accessible on the web, these are not made available in a consolidated manner on existing crowdfunding platforms. Consequently, one problem of existing crowdfunding platforms is that potential backers hardly ever get the opportunity to intimately know a start-up's offerings. This in turn results in high perceived risk and information asymmetry which in turn inhibits the probability for successful crowdfunding co-creation. One way to solve this problem is through using external product reviews,⁴ which are integrated into the crowdfunding platform. To implement these product reviews, I provided users with a summary of product reviews that were taken from external websites and users. The summaries were accompanied by the actual source of the reviews as well as a short rating that displayed the general sentiment of the review.⁵ Such product reviews allow users not only to draw on additional, less biased information, but they further allow them to experience products through other perspectives and to acquire gradual and more holistic information of the product (Chen and Xie 2005; Zhu and Zhang 2010). This marks an important pre-condition for people to become familiar with the product, thereby fostering their ability of engaging in product feedback (Dahan and Hauser 2002).

To address the second design principle, crowdfunding platforms have to provide users with the opportunity to state their preferences, thoughts, and ideas on the campaign's product, in order to allow them to become emotionally invested in the product. To achieve this goal, existing crowdfunding platforms provide their users with comment functionalities that allow users to leave any feedback. The problem with these comment functions, however, is that they are rarely used. In other cases, they are not used in a

⁴ These product reviews can be provided by early users who had the opportunity to test the product before others or by special communities who, due to a thematic interest report, review certain new products.

⁵ This was done to account for users who are likely to skip textual information and focus more on visual cues such as ratings.

systematic way. This means that companies do not use these functions to acquire targeted information about their products. Rather, they let users decide on their own how to make use of these comments which often results in "unsolicited information" (e.g., complaints without a concrete solution information, etc.). Hence, to promote the exchange of relevant solution information, new approaches are needed that encourage users to provide more specific feedback on potential products (e.g., the exact features a product must contain). One specific way to address this shortcoming is participatory updates. Participatory updates are used to ask customers about their preferences regarding a product (Piller and Walcher 2006; Leimeister et al. 2009). By doing so, they differ from conventional updates which are mainly used to keep users informed about the company's progress without giving them the chance to engage in specific feedback on a product. To implement my participatory update, I provided users with an interactive prompt that calls them to action and that allows them to openly contribute their ideas through a text form. To ensure that users can contribute purposefully and to prevent users from providing feedback that is too arbitrary, the interactive prompt was accompanied by an instruction that made clear on which aspect feedback was sought. In particular, I asked users which additional features they would like to have integrated into the product. This stands in contrast to conventional crowdfunding platforms, where users can leave behind arbitrary comments but are not asked for specific feedback.

To realize the third design principle, crowdfunding platforms should provide users with the opportunity to effectively participate in decisions that influence the final product outcome. This means that it is not enough to give users the opportunity to contribute their ideas and thereby become emotionally invested in a certain product. Rather, it is also important to convey to users that their contributions are valued by the company by showing that they have an actual effect on the design of the final product. This is often difficult to achieve through conventional IT functions such as comments. Thus, while comment functionalities allow users to openly post their ideas not every user idea will find its way into the final product. One way to counteract this problem is to provide users with a voting mechanism that allows them to choose among a selected list of features or design decisions that are going to be implemented in the final product. In this way users are given the possibility to control the final product outcome even though their specific ideas might not be considered in the final product. To implement such a selective voting mechanism, I provided users with a drag and drop system which they could use to rank a list of pre-selected product features according to their preferences. This tool was used to allow users to democratically vote on product features, the three

most highly ranked of which, they were told, would be incorporated into the final product. My voting mechanism contrasts with more generic voting systems found on crowdfunding platforms in that it allows users not only to vote on binary outcomes such as if they like a certain campaign or not but to engage in more complex decision processes (e.g., deciding on the design of the product). Prior literature shows that engaging people in such decisions promotes feelings of self-efficacy which in turn positively influences people's use and contribution behavior (Stone and Henry 2003; Jiang and Benbasat 2004). An overview of my complete design is provided in Table 7.

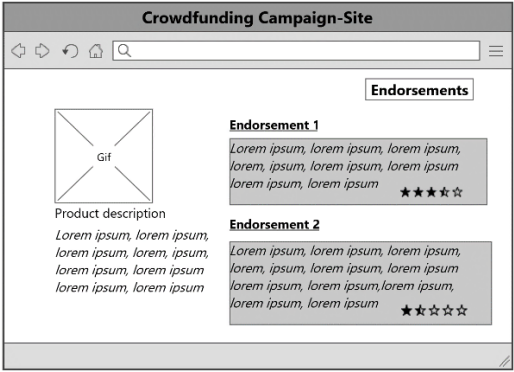
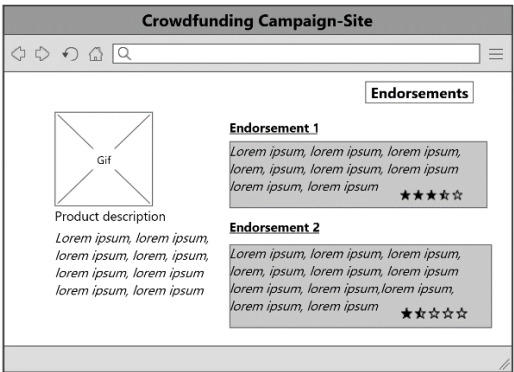
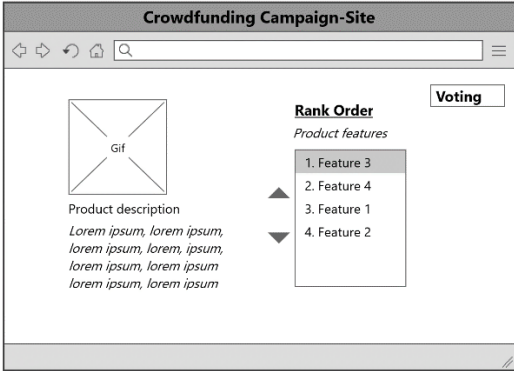
Routes to PO	Meta Design	Design Elements
Intimately knowing	DP1: <i>New CPs must provide users with rich and multiple sources of product information to positively influence crowdfunding co-creation among them.</i>	External Reviews 
Self-investment	DP2: <i>New CPs must provide ways to encourage users to state their preferences, thoughts, ideas, and feedback on the campaign's product to positively influence crowdfunding co-creation among them.</i>	Participatory Updates 
Control	DP3: <i>New CPs must allow users to effectively participate in decisions influencing the final product outcome to positively influence crowdfunding co-creation among them.</i>	Selective Voting 

Table 7. Overview of the Meta Design
(Source: Own depiction of Design Principles and Design Elements)

5.3.5 Evaluation of My Solution

5.3.5.1 Experimental Design

To be able to evaluate my design, I first have to determine the outcome variables of my measurement model (i.e., the dependent variables I would like to influence with my design). As already mentioned above in my design requirements, the aim of my design is to foster crowdfunding co-creation (for a detailed overview of the design requirements see Table 7). Crowdfunding co-creation is essentially composed of two variables, namely feedback and funding. Hence, the main purpose of my measurement model is to determine if my design elements increase the amount of feedback and funding during a campaign.

To test if my design instantiation meets the previously stipulated design requirements, I conducted a randomized 2x1 web (design) experiment on Amazon Mechanical Turk (AMT). AMT is an online labor marketplace that is often used for data collection in the social sciences. Research indicates that samples drawn from AMT are more reliable as they are demographically more diverse than typical research samples, which primarily consist of American college students (Mason and Suri 2012). Even more research suggests that in many respects the AMT population is quite representative of populations on crowdfunding platforms such as Kickstarter (Mason and Suri 2012; Chan and Parhankangas 2017). Participants of the experiment were compensated with US\$1.30 for a task with a duration of approximately 15 minutes, which corresponds to a fee that would typically be paid on AMT for a task with a similar length (Sheehan and Pittman 2016).

To test my design, I created two prototypical instantiations of crowdfunding campaigns. On one hand, I used the design of a conventional crowdfunding campaign as my control condition; on the other hand, I used the design of a crowdfunding campaign that featured my design elements (see Table 7) as my treatment condition. This resulted in my control condition differing from the treatment condition in important respects. Thus, the control condition primarily featured one source of product information (i.e., that of the company which endorsed its product as opposed to the treatment condition that featured multiple endorsements). Additionally, the control condition featured only regular updates (i.e., progress updates) as opposed to participatory updates. Finally, the control condition did not feature any voting mechanisms. Besides that, both designs were identical in terms of the content they featured to ensure the isolated effect of my implemented design.

Furthermore, I chose to model my campaign upon a real crowdfunding campaign that advertised smart luggage. I chose this setting to mimic reality as closely as possible. Moreover, luggage constitutes a product that everybody can relate to and that can be easily used as a design object, therefore providing us with the possibility of systematically integrating participants into product design decisions.

The experiment followed a strict sequence. Before entering the experiment, the participants were informed that the whole procedure would take approximately 15 minutes and would consist of two parts, namely a clickable crowdfunding campaign (part 1) and a questionnaire (part 2). Additionally, they were told to put themselves in the position of a potential funder and to read the campaign content carefully and conscientiously.

Once the participants agreed to begin the experiment, they were asked to self-assess their mood on a 7-point Likert scale. I measured this variable before the participants engaged in the experimental manipulation in order to control for effects that might be attributable to their mood. After measuring the participants' mood, a short definition of reward-based crowdfunding was displayed. This was done to ensure that all participants understood the context of the study. Next, the participants were randomly assigned to one of the two crowdfunding campaign designs (i.e., either the control condition or the treatment condition). During the campaign, the subjects were given the opportunity to leave feedback on the featured product, which constitutes my feedback measure in this study. Directly following the campaign, the subjects were asked to indicate their likeliness to support the respective campaign on a 7-point Likert scale as well as to state a relative funding amount with which they would support the campaign. In addition to that, I measured the participants' psychological ownership using the scale from Avey et al. (2009).

After the experiment, a short questionnaire was forwarded to the participants and was used to collect the most important control variables such as gender, age, country of origin, education, and income. To control for other influencing factors, I additionally measured participants' product interest (Franke et al. 2010) as well as their experience with crowdfunding (Griffin et al. 1996).

5.3.5.2 Results

The study attracted a gross sample of 133 participants, of whom 89.4% completed the experiment. The average completion time was 11.15 minutes ($SD=5.57$). This number

corresponds to the typical completion rates of online experiments (Davis and Metcalf 2016; Sayama and Sayama 2011). However, I had to exclude cases due to inconsistent responses (11) and due to cheating (i.e., bots) (3). Thus, my net sample consisted of 119 participants. Most participants in the sample were male (62.2%). The mean age of participants was 34.9 years ($SD=9.81$) with most participants coming from the US (70.3%), followed by participants from India (26.3%) and a small percentage of participants (3.4%) stating some other country. Even more, the participants of my experiment were fairly well educated with 73.1% reporting to have received higher education (i.e., at least an Associate's degree). Regarding income, 66.6% of participants reported an income below US\$ 50,000. Thus, in terms of gender, age, education and income, participants in my sample seem to be highly representative of visitors of reward-based crowdfunding websites.⁶ To comply with ethical standards, I further asked the participants about the appropriateness of the payment. The results show that the majority of the participants (89.9%) considered the payment as fair.

To examine the differences in the provision of feedback between my two conditions, I conducted a chi-square test. My results indicate that the subjects in the treatment group provided significantly more feedback than subjects in the control group ($X^2(1, N=119) = 21.620, p < 0.01$). In addition to that, I conducted a Mann Whitney-U-Test to examine differences in the elaboration of feedback (as measured by the total number of words each feedback contained) between both groups. My results suggest that the feedback provided by the treatment group was significantly more elaborate ($Mdn = 74.53$) than the feedback provided by the control group ($Mdn = 46.65, U(119) = 939, z = -4.57, p < 0.01$). To examine the differences regarding the subject's intention to fund as well as their perceived psychological ownership, I conducted a t-test. My results show that participants in the treatment condition indicate a significantly higher likeliness to support the respected campaign financially ($M = 4.56, SD = 1.60$) (as indicated by their likeliness to fund) compared to participants in the control group ($M = 3.90, SD = 1.69$), $t(117) = 2.17, p < 0.05$). To test differences in relative funding, I conducted a further Mann Whitney-U-Test. The results reveal that participants in the treatment group contributed with significantly higher funding amounts ($Mdn = 74.43$) as compared to participants in the control group ($Mdn = 46.73, U(119) = 944.5, z = -4.39, p < 0.01$).

⁶ <https://artofthekickstart.com/crowdfunding-demographics-understand-kickstarter-and-indiegogo-backers/>

An additional t-test was conducted to examine the differences in the participants' feelings of psychological ownership across both conditions. My results show that the people in the treatment group exhibit significantly higher scores on three dimensions of psychological ownership (i.e., self-efficacy, belongingness, and self-identity) (see Table 8).

Variables	Condition	Mean	SD	t-Value	p-Value
Self-efficacy	Control	3.07	1.65	6.72	.000
	Treatment	5.06	1.55	6.72	.000
Accountability	Control	3.66	1.51	1.96	.052
	Treatment	4.19	1.41	1.96	.052
Belongingness	Control	2.91	1.58	7.26	.000
	Treatment	5.02	1.58	7.26	.000
Self-identity	Control	2.76	1.52	7.34	.000
	Treatment	4.84	1.57	7.34	.000

Table 8. Results of the t-Test for Psychological Ownership

To test the causal relations of my variables, I further decided to conduct a partial least square regression. To this end, I created a model containing the variables of psychological ownership, likeliness to fund, likeliness to give feedback (i.e., feedback frequency) and dummy variable indicating the experimental condition. My structural model is successful in explaining a moderate amount of variance in feedback (i.e., likeliness to provide feedback) ($R^2 = .400$) and funding (i.e., likeliness to fund) ($R^2 = .641$) and a small portion of variance in psychological ownership ($R^2 = .264$). Additionally, I conducted a Sobel test to test for mediation of psychological ownership on funding as well as feedback. My results suggest that psychological ownership partially mediates feedback ($t = 4.92, p < .001$) as well as funding ($t = 6.11, p < .001$).

To control for other influencing factors, I applied a t-test to examine if the variables mood, product interest and experience (i.e., continuous variables) differ between the two conditions. My results show that there is no significant difference in these variables among both groups (see Table 9). Hence, I can rule out that the observed differences in my dependent variables (i.e., funding and feedback) are due to the fact that one group is

being overly represented by people having a better mood, being more interested in the product or being more experienced backers.

Variables	Condition	Mean	SD	t-Value	p-Value
Mood	Control	2.74.	1.11	.419	.676
	Treatment	2.65	1.30	.419	.676
Product Interest	Control	4.72	1.78	1.746	.083
	Treatment	5.22	1.35	1.746	.083
Experience	Control	3.93	1.80	.805	.422
	Treatment	4.18	1.66	.805	.422

Table 9. Results of the t-Test for Other Potentially Influencing Variables

To examine differences among other influencing factors that take the form of categorical variables, such as income and education, I conducted a chi-square test. My results suggest no significant differences in education among both groups ($\chi^2(5, N=119) = 1.963, p = 0.854$). Similarly, the results reveal no significant differences in income among both groups ($\chi^2(7, N=117) = 5.369, p = 0.615$). Against this background, I can conclude that the observed differences in funding are not due to the fact that one group is made up of individuals with higher educational degrees and better income. Taking all the results into consideration, it can be concluded that the other influencing factors that I controlled for in this study do not account for the observed effects of my main variables (i.e., psychological ownership, funding likeliness and feedback frequency).

In summary, my results suggest that subjects who are systematically integrated into decisions on the product design are significantly more likely to support a campaign financially as well as through feedback. Moreover, my results suggest that psychological ownership feelings mediate subjects' supporting behavior. My preliminary findings have important consequences for crowdfunders. Thus, my findings suggest that new design elements can be effectively used to influence backer behavior with the potential of increasing the success of crowdfunding co-creation.

5.3.6 Conclusion

This paper investigates how to leverage the innovative potential of backers by encouraging them to engage in co-creation for product development. Therefore, I take psychological ownership theory as kernel theory to design a solution that encourages

backers to increase feedback and funding towards a company's products and services. My results constitute unique design principles and design elements that crowdfunders should consider when aiming at employing such a solution.

My research provides three main contributions to previous work. First, I contribute to emergent crowdfunding research (Belleflamme and Lambert 2014; Brem et al. 2017; Stanko and Henard 2017), which suggests that crowdfunding is more than a mere financing mechanism and that it can be used by companies to integrate users into their innovation processes. Thus, by proposing new design elements that foster joint product development, I contribute to a better understanding as to how crowdfunding platforms must be designed for companies to effectively co-create value with customers during crowdfunding. Furthermore, I contribute to the propagation of design-oriented research approaches in crowdfunding (Ingram Bogusz et al. 2018). By doing so, I extend current crowdfunding research that is still dominated by empirical studies to include new research approaches that rather aim to improve existing crowdfunding platforms as opposed to just investigating a given phenomenon.

Second, I contribute to the application and advancement of new DSR approaches. I do so by applying the DSR approach of Niehaves and Ortbach (2016) which allows us to evaluate my artifact in greater depth. Thus, by applying this rather young approach, I cannot only show that my design affects co-creation (i.e., the intended design goal) but also how it affects the intended design outcome (i.e., through manipulating psychological ownership feelings). This provides us with an advantage over current DSR approaches that employ rather unidimensional and simplistic evaluation techniques (Davis et al. 1989; Sonnenberg and Vom Brocke 2012) and hence provide no understanding as to how a design achieves a particular goal. Consequently, I provide a better understanding as to how design affects human psychology and behavior and how this translates into achieving a certain design outcome as stipulated by design requirements.

Third, my research proposes psychological ownership as a theoretical lens to explain and design individual co-creation experiences, which addresses an important research gap that has received only little research attention so far (Zhao and Zhu 2014). This stands in contrast to previous research mainly focusing on the macro level of crowdfunding projects as the explanatory variable of collective funding success (Mollick 2014; Agrawal et al. 2015; Kuppusswamy and Bayus 2015). My results stress

the role of psychological ownership to foster an individual's likeliness to engage in crowdfunding co-creation. Consequently, this research allows us to obtain a better understanding of the psychological antecedents of crowdfunding and how they drive individual user behavior.

From a managerial perspective, this study provides new insights for practitioners on how to leverage crowdfunding apart from gathering financial resources. Thus, by making use of new design elements in crowdfunding, entrepreneurs can leverage the crowd to gather valuable feedback and ideas. This might help them to offer products and services that better reflect market needs, which possibly may benefit a company's long-term success.

5.3.7 Limitations and Future Research

My research design also includes certain limitations. Hence, it is important to note that my results rely on a prototypical instantiation of a crowdfunding campaign that was tested in an experimental setting. While this experimental setting benefits the internal validity of my results (i.e., experiments minimize the systematic error that accrues due to other influential factors), it is questionable and remains to be seen if my results hold up in the field (i.e., if they are externally valid). In addition to that, some might argue that my paper exhibits a methodological shortcoming due to the fact that the design elements have been manipulated together in a 2x1 experimental design and that a richer design would have manipulated each design element individually to be able to examine the isolated effects of these design elements. While this might be true from a methodological standpoint, it contradicts the assumptions implied by psychological ownership theory. Thus, according to Pierce et al. (2001), the process by which psychological ownership emerges is characterized through complex interactions between the several factors that are facilitating psychological ownership and hence can hardly be examined in an isolated manner. Consequently, I decided to manipulate the three design elements in a 2x1 experimental design in order to examine the full potential of psychological ownership within a crowdfunding environment.

Chapter 6

Exploring the Potential of ICOs and Tokens as
New Co-Creation Mechanisms
in Crowd-Based Entrepreneurship

6 Co-Creation as a Facet of Crowd-Based Entrepreneurship II: How ICOs and Tokens Can Be Used to Create and Govern Novel Entrepreneurial Ecosystems

Purpose

The purpose of this chapter is to explore new crowd-based mechanisms, namely ICOs and tokens, and to examine their role in creating and governing novel entrepreneurial platform ecosystems. To do so, in the first part of this chapter, I create a taxonomy that lays out different process characteristics of ICOs and relates them to different entrepreneurial outcomes. My research findings suggest three archetypes of ICOs that either yield in the creation of financial services, consumer-centric services, or the creation of new platforms. Following these findings, in the second part of this chapter I explore the role of tokens as underlying mechanisms of ICOs and how they relate to the development of novel entrepreneurial platform ecosystems. To this end, I explore the case of Ethereum, a novel blockchain-based platform ecosystem, that I use to derive a conceptual framework to explain how tokens can be used as a mechanism to govern the interactions of multiple actors in entrepreneurial blockchain-based platform ecosystems. Furthermore, I discuss the implications of these tokens regarding the future development of new entrepreneurial ecosystems.

Role for Dissertation

The findings of this chapter have a dual role. First, they allow me to introduce new crowd-based mechanisms and elaborate on how they can be used by entrepreneurs to create new services or platform innovations. Second, the insights of this chapter allow me to uncover how these mechanisms can be used to govern the co-creational activities of different platform actors and how these activities yield the development of novel entrepreneurial platform ecosystems. By doing so, I show how the concept of co-creation can not only be applied to unilateral platform interactions (e.g., between entrepreneurs and a clearly defined crowd) but how it can be also applied to account for multilateral platform interactions among heterogeneous actors of entrepreneurial platform ecosystems. Consequently, this last chapter provides a glimpse into the future of crowd-based entrepreneurship and how new crowd-based mechanisms must be designed to govern co-creational activities among different platform actors.

6.1 Conceptualizing ICOs as a New Form of Crowdfunding

The findings of this section were previously published as Lipusch, N., Dellermann, D., & Ebel, P. (2019) at the Hawaii International Conference on System Sciences in 2019. The study explores ICOs as a new blockchain-based crowdfunding type. To this end, the study employs a DSR approach to create a process taxonomy of ICOs. Additionally, I identify three archetypes of ICOs.

6.1.1 Introduction

The blockchain receives a lot of attention in the financial and information technology industry these days and is hailed by some proponents as the most disruptive technology since the web (Beck and Müller-Bloch 2017). Generally, a blockchain is a distributed digital ledger that is characterized by five basic principles, namely a distributed network, peer-to-peer interaction, transparency with pseudonymity, irreversibility of the entries and programmability (Iansiti and Lakhani 2017; Murck 2017).

Although the principles that make up the blockchain are not entirely new, their combination (i.e., the blockchain) is inextricably linked with increased innovation in various fields and application domains. The most prominent example is Bitcoin, which provided the financial industry with a more efficient and reliable payment system. At the heart of Bitcoin's blockchain is a so-called distributed ledger that allows not only getting rid of a middleman, who governs and oversees all transactions, but also allows a more tamper-resistant system since transactions are recorded and validated by multiple users of a network. Newer generations of blockchain technology are even more disruptive in that they represent a variety of other business logics that go beyond financial transactions (Glaser and Bezenberger 2015; Lindman et al. 2017). One example is Ethereum that can be used to represent a variety of functionalities such as virtual shares, assets, proof of membership and many others.

With the steady development of blockchain technology, new use cases emerged. ICOs denote a new kind of fundraising method made available by the development of blockchain technology and cryptographic tokens. Start-ups can use this method to obtain crowd capital to fund and develop their blockchain projects. In exchange for capital, these companies emit tokens through the blockchain that grant certain rights to investors. These rights can vary from project to project and entail things like access to a platform, application or service, rights to contribute work (e.g., developing or creating features for

a system), rights to participate in a company's revenues, rights to cast a vote on governance issues, etc (Conley 2017).

ICOs are currently experiencing a real boom. A prominent example is Filecoin, a US-based start-up that recently managed to raise US\$257 million through an ICO. In comparison, the highest amount of capital raised by a crowdfunding campaign (i.e., the Pebble smartwatch) was US\$20.3 million. Despite the economic realities of this new phenomenon, research on ICOs is still in its infancy. Most research on ICOs is anecdotal and describes the greater phenomenon but leaves out detailed knowledge about ICO processes. However, when conducting an ICO a company must carefully consider between different decisions and actions that can be taken at each process step of an ICO. Unfortunately, current literature leaves entrepreneurs and start-ups in the dark when it comes to figuring out how they can use ICOs to achieve their goals and which process steps they need to follow to reach them. Against this background, this paper tries to answer the following research question:

What processes and process characteristics must a blockchain start-up consider during an ICO and how are these processes related to the goals a start-up is trying to achieve?

The purpose of this paper is to propose a systematic scheme (i.e., a taxonomy) for classifying ICO processes. To this end, I analyze data of a representative sample of 42 ICO campaigns as well as literature related to the phenomenon. By developing a taxonomy of ICO processes, I aim to contribute to a better theoretical understanding of this rather young research domain. Additionally, I provide entrepreneurs with a guideline (in the form of a taxonomic framework) that they can use to strategically decide: 1) if an ICO is suited to achieve their goals and 2) if so, which process steps they must follow to achieve a certain goal.

The remainder of this paper is structured as follows: In chapter 6.1.2, I cover the related work and the conceptual background of ICOs. In chapter 6.1.3, I provide a general explanation of my methodological approach and how I applied it to derive my taxonomy. In chapter 6.1.4, I present the results of my research (i.e., the taxonomy as well as the identified clusters). I summarize the major findings in chapter 6.1.5. Finally, I elaborate on possible limitations and future research in chapter 6.1.6.

6.1.2 Related Work and Conceptual Background

Before I introduce ICOs, I provide an overview of related work and important concepts such as the blockchain, smart contracts, cryptocurrencies and tokens and crowdfunding.

6.1.2.1 Blockchain and Smart Contracts

The blockchain was first introduced in Satoshi Nakamoto's paper on a decentralized payment system called Bitcoin in 2008 (Nakamoto 2008). At that time, the blockchain was described as a decentralized shared ledger that uses chronological, encrypted and chained blocks to store verifiable and synchronized data across a peer-to-peer (P2P) network (Yuan and Wang). By using the blockchain, Bitcoin was able to bypass intermediaries through so-called miners (i.e., the P2P network) who contribute their computing power to verify transactions that are summarized in blocks and then stored in a shared ledger (i.e., the blockchain) (Prpić 2017). With advances in the blockchain technology (i.e., blockchain 2.0), the functionality of the blockchain increased vastly. Thus, the second generation of blockchains moved beyond Bitcoin's single purpose of transferring cryptocurrencies. One example of such a blockchain is Ethereum that, due to its Turing-complete programming language, offers a generally programmable platform that can be used as infrastructure for a variety of applications (Buterin 2014). Thus, Ethereum can be used for purposes such as controlling digital assets, identity management and fundraising (Buterin 2014). Another important feature of these newer generations of blockchains are so called smart contracts. Smart contracts refer to programs that are executed on the blockchain and can be used to automate any of the business logics and applications mentioned previously (Glaser and Bezenberger 2015; Beck et al. 2017; Sillaber and Walzl 2017).

6.1.2.2 Cryptocurrencies and Tokens

One term that is inextricably linked with the blockchain are so called cryptocurrencies. The most popular example is again Bitcoin. At the heart of Bitcoin are so called (bit)coins that denote a digital payment system. Coins can thereby be used as a medium to store and transfer value within a network (Nakamoto 2008). The main advantage of such a decentralized payment system is that users are not dependent on intermediaries to handle their transactions, meaning that users have greater freedom to engage in borderless and frictionless transactions (Prpić 2017). With the second generation of blockchains (i.e., Ethereum), tokens became more popular. Although coins and tokens are often used synonymously there is a fundamental difference between those two concepts. According to the Cambridge dictionary, tokens denote "a round, metal or

plastic disk which is used instead of money in some machines”. Hence, tokens can be best understood as a voucher or a gift card that can be used to consume a variety of services within a certain context (e.g., a shop, a fair, a casino or a vending machine). This is different from coins and cryptocurrencies, which usually act as a medium to transfer value across a variety of contexts. Another distinguishing characteristic of tokens is that they are programmable. One consequence of this is that they can be programmed to serve a variety of different functionalities and purposes. For example, they can be used to facilitate transactions, as an internal unit of account, for the verification of block-writing, or for more creative uses such as helping to prevent unintended use of the blockchain and to grant token holders certain types of privileged access (Glaser and Bezenberger 2015; Conley 2017; Schweizer et al. 2017). It is important to note that these are just some examples and that some tokens can fulfill one or several of the above-mentioned functions.

Apart from that it can be distinguished between native tokens inherent to a blockchain – so called protocol tokens – and on-chain tokens (sometimes referred to as app coins or app tokens) that are issued on top of a blockchain using smart contracts (Buterin 2014; Johnston et al. 2017; Kuo Chuen 2017). While native tokens serve mainly as incentive to develop and operate the blockchain, app-coins are tokens that can be used to access specific applications (i.e., the services) that are built on top of the blockchain. The most popular standard used to create app coins is the ERC20 standard that is employed by the Ethereum blockchain (Vogelsteller 2015).

As diverse as token functionality is, so are their use cases. For example, tokens can act as an access key that developers use to contribute work (i.e., work tokens). Another example constitutes tokens that act like shares (i.e., equity tokens) that allow developers to participate in the potential rise of value of the ecosystem they are building. Furthermore, as mentioned before native tokens inherent in the blockchain are used to incentivize miners to maintain and operate the network. This is achieved through so called proof-of-work algorithms that reward miners for solving cryptographic puzzles on the blockchain (Prpić 2017). Lastly, tokens can be issued in the form of ICOs in exchange for payment. These ICOs are regularly used by start-ups to collect the necessary funds to develop their blockchain projects (Conley 2017).

6.1.2.3 Crowdfunding

Crowdfunding is defined as “a collective effort by people who network and pool their money together, usually via the Internet, in order to invest in and support efforts initiated by other people or organizations” (Ordanini et al. 2011). The main rationale behind this concept is to collect small funding increments from a crowd of investors, which add up to a significant investment that start-ups can use to develop their business. In recent years, crowdfunding developed as a serious fundraising alternative for start-ups that are not eligible to traditional means of financing such as bank loans and venture capital. One popular example is the Pebble smartwatch which raised US\$20.3 million in funding. Despite its recent success, crowdfunding is also characterized by certain weaknesses. Thus, users of crowdfunding are usually charged a commission fee based on the total funds raised (Treiblmaier and Roman 2019). Further costs arise due to auxiliary services such as payment providers, which are necessary to process payments among the involved parties (Haas et al. 2014). Another issue concerns the trust between capital givers and capital seekers. At the heart of this are information asymmetries between capital seekers and capital givers which usually put capital contributors at a higher risk due to holding incomplete information. While crowdfunding platforms formed as a solution to mitigate these problems, the mechanisms used by these platforms sometimes perform very poorly (Mollick 2014; Lehner et al. 2015; Lipusch et al. 2018). Also, the mechanisms employed by crowdfunding platforms constrain how crowdfunding can be conducted (Treiblmaier and Roman 2019). ICOs developed as a new crowdfunding mechanism that bears the potential to solve these problems (Schweizer et al. 2017). In the following section, I introduce the concept of ICOs and elaborate how it differs from previous approaches to crowdfunding.

6.1.2.4 ICOs: A New Type of Blockchain-Based Crowdfunding

ICOs, also often referred to as “token-sales” or “crowd-sales”, recently emerged as a new business model that allows blockchain start-ups to collect capital to realize their business (usually before the business is initiated). Blockchain start-ups refer to businesses in the blockchain domain whose main aim is to develop blockchain protocols as well as blockchain applications (Conley 2017). Since ICOs share a lot of similarities with crowdfunding (e.g., they are conducted over the web and rely on the principle of crowdsourcing), they are considered a new crowdfunding mechanism (Schweizer et al. 2017; Treiblmaier and Roman 2019). However, one important difference to conventional crowdfunding mechanisms is that ICOs are conducted via a blockchain. The main advantage of this is that ICOs function in a completely decentralized way

through peer-to-peer mechanisms and, hence, do not require a central intermediary that moderates the matchmaking process between project initiators and investors (Danmayr 2013; Haas et al. 2014; Schweizer et al. 2017). While this allows ICOs to be cheaper, this is also likely to alter the processual nature of ICOs compared to crowdfunding.

Figure 14 illustrates a prototypical ICO process. A start-up engaging in an ICO uses the blockchain to generate tokens that will be issued to potential investors. Hence, the blockchain constitutes the technological infrastructure upon which a company creates and issues tokens. As I have already mentioned before, such tokens can represent different utilities (see 6.1.2.2). In most cases they represent an access right to consume the services that are provided by the start-up (also via the blockchain). In exchange for tokens, the company receives investments from a crowd in the form of cryptocurrencies (most often Bitcoin or Ethereum). The individual investments of the crowd are then pooled together to finance the development of the blockchain project (e.g., to cover the costs of developers).

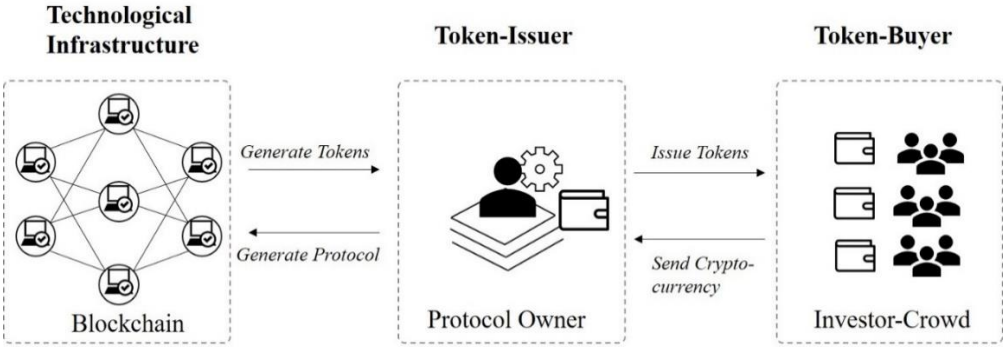


Figure 14. Prototypical ICO Process
(Source: Own depiction)

As can be seen from my illustration above (Figure 14), ICOs differ significantly in their structures and processes from related fundraising mechanisms. To get a better and more detailed understanding of these processes, research is needed.

6.1.3 Methodology

In the following section I provide a general overview of what constitutes a taxonomy. Furthermore, I explain in detail how I derived my taxonomy.

6.1.3.1 Taxonomical Approach

Taxonomies play an important role in structuring and ordering new concepts and hence lay the foundation to postulate and hypothesize about relationships among these concepts (Glass and Vessey 1995; McKnight et al. 2002). To derive my taxonomy, I rely on a method proposed by Nickerson et al. (2013) who came up with a design-based approach for taxonomy development (Hevner and Chatterjee 2011), that allows the identification of the dimensions (or variables) and corresponding characteristics (or variable domains) of the taxonomy through an iterative design process. By applying this approach, I follow seven general steps (see Figure 15).

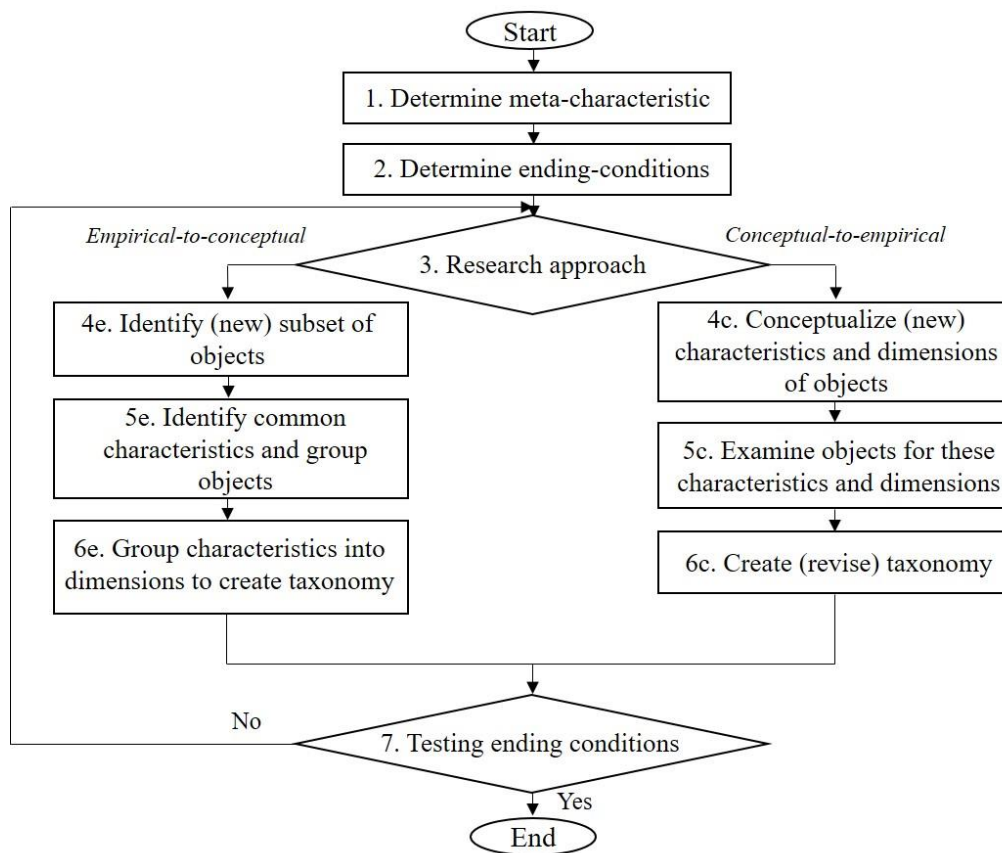


Figure 15. Taxonomical Approach
(Source: Nickerson et al., 2013)

6.1.3.2 Research Approach to Derive My Taxonomy

Following the approach proposed by Nickerson et al. (2013), I define my meta-characteristic in step one. This is the most important step as it helps to determine the purpose of the taxonomy with a view to its main target group. Since the intended users of my taxonomy are new ventures that possess limited knowledge with regard to the

purpose and functioning of ICOs, I frame my meta-characteristic as follows: I develop a taxonomy for design parameters and characteristics of ICO processes that blockchain start-ups can use to decide on how to conduct ICOs in a way that best serves their goals.

In a second step, I determine my ending conditions. For my ending conditions, I made use of objective as well as subjective ending conditions (Nickerson et al. 2013). In regard to my objective ending condition, my taxonomy must consist of dimensions with mutually exclusive and collectively exhaustive characteristics. For the subjective ending conditions, I decided to apply those proposed by Nickerson et al. (2013), who note that a useful taxonomy must be concise, robust, comprehensive, extendible and explanatory.

In step three, I choose my research approach. As proposed by Nickerson et al. (2013), I employ an empirical-to-conceptual as well as a conceptual-to-empirical approach (Nickerson et al. 2013).

For the empirical-to-conceptual approach, I decided to collect and analyze 42 real life ICOs (this corresponds to step 4e in Figure 15) from 2013 to 2018. To collect my sample of ICO campaigns, I made use of websites such as CoinSchedule, TokenMarket and Coinbase which contain an overview of historic, ongoing and upcoming ICOs. To analyze the ICOs, I primarily relied on secondary data and made use of multiple data sources (see Table 10). The gathered data was used to identify common process characteristics and design parameters of ICOs (see Figure 15, step 5e). To extract meaningful process characteristics, I made sure to only include characteristics that discriminate among the analyzed ICOs in a sufficient manner (Anderberg 1973; Nickerson et al. 2013). As a next step (see Figure 15, step 6e), I used a manual procedure to group the identified characteristics into dimensions (i.e., higher order concepts). This resulted in five dimensions (see Figure 16), which can be best understood as more abstract processes that contain the mutually exclusive process characteristics that I identified earlier.

Data Sources	Examples
<ul style="list-style-type: none"> • Press releases, news, announcements, online articles 	<i>e.g., CoinDesk, BraveNewCoin, CoinTelegraph, Medium, etc.</i>
<ul style="list-style-type: none"> • Case documents, legal papers and technical papers 	<i>e.g., Whitepapers, yellow papers, legal-term sheets, etc.</i>
<ul style="list-style-type: none"> • Keynotes and speeches 	<i>e.g., DevCons, Deconomy, blockchain labs, slide decks, etc.</i>
<ul style="list-style-type: none"> • Websites, platform data 	<i>e.g., Company websites, company blogs, company newsletters, etc.</i>
<ul style="list-style-type: none"> • Social media data and databases 	<i>e.g., Reddit, Telegram, GitHub, StackExchange and Gitter conversations, etc.</i>

Table 10. Secondary Data Sources Used for the Taxonomy of ICO Processes

For my empirical-to-conceptual approach, I analyzed literature related to the identified process characteristics and dimensions. In doing so, I utilized literature on crowdfunding, IPOs, venture capital and auction mechanisms. This additional step allowed us to verify my existing processes as well as to conceptualize new process characteristics for my taxonomy (i.e., Figure 15, step 4c). Finally, I took a sub-sample of my ICOs to verify the applicability of the newly derived process characteristics (i.e., Figure 15, step 4c) and adapted my taxonomy accordingly (i.e., Figure 15, step 5c). Steps 3-7 were repeated several times, checking against my ending conditions in each iteration, until I arrived at my final taxonomy.

To determine the usefulness of my taxonomy, I performed an additional evaluation cycle. In doing so I conducted interviews with three experts that had either acquired relevant practical knowledge or made a significant scientific contribution in the field of ICOs. The feedback of the experts indicates that my taxonomy could be useful for “start-ups who are interested in conducting ICOs especially against the background that best practices on how ICOs are conducted change very rapidly due to the very young nature of the phenomenon”. Moreover, one of the experts noted that “Since ICOs are less formalized (e.g., they are not guided by intermediaries such as crowdfunding) and because they are technologically more complex than comparable fundraising options, adequate guidelines in the form of such a taxonomy are very important to support entrepreneurial decision making during ICOs”. Another expert noted that “a lot of companies naively rush into ICOs without considering if they are the right type of financing for their business model. Providing a taxonomy could help companies to better assess if an ICO is the right way for them to develop their business”.

6.1.4 Findings

In the following section, I elaborate on the main results of my taxonomy creation process.

6.1.4.1 Characteristics of ICO Processes

Throughout this research, I identified five dimensions that describe how ICO processes differ. Figure 16 depicts these dimensions and their logical order within an ICO process. First, the company considering an ICO must decide how it defines and approaches its market. Then, the new venture needs to decide on the functionality of the tokens i.e., which types of token it wants to create and issue. This is an important step as it defines what the tokens can be used for (i.e., the value proposition for the user) and how they interact with a company's business model. In a next step, the company needs to decide how it wants to create the tokens that are issued to the crowd in exchange for cryptocurrencies. When the organization has decided on a certain token creation strategy, it must determine the token sale model which determines how tokens are distributed. Finally, a company must decide on its user communication and engagement strategy. This is an important step to convince users of the feasibility and utility of the project as well as to engage them throughout the entire ICO. It is important to note here that while the proposed sequence follows a logical order, this might not reflect the actual order of process steps companies follow when conducting an ICO.

6.1.4.2 Defining the Market

The first dimension, defining the market, is concerned with determining the groups that are targeted by a company's ICO. Once this process is applied, selected crowd investors can decide if they want to contribute to the ICO or not. As part of my data analysis, I identified four process characteristics that are used to define the market: a public offering, a public offering with a pre-sale, a private offering and self-selection.

Some of the ICO campaigns I analyzed deployed a public offering. Public offerings are characterized by a maximum of openness, meaning that they do not limit the participation of buyers. One of the advantages of this process characteristic is that it allows companies to leverage a high number of users (e.g., also potential investors) which benefits the scalability of a project. Very often (but not always) public offerings come with a so-called pre-sale (i.e., a public offering with pre-sale). Pre-sales allow a company to issue a certain number of tokens beforehand (i.e., before most of the tokens are issued to the broader market). The benefit of such pre-sales is that they can help

companies to better estimate the market potential for a company's tokens. Apart from that, pre-sales combined with a discount on tokens also constitute a promising strategy to attract early adopters.

Other ICO campaigns employed so-called private offerings. Private offerings differ from public offerings in that they are geared toward a specific group. Private offerings are often used to gather a core team around the project. Hence, this type of offering is often (but not exclusively) restricted to company owners, developers, advisors (e.g., advisor sales) and other important partners that have a key role in the creation of the project. This practice may be best compared to stock options that are offered to employees of a company.

Finally, some campaigns employed self-selection procedures which can be considered a mixture of the two characteristics mentioned above. Self-selection procedures require interested investors to register first on so-called whitelists to be considered for an offering. Some companies use this mechanism to determine market interest and to get order and fairness into the offering process by applying a first-come first-serve principle. Other companies use it as a selection mechanism to weed out unsuitable investors (e.g., companies that are looking exclusively for accredited investors). Moreover, certain companies use this procedure to get customer information that is needed in certain jurisdictions to address "Know your Customer" and "Anti Money Laundering" regularities.

6.1.4.3 Determining the Token Functionality

The second dimension, determining the token functionality, is concerned with stipulating the purpose of tokens as well as choosing the right token standards to realize these purposes. It can be distinguished between five process characteristics: utility-based tokens, equity-based tokens, work-based tokens and asset-based tokens.

Utility-based tokens denote a process characteristic in which a company creates and issues tokens (so-called usage tokens) that permit token holders to use a certain product or service. This type of token can be best compared to pre-selling agreements that promise users access to digital services that are about to be developed and provided by the company conducting the ICO. These services can take on many different forms. For example, Filecoin tokens provide users access to decentralized storage.

Equity-based tokens, sometimes also referred to as tokenized securities, describe a process characteristic in which a company creates and issues tokens that represent a tradable financial asset. These types of tokens can be best compared to a digital share in a company that entitles token holders to equity-like benefits such as profit-sharing or voting rights.

Work-based tokens describe a process characteristic in which a company issues so-called work tokens in exchange for capital (i.e., cryptocurrency). Work tokens enable holders to contribute work to a network and earn value in exchange for their work (Buterin 2014).

Finally, asset-based tokens denote a process characteristic in which companies create and issue tokens that represent a physical asset. These tokens are useful as they allow for the digitization of physical assets and commodities. One example of a company using this type of token is Goldmint, which uses the blockchain technology to tokenize gold. The main advantage of such tokens is that they allow the management of associated assets more efficiently (e.g., tokenized gold can be transferred and stored at lower costs).

6.1.4.4 Token Development and Creation

The third dimension, token development and creation, is concerned with the development strategy a company employs to create a token during an ICO. It can be distinguished between three process characteristics, namely native development, on-chain development, and side-chain development.

The process characteristic, native development, means that the token to be developed is native (i.e., the token is inherent to a blockchain). Companies deploying this kind of process usually build a token from scratch. This means that the company has to create the token as well as the token's underlying infrastructure (i.e., a blockchain). While creating a token from scratch is associated with a lot of development effort, one of the main advantages of this process is that it provides companies with more flexibility in determining the token's functionality.

On-chain development denotes a process characteristic in which a company makes use of an existing infrastructure to create and develop its token (e.g., app tokens). This means that the token is developed on top of an existing blockchain. One of the most popular examples is the Ethereum blockchain which features its own token building

standard (also known as ERC20) that allows the creation of tokens more easily through smart contracts. While developing a token on top of an existing infrastructure does not grant as much flexibility as native development, it significantly eases the process as it requires significantly less development effort.

The third process characteristic, side-chain development, is closely related to native development as it entails the creation of a so-called side-chain. Side-chains denote an additional blockchain next to a main blockchain. Side-chains are usually interoperable which means that tokens from one blockchain (e.g., the main chain) can be used on the other chain (i.e., the side-chain) and vice versa. Side-chains are usually employed by start-ups that want to test new tokens or new token models without compromising the functionality and security of the main blockchain.

6.1.4.5 Determining the Token Sales Model

The fourth dimension, determining the token sales model, describes the mechanisms by which a company aims to sell and distribute its tokens. During my empirical analysis, I identified four distinct process characteristics employed during an ICO: capped sales, uncapped sales, auction sales and others.

The process characteristic, capped-sale, describes a restriction on the number of tokens that are issued during a token sale. This means that companies cap the amount of capital to be raised through an ICO by fixating the total token supply. Once this pre-determined token supply has been consumed, the sale stops and there is no possibility for investors to obtain further tokens. During uncapped sales, tokens can be usually availed on a first-come-first-serve basis at a fixed price. Moreover, a fixed or predetermined percentage of the total token supply is allocated to the core developers and founders.

Uncapped sales denote a process characteristic in which a company sells an unlimited number of tokens at a fixed price over an extended period of time (Buterin 2017). This means that investors can buy as many tokens as they desire. Due to their special characteristics, uncapped sales are especially suitable for companies considering multiple investment rounds. Hence, the main purpose of uncapped sales is to maximize both the number of investors involved and the amount of capital flowing into the project. Similar to capped sales, a fixed percentage of the total token supply is allocated to the founders and the development team.

Some of the ICOs I analyzed employed an auction sale. This process characteristic denotes a special kind of sale in which buyers determine the price and the total amount they are willing to spend (Hausch et al. 1992). The issuing company then sells a variable number of tokens at the lowest bid price and in proportion to the total amount pledged. This type of mechanism is often used when a quick sale of tokens is desired. One example of an ICO that employed an auction sale was the Gnosis project with the aim to alleviate investors' fear of missing out. Participants in this sale are allocated a variable percentage of the total token supply, depending on the total number of tokens sold during the sale.

Quite recently, there has been an upsurge of new token-sales models. For my taxonomy, I summarize them as others. These are sales that either constitute a mix of the three main sales models mentioned above or sales that cannot be subsumed under one of these models. Examples are dynamic ceilings and soft caps. A dynamic ceiling is considered a series of mini hidden hard caps set at specific block intervals. A soft cap, on the other hand, refers to an extended time-based closing period until the full closure of the sale.

6.1.4.6 User Communication and Engagement

The fifth dimension, user communication and engagement, indicates how new ventures communicate and engage with their investors during an ICO. The dimension represents the four characteristics, inform, consult, involve and mixed, which reflect the degree of interaction between project creators (i.e., start-ups) and crowd investors.

The process characteristic, inform, denotes the lowest level of interaction and concerns the creation and provision of basic informational resources by the company. Most companies employing this type of process characteristic employ a website, a video, a whitepaper (i.e., basically a business plan of the blockchain project) or a yellow paper (i.e., a technical paper). While investors can use this information to get a basic idea about the project, it is important to note that this type of communication is non-interactive and non-binding. Hence, entrepreneurs can make no legal claims based on this information, nor do they have the possibility of inquiring additional information in which they might be interested.

Consulting goes beyond simple information provision. Usually this process characteristic involves one party inquiring or providing information that goes beyond the basic information requirements discussed above. Typical examples include surveys or questionnaires that companies use to determine the market needs of their customers.

Other examples include terms of sale documents and purchase agreements that companies use to inform investors about their rights and risks (Boreiko and Sahdev 2018). While these documents are not legal documents in a strict sense, they may be legally binding to a certain extent.

The process characteristic involve constitutes the highest level of interaction. It is characterized through multilateral and ongoing interaction between the company and the crowd investors. The main goal of this process characteristic is to establish the trust that is necessary to attract a community of loyal users. Popular channels that are used for this purpose are Reddit, Slack, Gitter or GitHub. Once a company manages to build and maintain a community, users of this community can be engaged in various activities that create value for the company. For example, they can be leveraged to contribute code via GitHub. Other examples include so called bounty programs, in which users contribute through identifying bugs in the software or promoting the project (either through word of mouth or through writing blog articles).

Finally, some ICOs employ a mix of the above-mentioned process characteristics (e.g., inform, consult and engage) to communicate and engage with the crowd. For instance, Steemit, which operates a decentralized social network, features a website that exhibits multiple versions of whitepapers and yellow papers. Additionally, Steemit communicates through several social media channels (e.g., Reddit and Slack) and organizes regular bounty programs (e.g., the Midex bounty program and the Deep Onion bounty program) in which users are asked to promote the apps that are built on the Steemit network.

6.1.4.7 Types of ICO Processes

My proposed taxonomy consists of five distinct dimensions that contain 19 process characteristics. By classifying the processes of my 42 ICOs, I obtain a list of 33 distinct process types (i.e., combinational paths of process characteristics). In order to identify more generic archetypes among these process types, I additionally performed a cluster analysis (Hair et al. 1998; Everitt et al. 2011). By doing so, I used a log-likelihood distance measure as well as Schwarz's Bayesian cluster criterion.

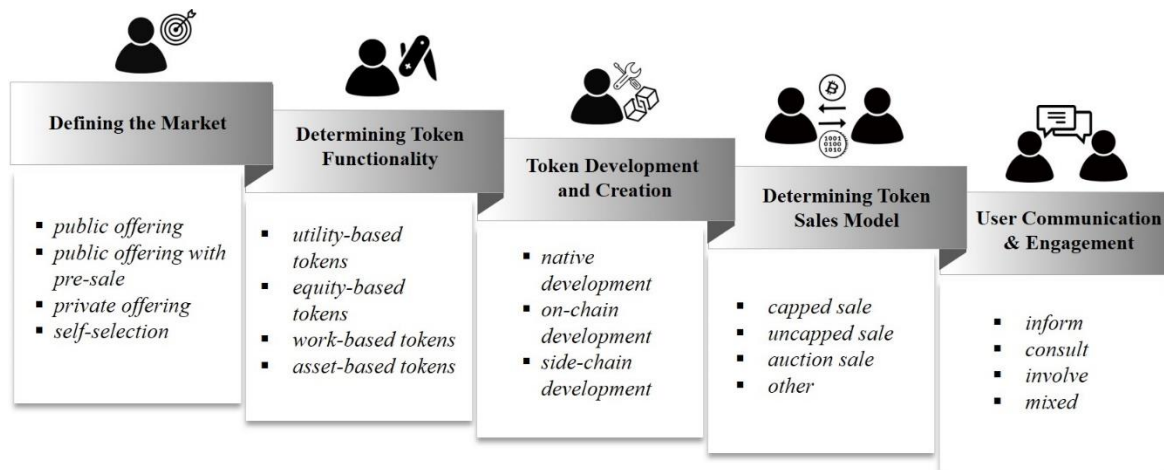


Figure 16. Dimensions and Characteristics of ICO Processes
(Source: Own depiction)

My analysis resulted in three robust clusters. In the following sections, I provide a short description of each of the identified clusters. Cluster 1 – Customer-Centric Service Innovators subsumes the biggest group of ICOs with 45%. The cluster is mainly characterized by companies which aim to disrupt existing industries through new innovative business models and more customer-centric services. Hence, these types of companies very often employ utility-based tokens (68%), which allows them to pre-sell access to their services to potential customers. Furthermore, this cluster also contains a decent number of asset-based tokens (29%) that sells future assets to investors to be used within these new innovative business models (e.g., IoT). To define the market, ICOs in this cluster mainly employ public offerings as well as public offerings with pre-sales. One possible reason for this might be to reach as many customers as possible as well as to reach a sufficient amount of people to scale their business models. Regarding user communication and involvement, this cluster is characterized by intermediate to high interaction. This means that beyond using websites, whitepapers and blogs, a decent number of companies within these ICOs also use channels such as Reddit and Slack for purposes of determining customer needs. Most companies within this cluster develop their token on-chain (82%) (e.g., on Waves or Ethereum). The most used token sales model within this cluster of ICOs constitute capped sales followed by uncapped sales and auction sales.

Cluster 2 – Financial Service Innovators subsumes the second biggest group of ICOs with 37%. This cluster is mainly characterized by companies that are looking for capital and are mainly interested in selling financial products (hence most of these companies

(74%) employ equity-based tokens). Most often, these types of companies employ selective offerings (i.e., supposedly, to adhere to KYC and AML regulations) or public offerings (supposedly, to leverage greater amounts of capital). The interaction with crowd investors can be characterized as low to intermediate with most companies within this cluster employing websites, whitepapers, purchase agreements and legal sale documents. Moreover, most companies within this cluster develop their projects on a chain (77%), as compared to 14.5% of companies which develop their project natively and 8.5% of companies which develop their projects on a side-chain. The token sale models most often employed within this cluster constitute capped sales and auction sales. One possible reason for this might be to create artificial scarcity among tokens to lure in investors.

Cluster 3 – Platform Innovators contains the third biggest group of ICOs with 18%. The cluster is mainly characterized by companies which aim to build and scale an ecosystem. Companies employing this type of ICO very often employ work tokens (33%). One of the main reasons for this might be to pay the developers that build the ecosystem. Additionally, ICOs within this cluster also employ equity-based tokens (66%). One reason for this might be to offer essential stakeholders (i.e., all parties that are necessary for the functioning of the ecosystem) an additional incentive to participate. Regarding the definition of the market, a lot of ICOs within this group make use of private offerings as well as public offerings. Private offerings are thereby mainly used to attract a core team of developers that is needed to create the ecosystem. The public offering, on the other hand, is used to get the critical user traction that is needed to scale the network of the ecosystem. When compared to the other clusters, the user communication and involvement is characterized through high interaction. Thus, a high percentage (81%) of ICO campaigns within this cluster employ all three communication strategies mentioned in Chapter 6.1.4.6 (i.e., mixed). Also, the majority of ICOs in this group makes use of so-called native tokens, meaning that they develop their own blockchain and its respective tokens. The most used token sale models within this cluster are uncapped sales and others. One possible reason for this might be the high capital requirements that are needed to build an ecosystem (calling for no-cap sales models) as well as the complex ecosystem relationships and interactions that require more complex token sale models (calling for other sales models).

6.1.5 Conclusion

The goal of this research paper was to develop a taxonomy of ICO processes. Through my empirical analysis, I was able to categorize five distinct process dimensions and 19 process characteristics that make up my taxonomy. Furthermore, I identified three distinct ICO archetypes that can be used to fully describe my sample campaigns. My results confirm and extend existing knowledge on ICOs. Thus, in line with the recently published taxonomy by Fridgen et al. (2018) and the working paper Boreiko and Sahdev (2018), I am able to show that ICOs differ along dimensions such as information disclosure, user engagement, sales terms and processes, token development and implementation, as well as registration processes. However, one important difference in my taxonomy compared to the taxonomy of Fridgen et al. (2018) is that it follows a process-oriented logic. By doing so my taxonomy does not only provide insight with regard to what ICOs are on a theoretical level, but it also provides new ventures and entrepreneurs with prescriptive knowledge which may help them to assess which process characteristics to consider and which process steps to follow when conducting an ICO to achieve a certain goal. The goals of new ventures thereby correspond to different types (i.e., clusters) of ICOs identified in this research (i.e., the creation of customer centric service innovations, the creation of financial service innovations and the creation of platform innovations). Although the derived clusters differ from the ones identified by Fridgen et al. (2018), they are easy to interpret and, thereby, likely to foster an intuitive understanding of ICO processes among entrepreneurs.

6.1.6 Limitations and Future Research

In accordance with Nickerson's approach to taxonomy building, my main aim was to build a useful taxonomy. While my first evaluation shows that my taxonomy is indeed perceived as useful, I am aware of the fact that the de-facto usefulness of my taxonomy can only be determined over time, through continuous and recurrent use of my artifact (Hevner and Chatterjee 2011). Another point to consider is that ICOs are still a very young phenomenon. Hence, knowledge on ICOs is still in a state of limbo with the potential to change or becoming obsolete very fast. One reason for this is that a regulatory framework on ICOs is yet to form and best practices on conducting ICOs change daily. Against this background, I like to point out that my taxonomy should be considered "as work in progress". Future research should, thus, focus on empirically validating my taxonomy as well as extending and adapting my taxonomy in line with regulatory changes that might occur. Moreover, my taxonomy might also constitute a

promising starting point for empirical studies to examine how different process characteristics influence the success of ICOs.

6.2 Tokens: A New Crowd-Based Mechanism to Govern Blockchain Platform Ecosystems

The findings of this section are submitted as Lipusch, N., Dellermann, D., Ghazawneh, A., Ebel, P., & Leimeister, J. M. (2019) to the Journal of the Association for Information Systems in 2019. The study examines the role of tokens as governance mechanism for the development of novel entrepreneurial platform ecosystems. To this end, the study explores the unique case of the decentralized platform ecosystem Ethereum.

6.2.1 Introduction

The emergence of digital platform ecosystems is changing and transforming the landscape of businesses worldwide (Gawer and Cusumano 2008; Tiwana et al. 2010; Ghazawneh and Henfridsson 2011). These platforms act as innovation engines across diverse industries such as PCs (Bresnahan and Greenstein 1999), video game consoles (Iansiti and Zhu 2007; Romberg 2007), smart mobile devices (Tiwana et al. 2010; Yoo et al. 2010), web systems (Evans et al. 2008), automotive technologies (Henfridsson and Lindgren 2010) and finance (Schreieck and Wiesche 2017).

In order to sustain the innovation within these digital platforms, a variety of external actors need to be attracted and motivated to join the platforms (Baldwin and Clark 2000; Boudreau 2010; Ghazawneh and Henfridsson 2013) and build its network effects (Uzzi 1996; Evans 2003; Yoo et al. 2012). To enable effective innovation, platform owners design and shift technological capabilities to external actors (Hippel and Katz 2002) and govern these external actors by providing boundary resources i.e., resources that act at the interface of the digital platform (Ghazawneh and Henfridsson 2013).

Recently the notion of digital platforms has also emerged within the ground-breaking technology of blockchain (Nærland et al. 2017), that is revolutionizing the economic systems that have been established for decades through decentralizing power in a secure and transparent way (Beck et al. 2017). In its essence, a blockchain denotes a decentralized, shared ledger that uses chronological, encrypted and chained blocks to store verifiable and synchronized data across a peer-to-peer (P2P) network (Schlegel et al. 2018). However, with the development of blockchain technologies new types of platforms developed that allow one to adopt the notion of blockchain platforms (Nærland et al. 2017). The blockchain platform constitutes a decentralized ledger that

acts as the platform core, a variety of developed applications in the form of complementary assets to the platform and a decentralized network of nodes in the form of external actors (Buterin 2014; Aste et al. 2017). Ethereum is a very popular example of an open-source, public-based blockchain platform that in short time has managed to attract thousands of active users and developers to the platform (Avital et al. 2016; Notheisen et al. 2017). With the advent of such new decentralized platform ecosystems, new mechanisms have emerged that govern the development of such platforms. One type of mechanism that seems to be particularly interesting is tokens, because they can be used for various purposes such as incentivizing developers, managing platform access and coordinating platform interactions (Catalini and Gans 2018).

A growing body of literature has explored the blockchain platforms as an enabler of innovation (Avital et al. 2016; Beck and Müller-Bloch 2017), discussed the new business models of such platforms (Beck and Müller-Bloch 2017; Notheisen et al. 2017) and investigated the role of cryptocurrencies and ICOs as a new financial instrument for blockchain platforms (Catalini and Gans 2018). Prior research documents the significance of governance in blockchain platforms and its economy (Beck et al. 2018). However, little has been done to understand the role of boundary resources in governing blockchain platforms (Ghazawneh and Henfridsson 2013). Therefore, the research questions addressed in this paper are:

RQ1: *What roles do tokens such as platform boundary resources play in governing blockchain platforms?*

RQ2: *What are the implications of these boundary resources for blockchain platform development?*

In order to address these research questions, I embarked on a detailed, empirical study of a single case: Ethereum's blockchain platform (Eisenhardt 1989; Yin 2008).

The remainder of this paper is structured as follows. Section 2 covers related work and the conceptual basis of my research. The first part of section 2 covers the fundamentals of platforms, platform governance, and blockchain platforms. The second part of section 2 reviews the theoretical notion of boundary resources and discusses the basics of tokens as blockchain-based platform boundary resources. The research context (i.e., the case description) and the applied methodological approach are covered in section 3. In section 4, I present the findings from my case study, by explaining how tokens govern

platforms. In section 5, I discuss the implications of tokens for platform development as well as pointing out interesting future research avenues. I conclude with a summary of my research in section 6.

6.2.2 Related Literature & Conceptual Basis

6.2.2.1 Platforms and Governance

In recent years, platform ecosystems have become the central logic of digital innovation (Sanchez and Mahoney 1996; Baldwin and Clark 2000; Parker et al. 2016). A software ecosystem is organized around a central technology that is often referred to as a software platform (Manikas and Hansen 2013). These software platforms are characterized by an extendible codebase that constitutes the core functionality of the platform. On top of this platform are modules that interoperate with the platform (Tiwana 2013; Tiwana et al. 2013). Typically, these modules are software applications that extend the functionalities of the platform. In line with the different parts of the platform, different actors of the platform can also be distinguished. There are keystone players (mostly platform owners and core developers) who are responsible for developing the platform core and controlling it (Hanssen 2012; Jansen et al. 2012). Then there are third-party application developers who work on the different modules (i.e., mostly applications) to extend the core functionality of the platform. Lastly, there are end users who consume the developed applications (Jansen et al. 2012). Taken together, these different actors form an innovation network that, connected through APIs and SDKs, facilitates the mutual development of the platform ecosystem (Ghazawneh and Henfridsson 2013; Dal Bianco et al. 2014).

Despite the vast innovation potential inherent to these platform ecosystems (Messerschmitt and Szyperski 2005; Evans et al. 2008), the governance of such platforms still remains a difficult and yet not well understood undertaking. The main reasons for this are the heterogenous actors involved in a platform (Hippel and Krogh 2003) as well as the complex dynamics between them (Fitzgerald 2006; West and Gallagher 2006; Garud et al. 2007). One challenge of platform owners is to come up with strategies to engage a critical mass of third-party developers to build and sustain platform innovation (Boland et al. 2007; Boudreau 2010; Yoo et al. 2010). To address this challenge, platform owners must provide enough utility to prospective developers so that they can create complementary resources in the form of applications and services (Meyer and Seliger 1998). To facilitate the creation of complementary resources,

platform owners engage in various strategies such as communicating technological functionalities to developers, accessing large or important clients, using the brand and marketing resources of the platform owner, getting involved in active community-building activities, and finally facilitating the provision of additional value to the end-user (Gawer and Cusumano 2002; Huber et al. 2017). At the same time, platform owners also have to enact strategies to keep the platform safe. They do so through user agreements, code review processes and soft power instruments such as community norms and standards which help to enforce compliant behavior and prevent platform infringements (Gawer 2009; Gawer and Cusumano 2008). While prior research has addressed these governance issues, its scope is still very narrow. Thus, most studies deal with proprietary software platforms - such as Apple or Android (Tilson et al. 2012; Ghazawneh and Henfridsson 2013; Eaton et al. 2015) - which leaves out a proper understanding of governance in other software platforms such as, for example, blockchain ecosystems. Hence, new research is needed that investigates governance issues in these new contexts (Yoo et al. 2010).

6.2.2.2 Blockchain Platforms and Ecosystems

In a narrow sense, a blockchain is a distributed, transactional database. In a broader sense, this database is linked to a P2P network that is used to verify transactions on the network usually through cryptographic means (i.e., to ensure security). Once transactions are verified, they are summarized in blocks (hence blockchain) and then stored in the database. Therefore, the blockchain's main function is to provide validated, immutable transactions (i.e., database updates) that are consistent between a large number of nodes in a global network (Glaser and Bezenberger 2015; Glaser 2017). Essentially, there are two types of blockchains: public (permissionless) blockchains and private (permissioned) blockchains (Peters and Panayi 2016; Glaser 2017; Tasca et al. 2017). In public blockchains, all nodes can read, submit and validate transactions, while in private blockchains only authorized nodes can read, submit and validate transactions (Tasca et al. 2017; Peters and Panayi 2016).

With the development of the blockchain, new platforms emerged. While at first blockchain platforms (e.g., Bitcoin) were rather limited in their capability, the second generation of blockchain platforms were multi-purpose platforms, featuring full-fledged programming languages that allowed the creation of a variety of new business logics (Swan 2015). One popular example – and indeed today's biggest platform ecosystem - is Ethereum, which features its own Turing-complete programming language (Wood

2014). Like other platform ecosystems, blockchain platforms are characterized by multiple platform layers that interact with each other. For reasons of comprehensibility I will describe the simplest form of a blockchain platform which is mainly composed of two layers. The first layer (i.e., the core) represents the blockchain which constitutes a decentralized database (Avital et al. 2016; Beck et al. 2017). On top of this first blockchain layer lies a second layer of platform protocols (comparable to APIs and SDKs) and decentralized applications (i.e., DApps) (Wood 2014).

Like other platforms, blockchain platforms consist of a variety of different actors, including core developers, third-party app developers and end-users. Depending on the nature of the blockchain platforms (i.e., open or public), these users are involved to a varying degree in the control of blockchain platforms. For example, in truly decentralized blockchain platforms (i.e., public blockchains), these users help to verify transactions on the blockchain, which constitutes an important pre-condition to run and deploy applications. In addition to that, these users are also frequently involved in decisions that concern the platform architecture, e.g., how transactions (i.e., through which algorithm: proof of work vs. proof of stake) should be processed in the future (Tasca et al. 2017). This means that these blockchain platforms are characterized through high decentralization at the lower and the upper platform layers (Glaser 2017). To effectively govern the different interactions of these actors (usually across multiple layers), blockchain platforms employ tokens that hold important implications for platform governance and development (Beck et al. 2018). One perspective that has previously been shown to be useful in investigating platform governance across different actors is the concept of boundary resources (Ghazawneh and Henfridsson 2011, 2013), which will be explained in the following section.

6.2.2.3 Boundary Resources as Platform Governance Mechanisms

Boundary resources are software tools and regulations that serve as the interface to govern the relationship between the platform owner and the application developer (Ghazawneh and Henfridsson 2010). The concept has roots in the boundary object theory (Star and Griesemer 1989), where boundary objects denote artifacts that cut across multiple social worlds (Star and Griesemer 1989; Mark et al. 2007; Barrett and Oborn 2010). The main purpose of these artifacts is thereby to support different actors and their activities within these separate social worlds (Star and Griesemer 1989). The notion of boundary resources aligns very well with the infrastructure of software platforms that are extensible beyond the borders of the organization controlling it. To

govern these platforms, platform owners need to provide third-party developers with platform boundary resources that allow them to effectively build complementary assets in the form of digital applications or apps on top of a software platform (Ghazawneh and Henfridsson 2013).

Platform boundary resources basically have two governance capabilities: expansion and control of platform development. The expansion capability of boundary resources mainly refers to resources that facilitate the development of (third-party) applications by shifting the design capability to third-party developers (Hippel and Katz 2002) and facilitating the use of core platform functions and application deployment (Gawer and Cusumano 2008; Baldwin et al. 2009; Tiwana et al. 2010; Yoo et al. 2010). Popular examples include APIs and SDKs that provide developers with an infrastructure to develop applications on the platform (Ghazawneh and Henfridsson 2013). One important feature of such boundary resources is that they are generative in nature, thereby contributing to the growth and expansion of the platform (Tilson et al. 2010; Tilson et al. 2012). The control capability of boundary resources keeps platform development stable and secure (Ghazawneh and Henfridsson 2013). Popular examples of such boundary resources include developer license agreements and application review processes. The main function of such boundary resources is to introduce rules and standards that prohibit platform infringements such as the development of malicious software applications (Gawer 2009). Hence, boundary resources provide third-party developers access to the platform and support their development practices, while at the same time allowing platform owners to maintain control of their platform (Ghazawneh and Henfridsson 2013) (see Figure 17).

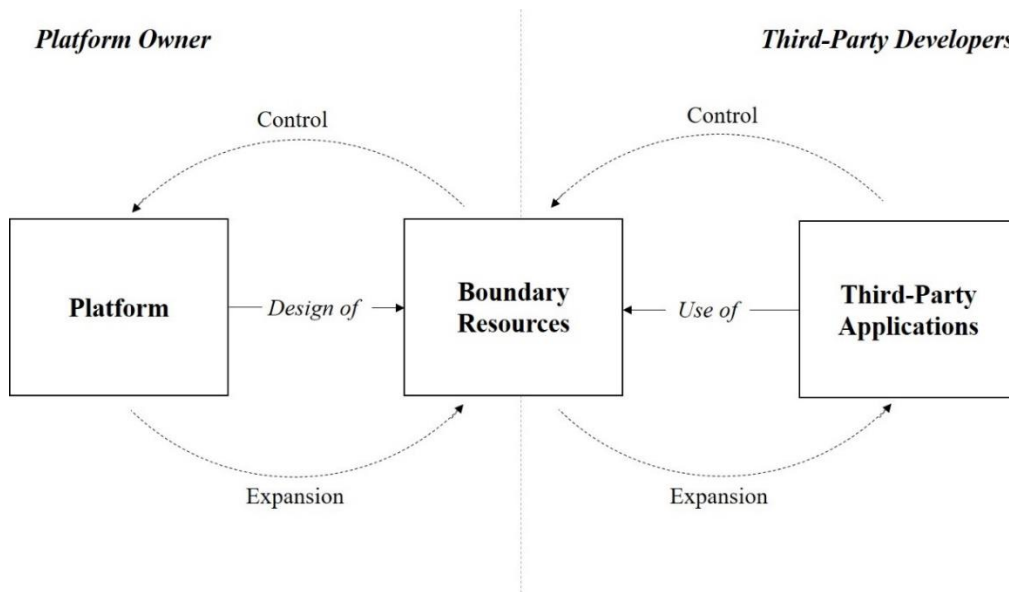


Figure 17. Model of Boundary Resources
 (Source: adapted from Ghazawneh & Henfridsson, 2013)

6.2.3 Tokens as Boundary Resources to Govern Blockchain Platform Ecosystems

I now provide an overview of extant literature regarding tokens and how they are applied in blockchain platforms. With this theoretical foundation, I argue that tokens play an important role as platform boundary resources in the context of blockchain platform ecosystems.

6.2.3.1 From Tokens and Crypto Tokens

According to the Merriam-Webster dictionary, tokens denote “a piece resembling a coin issued for use (as for fare on a bus) by a particular group on specified terms”. Tokens originally emerged in the fields of behavioral economics and psychology for modifying the behavior of institutionalized individuals (Winkler 1971; Kagel 1972). For example, Winkler (1970) showed that tokens could be used to elicit positive work behavior among patients at a psych ward. The main reason for using tokens in these experiments was due to their unique characteristics. For example, they can easily be bound to certain privileges and hence are perfectly suited to incentivize a certain type of behavior. Additionally, they can be easily bound to certain conditions and rules, which makes them a perfect tool to teach certain behaviors. Most importantly, they work only within a clearly defined context, which makes them difficult to counterfeit and hence suitable to control experimental environments (Kazdin 1982).

With the advent of the blockchain technology, tokens experienced a revival in the form of crypto tokens. Crypto tokens denote a digital form of tokens (i.e., a piece of code) that can be programmed to execute nearly any functionality (e.g., access to certain services, ownership, etc.) as well as the conditions upon which their functionality is executed. Also, like conventional tokens, crypto tokens usually work within clearly defined contexts which means that they are bound to certain platforms or blockchains. One exemption constitutes tokens that are interoperable with other tokens (e.g., native tokens and app tokens; see the following paragraph), which softens the strict contextual restrictions of conventional tokens. Another distinguishing factor concerns the issuance of crypto tokens. Crypto tokens can be issued in the course of ICOs, which denote a form of crowdfunding that companies use to acquire capital to realize their blockchain projects (Catalini and Tucker 2017; Conley 2017; Catalini and Gans 2018). Hence, in the case of ICOs users obtain tokens in exchange for money. Another way to issue tokens is through mining. Mining thereby refers to a process in which so called miners (i.e., users) contribute their computing power to validate transactions on the blockchain. In return for this they are given tokens. Hence, mining can be regarded as a process in which users get tokens in exchange for work (Fridgen et al. 2018). Another way to issue tokens is through cryptocurrency exchanges that are secondary markets in which the previously issued tokens can be bought and sold. Popular examples include Kraken and Bitfinex which today trade multiple tokens on the open market (Topchishvili 2018). Cryptocurrency exchanges have an important role in facilitating token liquidity, making it easier for token holders to trade their tokens for other tokens, to liquidate their current tokens and for companies to acquire additional funds (Catalini and Gans 2018; Giudici and Rossi-Lamastra 2018).

6.2.3.2 Types of Crypto Tokens

With the second generation of blockchains (i.e., Ethereum), tokens became programmable and featured a variety of different functionalities. Below, I elaborate on four basic types of crypto tokens and their functionalities.

Utility Tokens & Security Tokens

From a user's perspective, utility tokens and security tokens can be distinguished (Token 2018). The major difference between utility and security tokens lies in their intended use and functionality. Utility tokens entitle their holders to access a platform's service or application. Their main purpose is utilitarian. A popular example of a utility token is

the Filecoin token, which entitles its holders to access the company's decentralized storage services once they have been launched.⁷

Security tokens, on the other hand, promise their holders equity-like rights in the company that issued them. Security tokens can, hence, be best compared to digital shares that convey ownership to its holder and control in a company. A popular example of such a token was the Ethereum-based DAO token, which was designed to allow holders to participate in the profits generated by the project as well as to partake in company decisions.

Native Tokens & Applications Tokens

From a platform's operational perspective, there is a distinction between native tokens inherent to a blockchain (sometimes also called protocol tokens) and application tokens issued on top of a blockchain using smart contracts (Buterin 2014; Johnston et al. 2017). Native tokens can be thought of as fuel for a blockchain. They are needed to pay for operations on the underlying blockchain. In doing so, they act as incentives for miners who contribute their computing power to deploy applications on the blockchain platform.

Application tokens (or app tokens), on the other hand, are tokens that are used in the app itself. Mostly they are used to access a certain application (i.e., they are utility tokens), but they can also be used to let users participate in a company's success (i.e., security tokens). In the case of blockchain platforms, native and app tokens are usually easily convertible (i.e., they are fungible) and hence play an important role in governing the platform ecosystem (Voshmgir 2018) (see Figure 18).

⁷ The token types described here are not mutually exclusive. For example, one token can act as a utility token, a security token or any other kind of token.

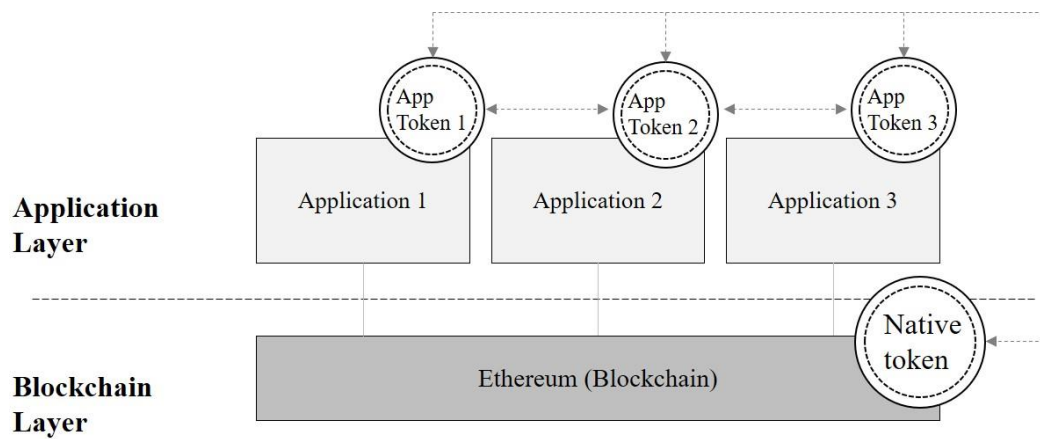


Figure 18. Relation between Native Tokens and App Tokens
(Source: Own depiction)

Now that I have covered some basic types of crypto tokens, I am going to investigate their role as boundary resources and how they facilitate the development of blockchain platforms. I do so by conducting a case study of Ethereum’s platform ecosystem.

6.2.4 Methodology

To better understand how tokens govern the development of blockchain platforms, I first conducted a single case study (Yin 2008) of the blockchain platform of Ethereum with a focus on platform boundary resources. Using multiple data sources, I adopted Hsieh and Shannon’s (2005) method to analyze the content of my collected data.

6.2.4.1 Research Context and Case Selection

The initial idea of the Ethereum platform was introduced by Vitalik Buterin in 2014. Because of the limited technological capabilities of Bitcoin, Buterin created his own blockchain, which became known as Ethereum. To build a blockchain with extended functionality, Buterin and his developer community created Ethereum’s own Turing-complete programming language (i.e., Solidity). They also introduced the concept of smart contracts, which can be best thought of as if-then agreements that stipulate the conditions upon which transactions are executed. Hence, smart contracts can be used to partly automate applications that run on the Ethereum blockchain (Buterin 2014).

There are several reasons why I choose Ethereum as the context of this study. First, unlike other platforms such as Bitcoin, that support specialized applications, Ethereum, due to its Turing-complete programming language provides the infrastructure to a variety of different applications. As a result of this, Ethereum can be considered as a multi-layered, multi-purpose platform that consists of various platform protocols and

applications. Due to its unique architecture, Ethereum represents an extreme case of a blockchain platform (Benbasat et al. 1987; Yin 2008). Thus, there is currently no other platform that offers a comparable number of applications and tokens as Ethereum. According to Gerring (2006), such extreme cases are predestined for theory generation as they usually define new theoretical concepts as opposed to testing existing theoretical concepts. The goal of my case study is, thus, to derive a new theoretical concept in the form of a conceptual framework (i.e., a matrix) to explain the underlying properties and roles of tokens as boundary resources and how these tokens impact the development of blockchain platforms. Moreover, the selected case is well suited to this kind of study as the short history of Ethereum involved a variety of token-related governance changes that are well covered and documented by various information sources. Hence, this unique case in combination with its rich documentation provides us with a suitable context within which to examine my research question.

6.2.4.2 Data Collection and Analysis

I collected five years of data on Ethereum. Hence, my observation period contains data points from Ethereum's incorporation up until today (16.11.2018). To comply with best practices of case study research, I collected data from multiple data sources (Benbasat et al. 1987; Sarker et al. 2013). Following such a data collection procedure enabled us to make more meaningful generalizations (Seale 1999; Creswell et al. 2007). Table 11 provides an overview of the types of data collected and analyzed for this study.

Description	Collected Data
Events – Visit to Ethereum’s biggest developer conference (DAPPCON 2018) that took place on 19 – 20, July 2018 in Berlin.	- Attendance of three workshops on the topics of token design and on building decentralized applications. - Each workshop lasted 2-3 hours. - 12 pages of field notes were taken as well as 10 hours of audio transcripts.
Documentation - Archives and documentation taken from multiple newspapers (online) and personal blog posts covering Ethereum and thematically related concepts such as the blockchain, tokens, cryptocurrencies, etc.	- 81 online articles and 64 posts taken from multiple online sources such as the Financial Times, MITTechnology Review, Coin Desk, CoinTelegraph, ETHNews, etc. - 36 medium blog posts.
Online Keynotes and Speeches – Audio and video recordings of multiple Ethereum conferences available on the Web.	- 63 hours of video recordings and streams of selected Ethereum conferences and events such as DevCon, Deconomy, Ethereal Summits, etc. - Supplementary material, such as slide decks provided for the events.
Official Information - Contents that were provided by official information sources of the Ethereum Foundation.	- Documents, entries, posts, and articles featured on Ethereum’s official information channels, such as the Ethereum blog, the Ethereum Newsletter, Etherscan and Ethereum’s GitHub repository.
Social Media Data - Posts and comments taken from online forums and social media websites covering different topics regarding Ethereum.	>200 entries of online conversations and discussions selected from various social media channels, such as Reddit and Gitter.

Table 11. Overview of Data Sources for the Ethereum Case

To analyze the collected data, I made use of a content analysis (Hsieh and Shannon 2005). To this end, I followed a three-step coding process (Elo and Kyngäs 2008). The first coding step involved an open coding procedure to identify the various token mechanisms that are conducive to governing platform development. The identified token mechanisms served as my basis to uncover latent boundary resources. The second step aimed at identifying boundary resources that lay behind the token mechanisms. In doing so, I assigned tokens with similar mechanisms to abstract classes of boundary resources. In the third step, I tried to elaborate on the tokens’ role as boundary resources by relating them to the notion of expanding and controlling capabilities that I introduced earlier in this paper. All steps of the data analysis were performed through several iterations. Consequently, my understanding of how tokens govern the development of blockchain platform ecosystems evolved gradually throughout my research process. In order to increase the robustness of my analysis and results, the procedures were performed by three independent researchers. Each of the three researchers performed the content analysis independently before meeting as a group to discuss the results.

Differences in categorization were resolved by mutual discussion and agreement on common categories.

6.2.5 Case Analysis & Results

With 1938 DApps developed or currently under development, Ethereum is the biggest blockchain platform (besides Bitcoin). Since its incorporation in 2015, Ethereum’s platform has grown steadily (see Table 12). For example, the number of monthly new applications increased more than tenfold from January 2016 to January 2018 (State of the Dapps 2018). A similar picture emerges when looking at Ethereum’s address growth rate, which can be considered as a proxy for its total number of users. From January 2016 to January 2018 the number of addresses increased by 449% (Etherscan 2018d). Even if we could subtract the number of users that have more than one address, the number is likely to remain high. While the Transaction History provides an overview of the total number of transactions carried out on the Ethereum platform, the HashRate Growth shows the total amount of external computing power used to validate these transactions. As can be seen in Table 12, both numbers increased significantly from 2016 to 2018, indicating a high usage of the platform (Etherscan 2018c, 2018a). Given these impressive numbers, it can be useful to examine more closely the governance strategies applied by Ethereum to develop the platform.

	July 30, 2015	January 1 st , 2016	January 1 st , 2017	January 1 st , 2018
Number of new DApp’s (per month)	-	5	17	76
Unique Address Growth	9205	40701	943417	18315828
Transaction History	8893	9164	38730	908945
HashRate Growth (measured in GH/s ⁷)	11.5297	526.2007	5962.5576	159441.8475

Table 12. Descriptive Statistics Highlighting Ethereum’s Ecosystem Growth

Based on the information provided by the case, I can answer **RQ1**: What roles do tokens as platform boundary resources play in governing blockchain platforms? During my analysis, I identified three new classes of boundary resources, with each class performing a particular role. In the following sub-sections, I elaborate on the underlying mechanisms of these boundary resources and how they relate to Ethereum’s ecosystem development in more detail.

6.2.5.1 Class 1 – Tokens as Incentive Mechanisms to Reward Developers and Users

The first class of boundary resources refers to tokens as incentive mechanisms that can be used to attract work or capital towards the platform. One popular example is Ethereum's "Dev Grants", in which early developers are rewarded with tokens in exchange for developing applications for the Ethereum platform (Davis 2015). Other examples include bug bounties, in which developers get rewarded with tokens for finding bugs in the system (Ethereum Bounty Program 2016). These tokens act like shares because they allow users to participate in the future gains of the platform. The earlier users obtain these tokens, the higher the ownership upside potential of these tokens, which can be sold at a higher price in a later point in time. Tokens can also be obtained in exchange for capital (see Chapter 6.2.2.4). This is enabled through mechanisms such as ICOs that allow users to buy tokens entitling them to participate in the future profits of the platform. Like development grants and bug bounties, early investment is rewarded to a higher degree. This is enabled through so-called token bonding curves (La Rouviere 2017), which constitute token price functions that gradually increase over time. Hence, the main rationale behind this mechanism is to reward early contributors who bear a higher risk (as compared to laggard users) with a higher ownership upside potential. Another interesting mechanism that has not been implemented yet but holds important implications for Ethereum's development is a proof of stake algorithm (Buterin 2014). The best way to explain this mechanism is to refer to mining networks, which similarly to development grants and bug bounties, constitute a mechanism that allows users to obtain tokens for work. This time, however, users contribute their computing power to verify transactions on the blockchain, which constitutes an important pre-condition for an application to run (Buterin 2014). Ethereum's current implementation of the mining network is still very inefficient as it rewards users for contributing work, regardless if this work is compromising or not (users would theoretically also get paid to verify invalid transactions). To counter this problem, Ethereum is currently working on introducing a token staking mechanism (i.e., a proof of stake algorithm) that requires users to stake tokens before verifying transactions on the ecosystems (Ethdocs 2016). In case users verify invalid transactions, the staked tokens will get destroyed, which discourages users from behaving in a compromising way. The above examples show that tokens act as an important incentive by rewarding early contributors with high ownership stakes. At the same time, tokens also introduce important disincentives (i.e., token destruction in the case of validating

untrusted transactions) thereby confronting users with ownership downside potential in the case of misconduct.

6.2.5.2 Class 2 – Tokens as Access Mechanisms to Developer Resources

The second class of boundary resource relates to tokens as mechanisms to access and utilize platform functionality. One popular example constitutes Ethereum's native token Ether, which is required to pay for gas, which is Ethereum's internal unit of account for processing transactions (one can think of it as the fuel that runs Ethereum).⁸ Hence, Ether tokens are needed to deploy applications on Ethereum's platform (Buterin 2014). This has some important implications for platform development as it introduces users to opportunity costs that they must bear in order to participate in the platform ecosystem. By doing so, the acquisition of Ether acts as an entry barrier that weeds out free riders, attracting only users that are committed or believe in the future value of the platform enough to work for or buy access to the platform. Another way this access mechanism works is that it provides users with access to individual token functionalities (i.e., functions and methods defined by the token standards). One popular example constitutes ERC20 tokens that allow users to easily create their own tokens (van de Sande 2015). Hence, this mechanism allows third-party app developers to monetize the development of their own applications by issuing tokens on top of the Ethereum blockchain. This functionality has important implications for complementors (e.g., third-party app developers) as the issued tokens allow ownership sharing, not only between core developers and third-party app developers but also between third-party app developers and end users. Hence, by making use of this mechanism, third-party app developers can monetize the development of their applications in exchange for transferring ownership of their applications to end users, thereby allowing them to partake in the future success of their applications. This brings forward entirely new ways to govern platform development as it allows different platform actors to share and co-create value on multiple levels of the platform ecosystem. While the discussed mechanisms can be best compared to resourcing strategies that enable third-party developers to access and utilize new platform functionalities and resources, tokens seem to stretch the boundaries of these existing boundary resources beyond the sphere of platform owners and platform developers. The examples above show that tokens govern the access of resources in many new ways by introducing users to some sort of entry barrier while enabling them

⁸ To run a simple operation like addition, three units of gas are needed which corresponds to $0.06 * 10^{-6}$ Ether or 0.06 microether (according to the default gas price).

to build their own boundary resources that allow them to attract users on their own (i.e., end users) by sharing ownership with them.

6.2.5.3 Class 3 – Tokens as Coordination Mechanisms to Manage Platform Actors

The third class of boundary resources relates to tokens as coordination mechanisms that manage platform interactions. The main mechanism within this boundary resource constitutes token standards (e.g., ERC20 and ERC223), which denote a set of conventions that govern the functions of tokens. Thus, token standards describe how tokens interact with smart contracts (and hence applications) and other tokens. To participate in the definition of these standards, users can hand in Ethereum Improvement Proposals (EIPs) (Ethereum Improvement Proposals 2018). The most popular token standard is ERC20 which defines six basic functions (e.g., `totalSupply()`, `transfer()`, `allowance()`, `balanceOf()`, `approve()`, `transferFrom()`) (Ethereum 2018). The functions of this standard fulfill an important role in maintaining the integrity of the platform. For example, the `approve()` function ensures that nobody can create additional tokens without approval, thereby preventing users from creating arbitrary tokens to benefit themselves. As another example, the `allowance()` function is used to secure the platform; it ensures transactions are valid, so users cannot spend tokens they do not own. One more example of a token standard that was developed with the aim of creating a well-functioning and secure platform is ERC223. It was created to resolve an existing bug in the ERC20 token standard that made it possible for tokens to be lost when users mistakenly send them to a smart contract. The ERC223 token standard fixed this issue by specifying that tokens cannot be transferred to contracts that do not allow tokens to be withdrawn. Beyond their role in securing interactions, token standards have another important function; they facilitate the interoperability of tokens. For example, the ERC20 standard forces compatibility among tokens by ensuring that all tokens have the same functions, methods and take the same arguments. This saves developers and users of tokens considerable time and money. Thus, users who want to engage in a transaction (either to trade tokens or to consume an application) theoretically do not need to communicate the terms and conditions of the transaction as these are inscribed in the token contract that is defined by the token standard. By doing so, tokens introduce a means of implicit and more efficient communication that replaces more fractured and asynchronous types of communication such as e-mail, Slack channels, etc. This allows platform coordination to be more efficient, as it reduces the complexity of communication. Also, it allows the addition of new tokens and applications faster, thereby facilitating the pace of innovation and value creation in the Ethereum platform

ecosystem. As can be seen from the above examples, tokens play an important role in governing users’ interactions by prohibiting or limiting certain types of interactions.

Based on the above considerations, I created a matrix that summarizes how tokens act as boundary resources by elaborating and providing examples of how they expand or control platform development (see Table 13).

	Controlling Capabilities	Expanding Capabilities
Tokens as Incentive Mechanisms	- Using tokens (e.g., proof of stake) as staking mechanisms to discourage unfaithful behavior, <i>e.g., Miners (i.e., users) who validate trustworthy transactions earn additional tokens, miners who validate untrustworthy transactions lose tokens.</i>	- Using tokens to reward early contributors of the platform, either for their work, or their financial contributions, <i>e.g., platform developers can issue security tokens to grant users ownership of the platform to be created and allow users to participate in the platform’s future success.</i>
Tokens as Access Mechanisms	- Using tokens as an access hurdle to weed out free riders and to attract committed users, <i>e.g., users have to put in some effort (either through work, or through buying tokens) to access platform services.</i>	- Using tokens (i.e., set of functions inherent to tokens) to create new platform functionality, <i>e.g., app developers can create their own tokens to monetize the development of their applications and share the success of their applications with end users.</i>
Tokens as Coordination Mechanisms	- Using tokens (i.e., adhering to token standards) as implicit and inscribed rules that govern the interactions of platform actors. Tokens can clearly define users’ scope of action, <i>e.g., by using the ERC223 token standard, users are prevented from transferring their tokens to a contract that does not allow tokens to be withdrawn, thereby protecting their tokens from getting locked in.</i>	- Using tokens (i.e., set of token standards) to guarantee interoperability and fungibility between different types of tokens/applications, <i>e.g., using the ERC20 token standard enhances a user’s ability to interact with other tokens and applications and hence helps to better utilize the ecosystem.</i>

Table 13. Overview of Token Boundary Resources

6.2.6 Discussion: Implications for Platform Development

Now that I have elaborated on the role of tokens as boundary resources to govern the development of blockchain platforms, I would like to discuss what implications these new types of boundary resources have for platform development. In doing so, I address

RQ2: What are the implications of these boundary resources for blockchain platform development?

6.2.6.1 New Platform Participation Structures

One consequence of the token mechanisms discussed in section 6.2.4 is that they introduce a completely new way of incentivizing platform development. This strategy is markedly different from strategies employed by other platforms so far. Take for example Apple's in App Purchase API, which allowed Apple to profit from sold applications of third-party developers with a cut of 30% (Ghazawneh and Henfridsson 2010, 2013). In the case of Ethereum, the relationship between the platform owner and third-party developers is partly reversed; developers can participate in a platform's success through equity. Users are thereby given increased ownership of the platform. This ownership is designed in a way that it incentivizes users according to the work they are doing or the risk they are bearing. This kind of mechanism introduces more symmetric incentives. This relates to the concept of "skin in the game" (Taleb 2018), which allows better alignment of incentives between platform actors. This mechanism is in stark contrast to current platform participation structures that are often asymmetric, meaning that platform actors are not remunerated in a meritocratic and fair way. Thus, the parties usually profiting the most are not the real innovators (i.e., the developers), but those that commercialize the innovations (i.e., the platform owners). This inhibits the expanding capabilities of a platform and hence may stifle innovation. Future research should be directed towards better understanding these new participation structures and how they can be used to strategically govern platform innovation.

6.2.6.2 New Network Effects

Another consequence of these token mechanisms is the introduction of new kinds of network effects (Katz and Shapiro 1985; Rochet J.-C. and Tirole J. 2003; Catalini and Gans 2017). Thus, the ownership structures discussed above provide early adopters not only with a vested interest in the product associated with the token, but they encourage early adoption of that token at a higher pace. The main reason for this is that early adopters face a higher ownership upside potential due to the low price of the token, which allows them to profit to a greater extent from token price increases as compared to lagging adopters. This leads to "a race to be in" that triggers more rapid user adoption and new kinds of network effects. These new, more immediate network effects differ from conventional network effects, that usually develop over time as the utility of the platform gradually increases. For a distinction between conventional network effects

and this new token network effects, see Figure 19. Another factor potentially influencing network effects is the interoperability of tokens (Tasca et al. 2017). Thus, the increasing adoption/creation of ERC20 tokens leads to a rise in value of Ethereum’s native token and vice versa (all the other ERC20 tokens). This might result, under certain conditions, in a vicious cycle of self-reinforcing network effects between native and app tokens, thereby driving the growth and value of the whole platform ecosystem. Future research should be directed towards investigating how tokens must be designed to create these new kinds of token-network effects as well as how the different kinds of network effects created through tokens interact with each other. Current observations seem to suggest that the value of a native token seems to rise proportionally with the number of tokens that are created on the basis of that token, at least initially. However, with the ongoing creation and adoption of app-tokens, the positive effect seems to get reversed after some point in time (Etherscan 2018b). This presents an interesting paradox worth investigating.

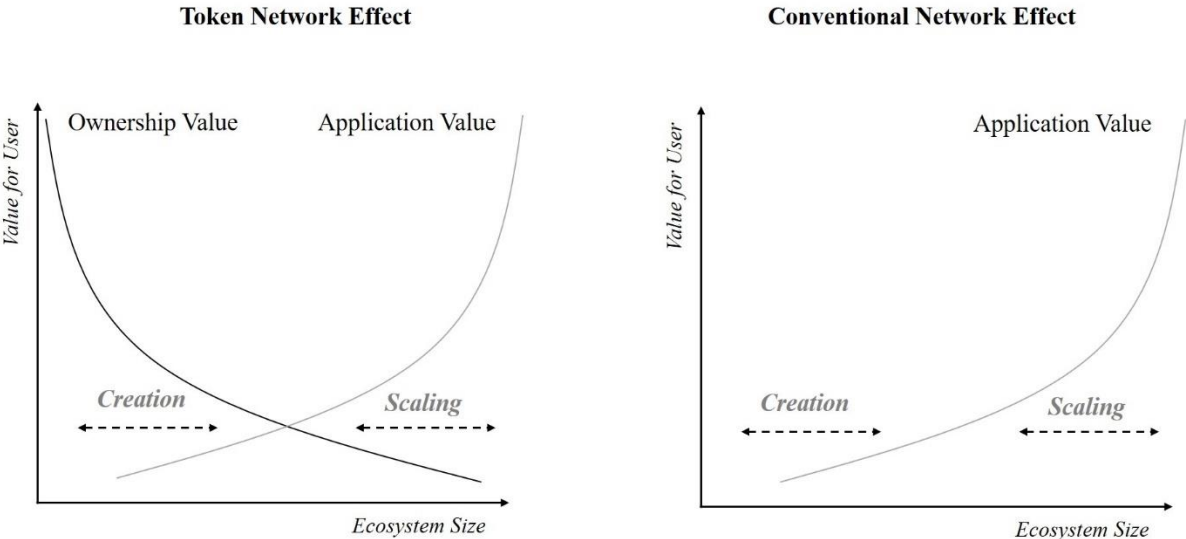


Figure 19. Comparison Token Network Effects vs. Conventional Network Effects
 (Source: Own depiction)

6.2.6.3 Creating Self-Governing and Organic Ecosystems

Additionally, token mechanisms introduce new forms of clan control. Clan control refers to shared values and common norms that help to govern platform ecosystems (Kirsch 1997). By allowing users to formulate their own set of functions and standards that they can put forward in the form of EIPs, Ethereum allows users to more explicitly state values and norms that they deem important for the functioning of the platform. Clan control is thereby established in a more direct way since its corresponding values

and norms are inscribed in code. This contrasts with previous approaches where clan control, while evolving through informal interactions between users (Tiwana 2013; Tiwana et al. 2013), often resulted in conflicting community values and norms (Goldbach and Benlian 2015) that had to be resolved and enforced by the central platform owner. Token mechanisms can resolve this issue as they introduce new and more direct ways in defining and enforcing clan control thereby resulting in truly self-governing platform ecosystems. Future research should explore this new type of clan control and evaluate its effectiveness compared to other forms of platform control. Another interesting consequence of token mechanisms might be the more organic development of platforms. Due to the fungibility of tokens, users can simply switch from one token community to another one. Likewise, due to the option of forking users can simply recreate a new community by building upon the basis (i.e., the code) of the old community (Andersen and Ingram Bogusz 2017). Together, these mechanisms decrease friction within a platform ecosystem as they allow users who do not believe in the merit of a certain token and its community to leave relatively easily and to join or create a new community. Hence, token mechanisms allow ecosystems to evolve more organically. Future research should be directed towards investigating how token boundary resources influence the organic development of platforms and how this affects platform innovation.

6.2.7 Conclusion & Contribution

This is, to the best of my knowledge, the first study that investigates tokens as a governance mechanism of blockchain platforms. The results of my study thereby suggest that tokens take a central role in managing access, incentives, and coordination in blockchain platforms. In doing so, I am the first to unravel the basic governance mechanisms of tokens and how they might influence blockchain platform development. Moreover, I elaborate on how these mechanisms might change the nature of platform development from tightly controlled gradually scaling platforms that are owned by a few key players towards more organic, fast scaling platforms which are owned by and in which revenue is shared by the masses, thereby uncovering interesting future research avenues.

My research provides three contributions. First, I contribute to the emerging research on blockchains (Avital et al. 2016; Notheisen et al. 2017) and its related phenomena (e.g., tokens, ICOs and cryptocurrencies) (Catalini and Tucker 2017; Catalini and Gans 2018). By exploring the multifaceted role of tokens in the context of blockchain platforms, I

am among the first to consider blockchains from a platform perspective. In doing so, I draw attention to and describe the unique characteristics of blockchain platforms with the aim of providing a better understanding of blockchain platform architectures as well as their underlying mechanisms. Second, by identifying and describing new types of boundary resources in the context of blockchain platforms, my research contributes to previous research on platform boundary resources (Ghazawneh and Henfridsson 2013). Since the current body of knowledge on boundary resources revolves only around a small fraction of platforms (i.e., proprietary platforms), my study extends the current understanding of boundary resources by exploring this concept in a new domain. Finally, I also contribute to literature on platform development and evolution (Tiwana 2015; Beck et al. 2018). I do so by discussing how the identified boundary resources might affect the development and evolution of platform ecosystems in this domain.

Chapter 7

Concluding Chapter

7 Discussion of the Results of this Thesis

In this last chapter, I summarize the major findings and discuss the theoretical as well as practical implications of my thesis. I conclude this thesis by identifying three promising future research directions.

7.1 Summary of Findings

Within this thesis, I examined how crowdsourcing platforms support entrepreneurs in realizing their opportunities (Chapter 4), how crowdsourcing platforms can be used and designed to co-create new products with the crowd more effectively (Chapter 5) and how new crowd-based mechanisms can be used to create and govern novel entrepreneurial platform ecosystems (Chapter 6). Below, I summarize the key findings of each chapter.

Chapter 4 focused on exploring crowd-based infrastructures in the entrepreneurial opportunity creation context. Hence, the main result of Chapter 4.1 was a conceptual framework that explains how crowdsourcing platforms support entrepreneurs during opportunity creation. The findings of my research show that crowdsourcing platforms offer valuable support to entrepreneurs during opportunity formation (i.e., opportunity objectification) as well as during opportunity realization (i.e., opportunity enactment). During opportunity formation, crowdsourcing platforms provide entrepreneurs new ways to access social resources (i.e., the crowd) as well as the heterogeneous knowledge of these resources. Access to these social resources allows entrepreneurs to involve the crowd in the sense making process of their opportunities which is an important precondition for an opportunity to become an objective reality. Furthermore, crowdsourcing platforms provide new ways for entrepreneurs to engage in a continuous dialogue with the crowd. By doing so, crowd-based infrastructures allow entrepreneurs to involve potential customers in multiple iterations of business development thereby shortening the overall business development time. Regarding opportunity realization, crowdsourcing platforms provide entrepreneurs with a new way to reduce stakeholder uncertainty and to persuade stakeholders. In doing so, crowd-based infrastructures allow entrepreneurs to use crowd support/engagement as a signal that helps to validate the potential of business ideas and opportunities, thereby reducing the risk for other stakeholders. Finally, crowdsourcing platforms provide new ways for entrepreneurs to mobilize the resources of the crowd. By doing so, they allow entrepreneurs to flexibly access skills (e.g., programming skills) and scarce resources (e.g., capital) they need to

develop their business. The findings of this chapter suggest that crowdsourcing platforms bear the potential to transform entrepreneurship by facilitating more open and dynamic entrepreneurial processes that consider the iterative development of novel business opportunities with external stakeholders. By doing so, my research challenges preexistent notions of entrepreneurship that assumes linear entrepreneurial processes and that regard entrepreneurs as the focal actors in shaping and realizing business opportunities.

Chapter 5 focused on exploring co-creation as a facet of crowd-based infrastructures to unlock new innovative potential among the crowd. The main result of Chapter 5.1 was a framework that helps to explain the concept of co-creation in the context of crowdfunding and how it can be leveraged to systematically involve the crowd in a company's innovation activities. The findings of this research study suggest that crowdfunding due to its unique properties can be used by start-ups to engage customers in the co-creational development of new products across the entire innovation process. This is in contrast to other open innovation tools that are mainly used to co-create value at the fuzzy front-end of innovation (usually in the ideation phase). Hence, crowdfunding platforms can be used to engage the crowd in various tasks such as validating ideas, creating viral marketing effects and early sales, providing feedback on novel product features, and helping with product delivery and customer service. The findings further imply that to fully utilize this co-creation potential inherent to crowdfunding platforms, an entrepreneur must take into consideration the careful balance between tasks, people, governance, and technology. The main result of Chapter 5.2 was a conceptual model of a new crowdfunding platform architecture that is particularly conducive to leveraging the co-creational potential of the crowd. The findings of this research suggest that to fully utilize this potential, crowdfunding platforms must employ certain design elements such as process incentives, clear IP rights, and more flexible participation architectures (i.e., participation structures that enable multilateral interactions and multiple exchange formats). A similar result was provided by my third study (see Chapter 5.3) in which I derived and tested a new design for crowdfunding participation architecture with the aim of facilitating co-creational efforts (i.e., feedback and funding) among users. The findings of this research showed that design elements such as participatory updates, multiple endorsements and voting mechanisms increase the feedback as well as the relative funding amounts of the crowd. Moreover, my findings suggest that psychological ownership feelings play a crucial role in mediating the effect of these design elements on the co-creational efforts of users

during crowdfunding. My findings challenge previous crowdfunding research which primarily considers crowdfunding as a funding mechanism. Thus, my research shows that crowdfunding has certain properties that make it conducive to co-create value beyond funding, e.g., through integrating the crowd in a company's product development. Additionally, my research findings suggest new participation structures that can help to more efficiently leverage the inherent co-creational potential of crowdfunding platforms.

Chapter 6 focused on exploring ICOs and tokens as new crowd-based mechanisms and how these mechanisms facilitate the creation and governance of new entrepreneurial ecosystems. The main result of Chapter 6.1 was a taxonomy of ICO processes that is used to distinguish three types of ICOs. My research findings thereby show that the most prominent cluster of ICOs is mainly concerned with the creation of customer-centric services, which is followed by the creation of financial service innovations and platform innovations. The latter is the starting point of Chapter 6.2 in which I discussed the relationship between tokens (as one underlying mechanism of ICOs) and platform innovation in more detail. The main result of Chapter 6.2 was a conceptual framework that explains how tokens (i.e., are usually issued during ICOs) can be used to govern novel decentralized platform ecosystems. The findings of this study suggest that tokens act as platform boundary resources that take a supporting function across different social worlds (e.g., platform owner, third-party developer and users). By doing so they provide new governance mechanisms that help to manage the interaction of different platform actors. Hence, my results show that tokens act as powerful incentive mechanisms that platform owners can use to reward third-party developers for their work. Additionally, tokens act as access mechanisms that can help third-party developers gain access to external platform resources such as the capital of the crowd which they can use to finance their development projects. Furthermore, tokens also act as important coordination mechanisms that allow platform actors to communicate with each other in a more frictionless and efficient way. Finally, I also discussed the implications of these novel governance mechanisms on the development of ecosystems. I thereby argue that tokens will lead to the creation of new types of organic, fast-scaling entrepreneurial ecosystems that are characterized by unprecedented levels of innovation.

7.2 Contribution of this Thesis

This thesis offers several theoretical and practical contributions. In the following section, I elaborate on these in more detail.

7.2.1 Theoretical Contribution

First, my thesis extends previous research on digital entrepreneurship by investigating the case of crowd-based infrastructures which constitute a special case of digital infrastructures. In doing so, my research provides a deeper and more nuanced understanding of how crowd-based infrastructures shape entrepreneurial innovation processes (see Chapter 5) and innovation outcomes (see Chapter 6.2). Furthermore, I contribute to existing entrepreneurship research by providing a future research agenda on crowdsourcing in the context of entrepreneurship. In doing so, I particularly argue for more interdisciplinary research at the intersection of entrepreneurship and crowdsourcing to better understand how crowdsourcing affects entrepreneurial innovation, collaboration and agency. Furthermore, I argue in favor of more design-oriented research (Hevner et al. 2004; Hevner, Alan, R. et al. 2004). Such research might be particularly helpful to come up with novel crowdsourcing solutions that do not exist yet and are better geared towards an entrepreneur's innovation needs. Moreover, DSR is likely to set new research impulses by propagating a constructivist research view in which new knowledge is created through the introduction of novel digital artifacts.

Second, my thesis contributes to existing crowdsourcing research by investigating crowdsourcing's role for new firms which is a domain that has received relatively little research attention yet (West et al. 2014). In doing so, I provide an overview of the innovative capabilities of crowdsourcing platforms and match them to the idiosyncratic innovation challenges of start-ups. Furthermore, I provide a more holistic understanding of how crowdsourcing platforms must be used to efficiently support startups in their innovation efforts. Additionally, I contribute to the existing body of knowledge by investigating new participation architectures of crowdfunding systems and how they relate to the effective utilization of such systems. By doing so, I address current calls for research on more open and generative participation architectures in crowdsourcing with the aim of fostering more co-creation and more innovative solutions among participants (Carlile 2002; Tsoukas 2009; Majchrzak and Malhotra 2013). Consequently, my research findings provide a novel insight on how existing participation structures must be altered to facilitate more effective co-creation between a crowd and the entrepreneur.

Third, my thesis contributes to existing crowdfunding research by exploring crowdfunding's role as an innovation mechanism (Stanko and Henard 2017). This is in contrast to the majority of crowdfunding research which considers crowdfunding primarily a mechanism to fund start-ups. While a small number of studies has

acknowledged the innovation potential of crowdfunding beyond funding start-ups (Brem et al. 2017; Stanko and Henard 2017), there is still relatively little empirical understanding about how crowdfunding can be used to benefit a company's innovation efforts. Hence, by examining crowdfunding as an innovation mechanism we do not only extend its application potential beyond funding, but we further contribute to a better understanding of how crowdfunding must be used and designed to systematically leverage the innovative potential of the crowd. Additionally, I contribute to an existing body of knowledge by exploring new types of crowdfunding models. By doing so, my research looks beyond standardized crowdfunding models (Bradford 2012) that are covered by current crowdfunding research and offer new theoretical insights with regard to more flexible crowdfunding models and how these models relate to a company's innovative capabilities and long-term success (Belleflamme et al. 2013). Finally, I contribute to existing crowdfunding research by introducing a new crowdfunding mechanism altogether. Thus, by exploring ICOs, I contribute to the foundational understanding of this new subtype of blockchain-based crowdfunding mechanism (Conley 2017; Catalini and Gans 2018).

Fourth, my thesis contributes to existing research on governance in software platform ecosystems (Ghazawneh and Henfridsson 2010, 2013; Ghazawneh 2011). It does so by exploring ICOs and tokens as novel platform boundary resources, i.e., governance mechanisms that support platform actors in multiple social worlds. Hence, my research does not only extend current research by considering novel governance mechanisms, but it also contributes to a better understanding of platform boundary resources in new contexts. This is in contrast to previous research which has mainly dealt with platform boundary resources in proprietary contexts (Tilson et al. 2012; Ghazawneh and Henfridsson 2013). Furthermore, I contribute to existing research on ecosystem development (Tiwana et al. 2010) by examining the implications of these new types of boundary resources on the development of new platform ecosystems. Consequently, my research provides a better understanding of how crowd-based infrastructures and their associated governance mechanisms lead to the formation of entirely new entrepreneurial ecosystems.

Lastly, I contribute to research on blockchains and blockchain-related phenomena (e.g., ICOs, blockchain ecosystems, etc.) (Glaser and Bezenberger 2015; Catalini and Gans 2018). Hence, by exploring ICOs as new blockchain-based funding mechanisms I am among the first to provide a theoretical understanding about ICOs and how they can be

used to create new innovative services and platform ecosystems. Moreover, I further explore the role of tokens (i.e., one underlying mechanism of ICOs) in the context of blockchain platform ecosystems thereby contributing to a more holistic understanding of how these two concepts are linked (Beck et al. 2018).

7.2.2 Practical Contribution

In addition to theoretical contributions, my thesis also offers several contributions for practitioners, i.e., entrepreneurs, crowdfunders and designers of crowdfunding platforms and entrepreneurial ecosystems.

My first practical contribution is to provide entrepreneurs with a holistic understanding of when and how to use crowdsourcing during entrepreneurial opportunity creation. So far relatively little is understood about the benefits of applying crowdsourcing in the domain of entrepreneurship. To resolve this issue, I provide entrepreneurs with a conceptual framework that has two main purposes. First, it provides them an overview of how crowdsourcing can resolve certain entrepreneurial issues encountered during entrepreneurial opportunity creation. Second, I provide them with a guideline that informs them about the suitability and effectiveness of certain crowdsourcing approaches to resolve these issues. Hence, based on this framework entrepreneurs are better able to adequately assess when and how to employ crowdsourcing when pursuing novel opportunities.

My second practical contribution is to provide crowdfunders and entrepreneurs with a schematic understanding of how to use existing crowdfunding systems to leverage the innovative and co-creative potential of a diverse crowd of people. This is in contrast to current crowdfunding guidelines that are primarily geared to educate entrepreneurs on how to reach a certain funding threshold. Moreover, existing guidelines very often seem to neglect the processual nature of crowdfunding (Gierczak et al. 2015; Beaulieu et al. 2015). To address this issue, I propose a conceptual framework in the form of a process model that contains various factors that entrepreneurs need to take into consideration to leverage the co-creational potential of the crowd at different stages of the crowdfunding process. In doing so, I provide crowdfunders and entrepreneurs with an easy to use management tool that they can use prior to a crowdfunding campaign to assess the innovation potential of the crowd and to strategically plan and prepare innovation activities with the crowd.

My third practical contribution is to provide designers and users of crowdfunding systems with prescriptive and design knowledge on how to foster co-creation in crowdfunding systems. As with prescriptive knowledge, we provide practitioners with a conceptual framework of a new crowdfunding model that is particularly conducive to co-creating value with customers beyond funding. The conceptual model can be used as a blueprint for system designers, informing them about the different design possibilities available to realize the co-creative potential of crowdfunding systems. Moreover, the model provides important managerial implications to campaign owners with regard to building more sustainable businesses. For example, the conceptual model suggests that entrepreneurs should consider co-creation efforts before the actual funding takes place. This helps users of such systems to validate the business before committing excessive resources in a potentially unviable business. Furthermore, I provide system designers with design knowledge in the form of actual design elements that facilitate co-creation on crowdfunding platforms as well as knowledge on the actual implementation of these elements. Consequently, my findings offer precise and actionable design instructions that platform designers can use to guide their own development of such platforms in the future.

My fourth practical contribution is to provide entrepreneurs with a processual understanding of how to successfully conduct ICOs. As of today, there is relatively little understanding about the processes of ICOs. This means that there is currently no guideline that informs entrepreneurs what actions they need to take and when they need to take them to successfully conduct an ICO campaign. To address this knowledge gap, I provide entrepreneurs with a taxonomic framework that they can use to strategically plan their ICO campaign in accordance with the outcome they try to achieve. Hence, my framework provides entrepreneurs an overview of different process steps and how they relate to achieving a particular entrepreneurial goal. Entrepreneurs can use this framework to guide their actions when launching their blockchain projects.

My final and most important practical contribution concerns the provision of a token governance framework for blockchain platform entrepreneurs. To this day there is practically no common understanding on how to use tokens to build and govern decentralized platform ecosystems. In fact, most of the existing knowledge is anecdotal and based on no empirical research. Against this background, my token governance framework provides entrepreneurs with a knowledge resource that helps them to develop an intuitive and fundamental understanding about tokens as platform governance

mechanisms. Apart from this, blockchain platform entrepreneurs can also use this framework to consider how these mechanisms affect the development of new entrepreneurial ecosystems.

7.3 Conclusion & Directions for Future Research

In this thesis, I investigated the phenomenon of crowd-based entrepreneurship and how this new phenomenon affects entrepreneurial innovation on an individual as well as on an ecosystem level. In particular, I showed how crowd-based infrastructures can be used to support entrepreneurs in creating new entrepreneurial opportunities. Furthermore, I showed how certain participation structures and design elements of crowdfunding platforms facilitate the co-creation of value between start-ups and customers. Finally, I showed how crowd-based mechanisms influence the creation as well as governance of new entrepreneurial ecosystems. My findings support the notion of Nambisan (2017) in that crowdsourcing transforms boundaries of entrepreneurial outcomes and processes. This is achieved through the web-based nature of crowdsourcing platforms that allow entrepreneurs to more easily integrate users and potential customers in their product development and commercialization processes, usually at a larger scale. Likewise, crowdsourcing also yields new and more customer-centric products and services. This is achieved through the flexibility of crowdsourcing platforms which allow products and services to be developed and refined with a crowd of customers through multiple iterations. Additionally, the findings of this thesis also support Nambisan et al.'s second notion, namely that crowdsourcing changes the boundaries of entrepreneurial agency. This is achieved through the integrative nature of crowdsourcing platforms that allow entrepreneurs to draw on the capabilities and resources of the crowd. In doing so, crowdsourcing enables entrepreneurs to hand over part of their agency to external actors who are not only willing but also capable of supporting them in their entrepreneurial and innovation related endeavors. Apart from this, my research implies that crowdsourcing is also transformative in the sense that it facilitates the creation of entirely new entrepreneurial ecosystems. It does so by introducing new mechanisms (e.g., ICOs and tokens) that take an important role in fostering the generative creation of new entrepreneurial applications as well as in governing the actors developing these applications.

Based on the findings of this thesis, I conclude that crowd-based entrepreneurship constitutes a new interesting research paradigm within the realm of digital entrepreneurship (Nambisan 2017) and open innovation (Chesbrough 2006) that holds

considerable potential for future research. In what follows, I will briefly elaborate on three potentially interesting research directions that I discovered while working on this thesis. The first research direction is related to the design of new crowdsourcing systems for entrepreneurship. Although my research could show that crowdsourcing is a valuable tool to support entrepreneurs in their endeavors, its focus is mostly on generic crowdsourcing platforms that are suited to solve single and clearly defined tasks. However, from literature we know that entrepreneurship is often a dynamic and serendipitous process (Reynolds 2005; Dew 2009). Such a process naturally depends on adequate infrastructures to support it. Against this background, future research should not only discover existing crowdsourcing infrastructures, but it should explore new crowdsourcing infrastructures that better address the flexible and complex needs of entrepreneurs and how such infrastructures can support entrepreneurial innovation. One research direction that might be particularly helpful in this regard is to explore new crowdsourcing participation architectures that focus on idea evolution rather than idea generation. This requires, for example, the consideration of new affordances that encourage and make transparent to the crowd the knowledge evolution that has occurred over time. This is an important requirement for evolving ideas as it allows anyone to see what knowledge has been collectively generated thus far and to build upon this pre-existing knowledge when developing ideas further. Moreover, research on new participation architectures should explore ways to further encourage the ongoing knowledge transfer between entrepreneurs and the crowd. One way to achieve this might be through new incentives that not only reward one-time contributions but also reward innovative process behaviors along the entire entrepreneurial journey. The result of this might be a crowd that is more motivated and committed to evolve existing ideas instead of posting new ideas on their own.

The second research direction is related to exploring new and more active crowdfunding models and how these models influence entrepreneurial success. While my research implies that more active crowdfunding models hold considerable potential with regards to a start-up's sustainable development, further research is needed that explores this relationship in more detail. Future research should, thus, include quantitative empirical studies that investigate the effects of more active crowdfunding models on different measures of entrepreneurial success (e.g., long-term survival rate, innovativeness, acquired capital etc.). Likewise, future research should consider a new and wider variety of crowdfunding models and investigate how these models help respective companies to co-innovate and create new value with the crowd. One type of crowdfunding model

that seems to be particularly interesting in this regard is ICOs. My research, thus, indicates that ICOs feature a variety of new mechanisms that allow groups to more effectively coordinate how value is created and shared among common goals. One example is token bonding curves that allow investors to be rewarded in accordance with the risk they are taking or the work they are contributing towards a certain company. This means that early investors or more active investors are eligible for a higher proportion of the company's profit. Curation markets (La Rouviere 2017) are another example that allows investors to flexibly join or part from a project in accordance with its performance. By doing so, this mechanism keeps project creators accountable throughout the entire project duration. While the above examples introduce new interesting mechanisms to the domain of crowdfunding, research on these concepts has been nascent so far. One potentially interesting research avenue might be to explore how token bonding curves and curation markets change how value is co-created in crowdfunding.

The third research direction is related to the investigation of new entrepreneurial ecosystems and how crowd-based mechanisms influence the development of these ecosystems. One interesting example here is tokens which constitute a new form of crowdsourcing mechanism that is not only geared toward acquiring funds but that can be used to align and coordinate the interests of multiple platform actors. As shown in my research, such tokens take the form of so-called boundary resources that support the development of complementary resources. In doing so, tokens facilitate the development of decentralized entrepreneurial ecosystems that lie beyond one entrepreneur's direct control and aspiration. Future research should explore this generative role of tokens in the context of entrepreneurial ecosystems in more detail. One research direction that might be particularly interesting in this regard is to explore new kinds of token-based network effects and to investigate how these effects drive the growth and value of ecosystems. Future research should, thus, be directed towards investigating how tokens must be designed to create these new kinds of token-network effects as well as how the different kinds of network effects created through tokens interact with each other. Another interesting research direction pertains to tokens and their capability of flexibly supporting the creation of new projects and communities within an ecosystem. This is enabled through the fungibility of tokens which allows platform actors to enter or part from certain communities or projects more easily. Because of this, communities and projects within an ecosystem form and cease to exist more organically. Hence, future research should be directed towards investigating how tokens facilitate the organic

development of platforms and how this organic development relates to platform innovation.

Publication bibliography

- Adamson, Robert E. (1952): Functional fixedness as related to problem solving: A repetition of three experiments. In *Journal of Experimental Psychology* 44 (4), pp. 288–291.
- Afuah, Allan; Tucci, Christopher L. (2012): Crowdsourcing as a solution to distant search. In *Academy of Management Review* 37 (3), pp. 355–375.
- Agrawal, Ajay; Catalini, Christian; Goldfarb, Avi (2014): Some simple economics of crowdfunding. In *Innovation Policy and the Economy* 14 (1), pp. 63–97.
- Agrawal, Ajay; Catalini, Christian; Goldfarb, Avi (2015): Crowdfunding: Geography, social networks, and the timing of investment decisions. In *Journal of Economics & Management Strategy* 24 (2), pp. 253–274.
- Agrawal, Ajay; Catalini, Christian; Goldfarb, Avi (2016): Are syndicates the killer app of equity crowdfunding? In *California Management Review* 58 (2), pp. 111–124.
- Ahlers, Gerrit K. C.; Cumming, Douglas; Günther, Christina; Schweizer, Denis (2015): Signaling in equity crowdfunding. In *Entrepreneurship Theory and Practice* 39 (4), pp. 955–980.
- Aldrich, Howard (2014): The democratization of entrepreneurship? Hackers, makerspaces, and crowdfunding. In *Annual Meeting of the Academy of Management*, p. 7.
- Alvarez, Sharon A.; Barney, Jay B. (2007): Discovery and creation: Alternative theories of entrepreneurial action. In *Strategic Entrepreneurship Journal* 1 (1-2), pp. 11–26.
- Alvarez, Sharon A.; Barney, Jay B. (2010): Entrepreneurship and epistemology: The philosophical underpinnings of the study of entrepreneurial opportunities. In *Academy of Management Annals* 4 (1), pp. 557–583.
- Alvarez, Sharon A.; Barney, Jay B.; Anderson, Philip (2013): Forming and exploiting opportunities: The implications of discovery and creation processes for entrepreneurial and organizational research. In *Organization Science* 24 (1), pp. 301–317.
- Alvarez, Sharon A.; Barney, Jay B.; McBride, Russ; Wuebker, Robert (2014): Realism in the study of entrepreneurship. In *Academy of Management Review* 39 (2), pp. 227–231.
- Alvarez, Sharon A.; Young, Susan L.; Woolley, Jennifer L. (2015): Opportunities and institutions: A co-creation story of the king crab industry. In *Journal of Business Venturing* 30 (1), pp. 95–112.
- Anderberg, Michael R. (1973): Cluster analysis for applications. New York, NY: Academic Press.
- Andersen, Jonas Valbjørn; Ingram Bogusz, Claire (2017): Patterns of self-organising in the bitcoin online community: Code forking as organising in digital infrastructure. In *International Conference on Information Systems, Seoul, Korea*, p. 20.
- Archer, Bruce (1981): A view of the nature of design research. In *Design: Science: Method* 1, pp. 30–47.
- Aste, Tomaso; Tasca, Paolo; Di Matteo, Tiziana (2017): Blockchain technologies: The foreseeable impact on society and industry. In *Computer* 50 (9), pp. 18–28.
- Avey, James B.; Avolio, Bruce J.; Crossley, Craig D.; Luthans, Fred (2009): Psychological ownership: Theoretical extensions, measurement and relation to work outcomes. In *Journal of Organizational Behavior* 30 (2), pp. 173–191.
- Avital, Michel; Beck, Roman; King, John; Rossi, Matti; Teigland, Robin (2016): Jumping on the blockchain bandwagon: Lessons of the past and outlook to the future. In *International Conference of Information Systems, Dublin, Ireland*, p. 6.

- Azkarate, Tania Arriaga; Croasdell, David (2013): NASF in Twitter: An entrepreneur's community of practice using electronic networks of practice. In *Hawaii International Conference on System Sciences*, pp. 3488–3493.
- Baeyens, Katleen; Manigart, Sophie (2003): Dynamic financing strategies: The role of venture capital. In *The Journal of Private Equity* 7 (1), pp. 50–58.
- Baker, Ted; Nelson, Reed E. (2005): Creating something from nothing: Resource construction through entrepreneurial bricolage. In *Administrative Science Quarterly* 50 (3), pp. 329–366.
- Bakos, Yannis (1991): A strategic analysis of electronic marketplaces. In *MIS Quarterly* 15 (3), pp. 295–310.
- Bakos, Yannis (1998): The emerging role of electronic marketplaces on the Internet. In *Communications of the ACM* 41 (8), pp. 35–42.
- Baldwin, Carliss Y.; Clark, Kim B. (2000): *Design rules: The power of modularity*: MIT Press.
- Baldwin, Carliss Y.; Woodard, Jason; Gawer, Annabelle (2009): Platforms, markets and innovation. In *The Architecture of Platforms: A Unified View*, pp. 19–44.
- Bandura, Albert (1997): *Self-efficacy: The exercise of control*. New York: Macmillan.
- Baron, Robert A.; Markman, Gideon D. (2003): Beyond social capital: The role of entrepreneurs' social competence in their financial success. In *Journal of Business Venturing* 18 (1), pp. 41–60.
- Barrett, Michael; Davidson, Elizabeth; Prabhu, Jaideep; Vargo, Stephen L. (2015): Service innovation in the digital age: key contributions and future directions. In *MIS Quarterly* 39 (1), pp. 135–154.
- Barrett, Michael; Oborn, Eivor (2010): Boundary object use in cross-cultural software development teams. In *Human Relations* 63 (8), pp. 1199–1221.
- Baum, Joel A. C.; Silverman, Brian S. (2004): Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. In *Journal of Business Venturing* 19 (3), pp. 411–436.
- Baxter, Pamela; Jack, Susan (2008): Qualitative case study methodology: Study design and implementation for novice researchers. In *The Qualitative Report* 13 (4), pp. 544–559.
- Bayus, Barry L. (2013): Crowdsourcing new product ideas over time: An analysis of the Dell IdeaStorm community. In *Management Science* 59 (1), pp. 226–244.
- Beaglehole, Ernest (1932): *A study in social psychology*. New York: Macmillan.
- Beaulieu, Tanya; Sarker, Suprateek; Sarker, Saonee (2015): A conceptual framework for understanding crowdfunding. In *Communications of the Association for Information Systems* 37 (1), pp. 1–31.
- Beck, Roman; Avital, Michel; Rossi, Matti; Thatcher, Jason Bennett (2017): Blockchain technology in business and information systems research. In *Business & Information Systems Engineering* 59 (6), pp. 381–384. DOI: 10.1007/s12599-017-0505-1.
- Beck, Roman; Müller-Bloch, Christoph (2017): Blockchain as radical innovation: a framework for engaging with distributed ledgers as incumbent organization. In *Hawaii International Conference on System Sciences*, p. 10.
- Beck, Roman; Müller-Bloch, Christoph; King, John Leslie (2018): Governance in the blockchain economy: A framework and research agenda. In *accepted by the Journal of the Association for Information Systems*, p. 40.
- Becker, Alexander; Knyphausen–Aufseß, Dodo zu; Brem, Alexander (2015): Beyond traditional developmental models: A fresh perspective on entrepreneurial new venture creation. In *International Journal of Entrepreneurial Venturing* 7 (2), pp. 152–172.

- Beggan, James K.; Brown, Ellen M. (1994): Association as a psychological justification for ownership. In *The Journal of Psychology* 128 (4), pp. 365–380.
- Belleflamme, Paul; Lambert, Thomas (2014): Crowdfunding: Some empirical findings and microeconomic underpinnings. In *Social Science Research Network (SSRN)*, p. 15. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2437786, checked on 1/5/2019.
- Belleflamme, Paul; Lambert, Thomas; Schwienbacher, Armin (2010): Crowdfunding: An industrial organization perspective. In *Presented at the Workshop Digital Business Models: Understanding Strategies', held in Paris*, p. 30.
- Belleflamme, Paul; Lambert, Thomas; Schwienbacher, Armin (2013): Individual crowdfunding practices. In *Venture Capital* 15 (4), pp. 313–333.
- Belleflamme, Paul; Lambert, Thomas; Schwienbacher, Armin (2014): Crowdfunding: Tapping the right crowd. In *Journal of Business Venturing* 29 (5), pp. 585–609.
- Benbasat, Izak; Goldstein, David K.; Mead, Melissa (1987): The case research strategy in studies of information systems. In *MIS Quarterly* 11 (3), pp. 369–386.
- Bhattacharjee, Anol (2012): Social science research. Principles, methods, and practices. 2nd ed. Tampa, FL: University of South Florida Textbooks Collection.
- Bhide, Amar (1992): Bootstrap finance: The art of start-ups. In *Harvard Business Review* 70 (6), pp. 109–117.
- Bingham, Alpheus; Spradlin, Dwayne (2011): The open innovation marketplace: Creating value in the challenge driven enterprise. New Jersey, NJ: FT Press, Upper Saddle River.
- Bjelland, Osvald M.; Wood, Robert C. (2008): An inside view of IBM's' Innovation Jam'. In *MIT Sloan Management Review* 50 (1), p. 32.
- Blank, Steve (2013): Why the lean start-up changes everything. In *Harvard Business Review* 91 (5), pp. 63–72.
- Blohm, Ivo; Leimeister, Jan Marco; Krcmar, Helmut (2013): Crowdsourcing: how to benefit from (too) many great ideas. In *MIS Quarterly Executive* 12 (4), pp. 199–211.
- Blohm, Ivo; Riedl, Christoph; Füller, Johann; Leimeister, Jan Marco (2016): Rate or trade? Identifying winning ideas in open idea sourcing. In *Information Systems Research* 27 (1), pp. 27–48.
- Boland, Richard J.; Lyytinen, Kalle; Yoo, Youngjin (2007): Wakes of innovation in project networks: The case of digital 3-D representations in architecture, engineering, and construction. In *Organization Science* 18 (4), pp. 631–647.
- Bonoma, Thomas V. (1985): Case research in marketing: opportunities, problems, and a process. In *Journal of Marketing Research* 22 (2), pp. 199–208.
- Boreiko, Dmitri; Sahdev, Navroop K. (2018): To ICO or not to ICO—Empirical analysis of Initial Coin Offerings and Token Sales. In *Social Science Research Network (SSRN)*, p. 25. Available online at https://papers.ssrn.com/sol3/Papers.cfm?abstract_id=3209180, checked on 1/5/2019.
- Boruch, Robert F. (1998): Randomized controlled experiments for evaluation and planning. In : *The Sage Handbook of Applied Social Research Methods*. Thousand Oaks, CA: SAGE Publications, pp. 161–192.
- Boudreau, Kevin J. (2010): Open platform strategies and innovation: Granting access vs. devolving control. In *Management Science* 56 (10), pp. 1849–1872.
- Boudreau, Kevin J.; Lacetera, Nicola; Lakhani, Karim R. (2011): Incentives and problem uncertainty in innovation contests: An empirical analysis. In *Management Science* 57 (5), pp. 843–863.
- Boudreau, Kevin J.; Lakhani, Karim R. (2009): How to manage outside innovation. In *MIT Sloan Management Review* 50 (4), p. 69.

- Boudreau, Kevin J.; Lakhani, Karim R. (2013): Using the crowd as an innovation partner. In *Harvard Business Review* 91 (4), 60-9, 140.
- Braa, Jørn; Hanseth, Ole; Heywood, Arthur; Mohammed, Woinshet; Shaw, Vincent (2007): Developing health information systems in developing countries: The flexible standards strategy. In *MIS Quarterly* 31 (2), pp. 381–402.
- Brabham, Daren C. (2008): Crowdsourcing as a model for problem solving: An introduction and cases. In *Convergence* 14 (1), pp. 75–90.
- Brabham, Daren C. (2010): Moving the crowd at Threadless: Motivations for participation in a crowdsourcing application. In *Information, Communication & Society* 13 (8), pp. 1122–1145.
- Brabham, Daren C. (2013): Crowdsourcing. Cambridge, MA: MIT Press.
- Bradford, Steven C. (2012): Crowdfunding and the federal securities laws. In *Columbia Business Law Review* (1), pp. 1–150.
- Breland, Jacob W.; Treadway, Darren C.; Duke, Allison B.; Adams, Garry L. (2007): The interactive effect of leader-member exchange and political skill on subjective career success. In *Journal of Leadership & Organizational Studies* 13 (3), pp. 1–14.
- Brem, Alexander; Bilgram, Volker; Marchuk, Anna (2017): How crowdfunding platforms change the nature of user innovation—from problem solving to entrepreneurship. In *Technological Forecasting and Social Change*, pp. 1–14.
- Bresnahan, Timothy; Greenstein, Shane (2014): Mobile computing: The next platform rivalry. In *The American Economic Review* 104 (5), pp. 475–480.
- Bresnahan, Timothy F.; Greenstein, Shane (1999): Technological competition and the structure of the computer industry. In *The Journal of Industrial Economics* 47 (1), pp. 1–40.
- Bretschneider, Ulrich; Leimeister, Jan Marco (2017): Not just an ego-trip: Exploring backers' motivation for funding in incentive-based crowdfunding. In *The Journal of Strategic Information Systems* 26 (4), pp. 246–260.
- Bretschneider, Ulrich; Leimeister, Jan Marco; Mathiassen, Lars (2015): IT-enabled product innovation: Customer motivation for participating in virtual idea communities. In *International Journal of Product Development* 20 (2), pp. 126–141.
- Brown, Terrence E.; Boon, Edward; Pitt, Leyland F. (2017): Seeking funding in order to sell: Crowdfunding as a marketing tool. In *Business Horizons* 60 (2), pp. 189–195.
- Burmeister, Katrin; Schade, Christian (2007): Are entrepreneurs' decisions more biased? An experimental investigation of the susceptibility to status quo bias. In *Journal of Business Venturing* 22 (3), pp. 340–362.
- Burnard, Philip (1991): A method of analysing interview transcripts in qualitative research. In *Nurse Education Today* 11 (6), pp. 461–466.
- Burnard, Philip (1996): Teaching the analysis of textual data: An experiential approach. In *Nurse Education Today* 16 (4), pp. 278–281.
- Burt, Ronald S. (1997): The contingent value of social capital,. In *Administrative Science Quarterly* 42 (2), pp. 339–365.
- Burtch, Gordon; Ghose, Anindya; Wattal, Sunil (2015): The hidden cost of accommodating crowdfunder privacy preferences: a randomized field experiment. In *Management Science* 61 (5), pp. 949–962.
- Buterin, Vitalik (2014): A next-generation smart contract and decentralized application platform. In *White Paper*. Available online at <https://github.com/ethereum/wiki/wiki/White-Paper>, checked on 1/5/2019.

- Buterin, Vitalik (2017): Analyzing Token Sale Models. Available online at <https://vitalik.ca/general/2017/06/09/sales.html>, updated on 1/9/2017, checked on 6/12/2018.
- Campbell, Donald T. (1960): Blind variation and selective retentions in creative thought as in other knowledge processes. In *Psychological Review* 67 (6), p. 380.
- Campbell, Donald T.; Stanley, Julian C. (1966): Experimental and quasi-experimental designs for research. In : *Hanbook of Research and Teaching*. Chicago, IL: Rand-McNally, pp. 1–76.
- Carbonell, Pilar; Rodríguez-Escudero, Ana I.; Pujari, Devashish (2009): Customer involvement in new service development: An examination of antecedents and outcomes. In *Journal of Product Innovation Management* 26 (5), pp. 536–550.
- Carlile, Paul R. (2002): A pragmatic view of knowledge and boundaries: Boundary objects in new product development. In *Organization Science* 13 (4), pp. 442–455.
- Carolis, Donna Marie de; Saporito, Patrick (2006): Social capital, cognition, and entrepreneurial opportunities: A theoretical framework. In *Entrepreneurship Theory and Practice* 30 (1), pp. 41–56.
- Catalini, Christian; Gans, Joshua (2018): Initial coin offerings and the value of crypto tokens. In *MIT Sloan School Working Paper*, p. 23, checked on 4/18/2019.
- Catalini, Christian; Gans, Joshua S. (2017): Some simple economics of the blockchain. In *Social Science Research Network (SSRN)*, p. 32. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2874598, checked on 4/18/2019.
- Catalini, Christian; Tucker, Catherine (2017): When early adopters don't adopt. In *Science* 357 (6347), pp. 135–136.
- Cepeda, Gabriel; Martin, David (2005): A review of case studies publishing in Management Decision 2003-2004: Guides and criteria for achieving quality in qualitative research. In *Management Decision* 43 (6), pp. 851–876.
- Chan, Richard C. S.; Parhankangas, Annaleena (2017): Crowdfunding innovative ideas: How incremental and radical innovativeness influence funding outcomes. In *Entrepreneurship Theory and Practice* 41 (2), pp. 237–263.
- Chandler, Gaylen N.; Hanks, Steven H. (1994): Founder competence, the environment, and venture performance. In *Entrepreneurship Theory and Practice* 18 (3), pp. 77–89.
- Chen, Yubo; Xie, Jinhong (2005): Third-party product review and firm marketing strategy. In *Marketing Science* 24 (2), pp. 218–240.
- Chesbrough, Henry William (2006): *Open innovation: The new imperative for creating and profiting from technology*. Boston, MA: Harvard Business School Press.
- Chesbrough, Henry William (2010): Business model innovation: Opportunities and barriers. In *Long Range Planning* 43 (2-3), pp. 354–363.
- Chesbrough, Henry William (2011): Bringing open innovation to services. In *MIT Sloan Management Review* 52 (2), pp. 85–90.
- Chinn, Peggy L.; Kramer, Maeona K. (1999): *Theory and Nursing. Integrated Knowledge Development*. 6th ed. Mosby, St Louis, MO.
- Cholakova, Magdalena; Clarysse, Bart (2015): Does the possibility to make equity investments in crowdfunding projects crowd out reward-based investments? In *Entrepreneurship Theory and Practice* 39 (1), pp. 145–172.
- Choy, Katherine; Schlagwein, Daniel (2016): Crowdsourcing for a better world: On the relation between IT affordances and donor motivations in charitable crowdfunding. In *Information Technology & People* 29 (1), pp. 221–247.

- Ciborra, Claudia U. (1996): The platform organization: Recombining strategies, structures, and surprises. In *Organization Science* 7 (2), pp. 103–118.
- Clauss, Thomas; Breitenacker, Robert J.; Kraus, Sascha; Brem, Alexander; Richter, Chris (2018): Directing the wisdom of the crowd: The importance of social interaction among founders and the crowd during crowdfunding campaigns. In *Economics of Innovation and New Technology* 27 (8), pp. 709–729.
- Clercq, Dirk de; Voronov, Maxim (2009): Toward a practice perspective of entrepreneurship: Entrepreneurial legitimacy as habitus. In *International Small Business Journal* 27 (4), pp. 395–419.
- Compeau, Deborah R.; Higgins, Christopher A. (1995): Application of social cognitive theory to training for computer skills. In *Information Systems Research* 6 (2), pp. 118–143.
- Conley, John P. (2017): Blockchain and the economics of crypto-tokens and initial coin offerings. In *Vanderbilt University Department of Economics Working Paper Series*, p. 20. Available online at <http://www.accessecon.com/Pubs/VUECON/VUECON-17-00008.pdf>, checked on 4/18/2019.
- Cook, Thomas D.; Campbell, Donald T. (1979): The design and conduct of true experiments and quasi-experiments in field settings. In : Reproduced in part in *Research in Organizations: Issues and Controversies*. With assistance of R. T. Mowday, R. M. Steers. Santa Monica, CA: Goodyear Publishing Company.
- Cooper, Joel (2007): *Cognitive dissonance: 50 years of a classic theory*. London, UK: SAGE Publications.
- Courtney, Christopher; Dutta, Supradeep; Li, Yong (2017): Resolving information asymmetry: Signaling, endorsement, and crowdfunding success. In *Entrepreneurship Theory and Practice* 41 (2), pp. 265–290.
- Creswell, John W.; Brown, Martha L. (1992): How chairpersons enhance faculty research: A grounded theory study. In *The Review of Higher Education* 16 (1), pp. 41–62.
- Creswell, John W.; Creswell, J. David (2017): *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: SAGE Publications.
- Creswell, John W.; Hanson, William E.; Clark Plano, Vicki L.; Morales, Alejandro (2007): Qualitative research designs: Selection and implementation. In *The Counseling Psychologist* 35 (2), pp. 236–264.
- Cumming, Douglas; Leboeuf, Gaël; Schwienbacher, Armin (2015): Crowdfunding models: Keep-it-all vs. all-or-nothing. In *Social Science Research Network (SSRN)*, p. 41. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2447567, checked on 4/18/2019.
- Dahan, Ely; Hauser, John R. (2002): The virtual customer. In *Journal of Product Innovation Management* 19 (5), pp. 332–353.
- Dahan, Ely; Mendelson, Haim (2001): An extreme-value model of concept testing. In *Management Science* 47 (1), pp. 102–116.
- Dal Bianco, Vittorio; Myllarniemi, Varvana; Kommsi, Marko; Raatikainen, Mikko (2014): The role of platform boundary resources in software ecosystems: A case study. In *Conference on Software Architecture, Sydney, Australia*, p. 10.
- Danmayr, Florian (2013): *Archetypes of crowdfunding platforms: A multidimensional comparison*. Wiesbaden, Germany: Springer Gabler.
- Davidsson, Per (2015): Entrepreneurial opportunities and the entrepreneurship nexus: A re-conceptualization. In *Journal of Business Venturing* 30 (5), pp. 674–695.
- Davidsson, Per; Low, Murray B.; Wright, Mike (2001): Editor's introduction: Low and MacMillan ten years on: Achievements and future directions for entrepreneurship research. In *Entrepreneurship Theory and Practice* 25 (4), pp. 5–15.

- Davis, Fred D.; Bagozzi, Richard P.; Warshaw, Paul R. (1989): User acceptance of computer technology: A comparison of two theoretical models. In *Management Science* 35 (8), pp. 982–1003.
- Davis, Lucas W.; Metcalf, Gilbert E. (2016): Does better information lead to better choices? Evidence from energy-efficiency labels. In *Journal of the Association of Environmental and Resource Economists* 3 (3), pp. 589–625.
- Davis, Wendell (2015): DEVgrants: Here to help. Available online at <https://blog.ethereum.org/2015/04/07/devgrants-help/>, updated on 4/7/2015, checked on 12/14/2018.
- Demil, Benoît; Lecocq, Xavier; Ricart, Joan E.; Zott, Christoph (2015): Introduction to the SEJ special issue on business models: Business models within the domain of strategic entrepreneurship. In *Strategic Entrepreneurship Journal* 9 (1), pp. 1–11.
- Dew, Nicholas (2009): Serendipity in entrepreneurship. In *Organization Studies* 30 (7), pp. 735–753.
- Dey, Ian (1993): *Qualitative analysis: A user-friendly guide*. New York, NY: Routledge.
- Di Gangi, Paul M.; Wasko, Molly (2009): Steal my idea! Organizational adoption of user innovations from a user innovation community: A case study of Dell IdeaStorm. In *Decision Support Systems* 48 (1), pp. 303–312.
- Dimov, Dimo (2010): Nascent entrepreneurs and venture emergence: Opportunity confidence, human capital, and early planning. In *Journal of Management Studies* 47 (6), pp. 1123–1153.
- Dimov, Dimo (2011): Grappling with the unbearable elusiveness of entrepreneurial opportunities. In *Entrepreneurship Theory and Practice* 35 (1), pp. 57–81.
- Dimov, Dimo (2016): Toward a design science of entrepreneurship. In : *Advances in Entrepreneurship, Firm Emergence and Growth. Models of Start-up Thinking and Action*. With assistance of A. C. Corbett, J. A. Katz. 18th ed.: Emerald Group Publishing Limited, pp. 1–31.
- Donaldson, Thomas; Preston, Lee E. (1995): The stakeholder theory of the corporation: Concepts, evidence, and implications. In *Academy of Management Review* 20 (1), pp. 65–91.
- Doukas, Charalampos; Pliakas, Thomas; Maglogiannis, Ilias (2010): Mobile healthcare information management utilizing Cloud Computing and Android OS. In *International Engineering in Medicine and Biology Conference, Buenos Aires, Argentina*, p. 4.
- Dubini, Paola; Aldrich, Howard (1991): Personal and extended networks are central to the entrepreneurial process. In *Journal of Business Venturing* 6 (5), pp. 305–313.
- Durward, David; Blohm, Ivo; Leimeister, Jan Marco (2016): Crowd work. In *Business & Information Systems Engineering* 58 (4), pp. 281–286.
- Eaton, Ben; Elaluf-Calderwood, Silvia; Sorensen, Carsten; Yoo, Youngjin (2015): Distributed tuning of boundary resources: The case of Apple's iOS service system. In *MIS Quarterly* 39 (1), pp. 217–243.
- Ebel, Philipp Alexander; Bretschneider, Ulrich; Leimeister, Jan Marco (2016): Can the crowd do the job? Exploring the effects of integrating customers into a company's business model innovation. In *International Journal of Innovation Management* 20 (07), pp. 1–39.
- Ebner, Winfried; Leimeister, Jan Marco; Krcmar, Helmut (2009): Community engineering for innovations: The ideas competition as a method to nurture a virtual community for innovations. In *R&D Management* 39 (4), pp. 342–356.
- Eckhardt, Jonathan T.; Shane, Scott A. (2003): Opportunities and entrepreneurship. In *Journal of Management* 29 (3), pp. 333–349.
- Eisenhardt, Kathleen M. (1989): Agency theory: An assessment and review. In *Academy of Management Review* 14 (1), pp. 57–74.
- Elo, Satu; Kyngäs, Helvi (2008): The qualitative content analysis process. In *Journal of Advanced Nursing* 62 (1), pp. 107–115.

- Ernst, Sissy-Josefina; Janson, Andreas; Söllner, Matthias; Leimeister, Jan Marco (2016): It's about understanding each other's culture—Improving the outcomes of mobile learning by avoiding culture conflicts. In *International Conference on Information Systems, Dublin, Ireland*, p. 21.
- Estellés-Arolas, Enrique; González-Ladrón-De-Guevara, Fernando (2012): Towards an integrated crowdsourcing definition. In *Journal of Information Science* 38 (2), pp. 189–200.
- Ethdocs (2016): Mining. Available online at <http://ethdocs.org/en/latest/mining.html>, checked on 12/14/2018.
- Ethereum (2018): Create your own cryptocurrency with Ethereum. Available online at <https://www.ethereum.org/token>, checked on 12/14/2018.
- Ethereum Bounty Program (2016). Available online at <https://bounty.ethereum.org/>, updated on 10/16/2018, checked on 12/14/2018.
- Ethereum Improvement Proposals (2018). Available online at <https://eips.ethereum.org/>, checked on 12/14/2018.
- Etherscan (2018a): Ethereum Network HashRate Growth Chart. Available online at <https://etherscan.io/chart/hashrate>, updated on 12/14/2018, checked on 12/14/2018.
- Etherscan (2018b): Ethereum Token Market Capitalization. Available online at <https://etherscan.io/tokens>, checked on 12/14/2018.
- Etherscan (2018c): Ethereum Transaction Chart. Available online at <https://etherscan.io/chart/tx>, updated on 12/14/2018, checked on 12/14/2018.
- Etherscan (2018d): Ethereum Unique Address Growth Chart. Available online at <https://etherscan.io/chart/address>, updated on 12/14/2018, checked on 12/14/2018.
- Evans, David S. (2003): The antitrust economics of multi-sided platform markets. In *Yale J. on Reg.* 20, p. 325.
- Evans, David S.; Hagiu, Andrei; Schmalensee, Richard (2008): *Invisible engines: How software platforms drive innovation and transform industries*. Cambridge, MA: MIT Press.
- Everitt, Brian S.; Landau, Sabine; Leese, Morven; Stahl, Daniel (2011): Hierarchical clustering. In *Cluster Analysis, 5th Edition*, pp. 71–110.
- Faraj, Samer; Jarvenpaa, Sirkka L.; Majchrzak, Ann (2011): Knowledge collaboration in online communities. In *Organization Science* 22 (5), pp. 1224–1239.
- Fauchart, Emmanuelle; Gruber, Marc (2011): Darwinians, communitarians, and missionaries: The role of founder identity in entrepreneurship. In *Academy of Management Journal* 54 (5), pp. 935–957.
- Felin, Teppo; Zenger, Todd R. (2014): Closed or open innovation? Problem solving and the governance choice. In *Research Policy* 43 (5), pp. 914–925.
- Field, Andy; Hole, Graham (2002): *How to design and report experiments*. Thousand Oaks, CA: SAGE Publications.
- Fischer, Eileen; Reuber, A. Rebecca (2011): Social interaction via new social media:(How) can interactions on Twitter affect effectual thinking and behavior? In *Journal of Business Venturing* 26 (1), pp. 1–18.
- Fischhoff, Baruch; Slovic, Paul; Lichtenstein, Sarah (1977): Knowing with certainty: The appropriateness of extreme confidence. In *Journal of Experimental Psychology: Human perception and performance* 3 (4), pp. 552–564.
- Fitzgerald, Brian (2006): The transformation of open source software. In *MIS Quarterly* 30 (3), pp. 587–598.

- Foss, Nicolai J.; Klein, Peter G.; Kor, Yasemin Y.; Mahoney, Joseph T. (2008): Entrepreneurship, subjectivism, and the resource-based view: Toward a new synthesis. In *Strategic Entrepreneurship Journal* 2 (1), pp. 73–94.
- Franke, Nikolaus; Gruber, Marc; Harhoff, Dietmar; Henkel, Joachim (2006): What you are is what you like—similarity biases in venture capitalists' evaluations of start-up teams. In *Journal of Business Venturing* 21 (6), pp. 802–826.
- Franke, Nikolaus; Schreier, Martin; Kaiser, Ulrike (2010): The “I designed it myself” effect in mass customization. In *Management Science* 56 (1), pp. 125–140.
- Fridgen, Gilbert; Regner, Ferdinand; Schweizer, André; Urbach, Nils (2018): Don't slip on the Initial Coin Offering (ICO). A taxonomy for a blockchain-enabled form of crowdfunding. In *European Conference on Information Systems, San Francisco, California*, p. 17.
- Frydrych, Denis; Bock, Adam J.; Kinder, Tony (2016): Creating project legitimacy—The role of entrepreneurial narrative in reward-based crowdfunding. In : *International Perspectives on Crowdfunding: Positive, Normative and Critical Theory*. With assistance of Jérôme Méric, Isabelle Maque, Julienne Brabet: Emerald Group Publishing Limited, pp. 99–128.
- Frydrych, Denis; Bock, Adam J.; Kinder, Tony; Koeck, Benjamin (2014): Exploring entrepreneurial legitimacy in reward-based crowdfunding. In *Venture Capital* 16 (3), pp. 247–269.
- Fuchs, Christoph; Prandelli, Emanuela; Schreier, Martin (2010): The psychological effects of empowerment strategies on consumers' product demand. In *Journal of Marketing* 74 (1), pp. 65–79.
- Füller, Johann; Hutter, Katja; Faullant, Rita (2011): Why co-creation experience matters? Creative experience and its impact on the quantity and quality of creative contributions. In *R&D Management* 41 (3), pp. 259–273.
- Füller, Johann; Matzler, Kurt (2007): Virtual product experience and customer participation—A chance for customer-centred, really new products. In *Technovation* 27 (6), pp. 378–387.
- Furby, Lita (1976): The socialization of possession and ownership among children in three cultural groups: Israeli kibbutz, Israeli city, and American. In *Piagetian Research: Compilation and Commentary* 8, pp. 95–127.
- Gales, Lawrence; Mansour-Cole, Dina (1995): User involvement in innovation projects: Toward an information processing model. In *Journal of Engineering and Technology Management* 12 (1-2), pp. 77–109.
- Garud, Raghu; Hardy, Cynthia; Maguire, Steve (2007): *Institutional entrepreneurship as embedded agency: An introduction to the special issue*. London, UK: SAGE Publications.
- Garud, Raghu; Jain, Sanjay; Tuertscher, Philipp (2008): Incomplete by design and designing for incompleteness. In *Organization Studies* 29 (3), pp. 351–371.
- Garud, Raghu; Karnøe, Peter (2003): Bricolage versus breakthrough: distributed and embedded agency in technology entrepreneurship. In *Research Policy* 32 (2), pp. 277–300.
- Gawer, Annabelle (2009): *Platform dynamics and strategies: from products to services*. In : *Platforms, Markets and Innovation*. With assistance of Annabelle Gawer. Cheltenham, UK: Edward Elgar Publishing, pp. 45–76.
- Gawer, Annabelle; Cusumano, Michael A. (2002): *Platform leadership: How Intel, Microsoft, and Cisco drive industry innovation*. Vol. 5. Boston, MA: Harvard Business School Press.
- Gawer, Annabelle; Cusumano, Michael A. (2008): How companies become platform leaders. In *MIT Sloan Management Review* 49 (2), pp. 28–35.
- Gawer, Annabelle; Cusumano, Michael A. (2014): Industry platforms and ecosystem innovation. In *Journal of Product Innovation Management* 31 (3), pp. 417–433.

- Gerber, Elizabeth M.; Hui, Julie S. (2013): Crowdfunding: Motivations and deterrents for participation. In *ACM Transactions on Computer-Human Interaction* 20 (6), p. 34.
- Gerber, Elizabeth M.; Hui, Julie S.; Kuo, Pei Y. (2012): Crowdfunding: Why people are motivated to post and fund projects on crowdfunding platforms. In : *International Workshop on Design, Influence, and Social Technologies: Techniques, Impacts and Ethics*, p. 10.
- Gerring, John (2006): *Case study research: Principles and practices*. New York, NY: Cambridge University Press.
- Ghazawneh, Ahmad (2011): The power of platforms for software development in open innovation networks. In *International Journal of Networking and Virtual Organisations* 9 (2), pp. 140–154.
- Ghazawneh, Ahmad; Henfridsson, Ola (2010): Governing third-party development through platform boundary resources. In *International Conference on Information Systems, St. Louis, USA*, p. 18.
- Ghazawneh, Ahmad; Henfridsson, Ola (2011): Micro-strategizing in platform ecosystems: A multiple case study. In *International Conference on Information Systems, Shanghai, China*, p. 19.
- Ghazawneh, Ahmad; Henfridsson, Ola (2013): Balancing platform control and external contribution in third-party development: The boundary resources model. In *Information Systems Journal* 23 (2), pp. 173–192.
- Gierczak, Michael M.; Bretschneider, Ulrich; Haas, Philipp; Blohm, Ivo; Leimeister, Jan Marco (2015): Crowdfunding: Outlining the new era of fundraising. In : *Crowdfunding in Europe: State of the Art in Theory and Practice*. With assistance of Dennis Brüntje, Oliver Gajda: Springer, pp. 7–20.
- Giones, Ferran; Oo, Pyayt (2017): How Crowdsourcing and Crowdfunding are redefining innovation management. In : *Revolution of Innovation Management*. With assistance of A. Brem, E. Viardot. London, UK: Palgrave Macmillan, pp. 43–70.
- Girotra, Karan; Terwiesch, Christian; Ulrich, Karl T. (2010): Idea generation and the quality of the best idea. In *Management Science* 56 (4), pp. 591–605.
- Giudici, Giancarlo; Guerini, Massimiliano; Rossi Lamastra, Cristina (2013): Why crowdfunding projects can succeed: The role of proponents' individual and territorial social capital. In *Social Science Research Network (SSRN)*, p. 20. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2255944, checked on 4/18/2019.
- Giudici, Giancarlo; Nava, Ricardo; Rossi Lamastra, Cristina; Verecondo, Chiara (2012): Crowdfunding: The new frontier for financing entrepreneurship? In *Social Science Research Network (SSRN)*, p. 13. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2157429, checked on 4/18/2019.
- Giudici, Giancarlo; Rossi-Lamastra, Cristina (2018): Crowdfunding of SMEs and startups: When open investing follows open innovation. In *World Scientific Book Chapters*, pp. 377–396.
- Glaser, Florian (2017): Pervasive decentralisation of digital infrastructures: A framework for blockchain enabled system and use case analysis. In *Hawaii International Conference on System Sciences*, pp. 1543–1552.
- Glaser, Florian; Bezenberger, Luis (2015): Beyond cryptocurrencies-a taxonomy of decentralized consensus systems. In *Social Science Research Network (SSRN)*, p. 18. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2605803, checked on 1/5/2019.
- Glass, Robert L.; Vessey, Iris (1995): Contemporary application-domain taxonomies. In *IEEE Software* 12 (4), pp. 63–76.
- Goldbach, Tobias; Benlian, Alexander (2015): How social capital facilitates clan control on software platforms to enhance App-developers' performance and success. In *International Conference on Information Systems, Fort Worth, Texas*, p. 18.

- Goodchild, Michael F.; Glennon, J. Alan (2010): Crowdsourcing geographic information for disaster response: a research frontier. In *International Journal of Digital Earth* 3 (3), pp. 231–241.
- Granovetter, Mark (1985): Economic action and social structure: The problem of embeddedness. In *American Journal of Sociology* 91 (3), pp. 481–510.
- Gregoire, Denis A.; Noel, Martin X.; Déry, Richard; Béchar, Jean–Pierre (2006): Is there conceptual convergence in entrepreneurship research? A co–citation analysis of frontiers of entrepreneurship research, 1981–2004. In *Entrepreneurship Theory and Practice* 30 (3), pp. 333–373.
- Grégoire, Denis A.; Corbett, Andrew C.; McMullen, Jeffery S. (2011): The cognitive perspective in entrepreneurship: An agenda for future research. In *Journal of Management Studies* 48 (6), pp. 1443–1477.
- Gregor, Shirley; Hevner, Alan R. (2013): Positioning and presenting design science research for maximum impact. In *MIS Quarterly* 37 (2), pp. 337–355.
- Griffin, Abbie; Hauser, John R. (1993): The voice of the customer. In *Marketing Science* 12 (1), pp. 1–27.
- Griffin, Mitch; Babin, Barry J.; Attaway, Jill S. (1996): Anticipation of injurious consumption outcomes and its impact on consumer attributions of blame. In *Journal of the Academy of Marketing Science* 24 (4), pp. 314–327.
- Griffin, Zachary J. (2013): Crowdfunding: Fleecing the American masses. In *Journal of Law, Technology & the Internet* 4 (2), p. 375.
- Haas, Philipp; Blohm, Ivo; Leimeister, Jan Marco (2014): An empirical taxonomy of crowdfunding intermediaries. In *International Conference on Information Systems, Auckland, New Zealand*, p. 18.
- Hagedoorn, John; Zobel, Ann-Kristin (2015): The role of contracts and intellectual property rights in open innovation. In *Technology Analysis & Strategic Management* 27 (9), pp. 1050–1067.
- Hair, Joseph F.; Black, William C.; Babin, Barry J.; Anderson, Rolph E.; Tatham, Ronald L. (1998): *Multivariate data analysis*. 5th ed. Upper Saddle River, NJ: Prentice-Hall.
- Hanseth, Ole; Bygstad, Bendik; Ellingsen, Gunnar; Johannessen, Liv Karen; Larsen, Eli (2012): ICT standardization strategies and service innovation in health care. In *International Conference on Information Systems, Orlando, Florida*, p. 17.
- Hanseth, Ole; Lundberg, Nina (2001): Designing work oriented infrastructures. In *Computer Supported Cooperative Work (CSCW)* 10 (3-4), pp. 347–372.
- Hanseth, Ole; Lyytinen, Kalle (2010): Design theory for dynamic complexity in information infrastructures: The case of building internet. In *Journal of Information Technology* 25 (1), pp. 1–19.
- Hanseth, Ole; Monteiro, Eric (1997): Inscribing behaviour in information infrastructure standards. In *Accounting, Management and Information Technologies* 7 (4), pp. 183–211.
- Hanssen, Geir K. (2012): A longitudinal case study of an emerging software ecosystem: Implications for practice and theory. In *Journal of Systems and Software* 85 (7), pp. 1455–1466.
- Hatch, J. Amos (2002): *Doing qualitative research in education settings*. Albany, NY: Suny Press.
- Hausch, Donald B.; Logue, Dennis E.; Seward, James K. (1992): Dutch auction share repurchases: Theory and evidence. In *Journal of Applied Corporate Finance* 5 (1), pp. 44–49.
- Haynie, J. Michael; Shepherd, Dean A.; McMullen, Jeffery S. (2009): An opportunity for me? The role of resources in opportunity evaluation decisions. In *Journal of Management Studies* 46 (3), pp. 337–361.
- Hellmann, Thomas; Puri, Manju (2002): Venture capital and the professionalization of start-up firms: Empirical evidence. In *The Journal of Finance* 57 (1), pp. 169–197.

- Henfridsson, Ola; Lindgren, Rikard (2010): User involvement in developing mobile and temporarily interconnected systems. In *Information Systems Journal* 20 (2), pp. 119–135.
- Henfridsson, Ola; Mathiassen, Lars; Svahn, Fredrik (2014): Managing technological change in the digital age: the role of architectural frames. In *Journal of Information Technology* 29 (1), pp. 27–43.
- Hevner, Alan; Chatterjee, Samir (2011): Design science research in information systems. In : *Design Research in Information Systems*. Boston, MA: Springer, pp. 9–22.
- Hevner, Alan R. (2007): A three cycle view of design science research. In *Scandinavian Journal of Information Systems* 19 (2), pp. 87–92.
- Hevner, Alan R.; March, Salvatore T.; Park, Jinsoo; Ram, Sudha (2004): Design science in information systems research. In *MIS Quarterly* 28 (1), pp. 75–105.
- Hevner, Alan, R.; March, Salvatore T.; Park, Jinsoo; Ram, Sudha (2004): Design science in information systems research. In *MIS Quarterly* 28 (1), pp. 75–105.
- Hippel, Eric (2001): User toolkits for innovation. In *Journal of Product Innovation Management* 18 (4), pp. 247–257.
- Hippel, Eric von (1986): Lead users: A source of novel product concepts. In *Management Science* 32 (7), pp. 791–805.
- Hippel, Eric von (1994): “Sticky information” and the locus of problem solving: Implications for innovation. In *Management Science* 40 (4), pp. 429–439.
- Hippel, Eric von (2005): Democratizing innovation: The evolving phenomenon of user innovation. In *Journal für Betriebswirtschaft* 55 (1), pp. 63–78.
- Hippel, Eric von; Katz, Ralph (2002): Shifting innovation to users via toolkits. In *Management Science* 48 (7), pp. 821–833.
- Hippel, Eric von; Krogh, Georg von (2003): Open source software and the “private-collective” innovation model: Issues for organization science. In *Organization Science* 14 (2), pp. 209–223.
- Hmieleski, Keith M.; Baron, Robert A. (2009): Entrepreneurs' optimism and new venture performance: A social cognitive perspective. In *Academy of Management Journal* 52 (3), pp. 473–488.
- Hong, Lu; Page, Scott E. (2004): Groups of diverse problem solvers can outperform groups of high-ability problem solvers. In *Proceedings of the National Academy of Sciences of the United States of America* 101 (46), pp. 16385–16389.
- Howe, Jeff (2006): The rise of crowdsourcing. In *Wired Magazine* 14 (6), pp. 1–4.
- Howe, Jeff (2008): *Crowdsourcing: How the power of the crowd is driving the future of business*. New York, NY: Crown Publishing.
- Hsieh, Hsiu-Fang; Shannon, Sarah E. (2005): Three approaches to qualitative content analysis. In *Qualitative health research* 15 (9), pp. 1277–1288.
- Hsu, David H. (2004): What do entrepreneurs pay for venture capital affiliation? In *The Journal of Finance* 59 (4), pp. 1805–1844.
- Huang, Jimmy; Henfridsson, Ola; Liu, Martin J.; Newell, Sue (2017): Growing on steroids: Rapidly scaling the user base of digital ventures through digital innovation. In *MIS Quarterly* 41 (1), pp. 301–314.
- Huber, Thomas L.; Kude, Thomas; Dibbern, Jens (2017): Governance practices in platform ecosystems: Navigating tensions between co-created value and governance costs. In *Information Systems Research* 28 (3), pp. 563–584.
- Hyperloop Transportation Technologies (2014): *Official Crowdstorm Documentation*. Edited by Hyperloop Transportation Technologies. Available online at

<https://lintvkrqe.files.wordpress.com/2014/12/crowdstorm.pdf>, updated on 2014, checked on 11/25/2017.

Iansiti, Marco; Lakhani, Karim R. (2017): The truth about blockchain. In *Harvard Business Review* 95 (1), pp. 118–127.

Iansiti, Marco; Zhu, Feng (2007): Dynamics of platform competition: Exploring the role of installed base, platform quality and consumer expectations. In *International Conference of Information Systems, Montreal, Quebec*, p. 19.

Ingram Bogusz, Claire; Teigland, Robin; Vaast, Emmanuelle (2018): Designed entrepreneurial legitimacy: The case of a Swedish crowdfunding platform. In *European Journal of Information Systems*, pp. 1–18.

Jansen, Slinger; Brinkkemper, Sjaak; Souer, Jurriaan; Luinenburg, Lutzen (2012): Shades of gray: Opening up a software producing organization with the open software enterprise model. In *Journal of Systems and Software* 85 (7), pp. 1495–1510.

Jawahar, I. M.; McLaughlin, Gary L. (2001): Toward a descriptive stakeholder theory: An organizational life cycle approach. In *Academy of Management Review* 26 (3), pp. 397–414.

Jeppesen, Lars Bo; Lakhani, Karim R. (2010): Marginality and problem-solving effectiveness in broadcast search. In *Organization Science* 21 (5), pp. 1016–1033.

Jeppesen, Lars Bo; Molin, Måns J. (2003): Consumers as co-developers: Learning and innovation outside the firm. In *Technology Analysis & Strategic Management* 15 (3), pp. 363–383.

Jiang, Zhenhui; Benbasat, Izak (2004): Virtual product experience: Effects of visual and functional control of products on perceived diagnosticity and flow in electronic shopping. In *Journal of Management Information Systems* 21 (3), pp. 111–147.

Jiwa, Salim; Lavelle, Dawn; Rose, Arjun (2005): E-Entrepreneurship: Learning in a simulated environment. In *Journal of Electronic Commerce in Organizations* 3 (3), pp. 42–56.

Johnston, David; Yilmaz, Sam Onat; Kandah, Jeremy; Bentenitis, Nikos; Hashemi, Farzad; Gross, Ron et al. (2017): The General Theory of Decentralized Applications, Dapps. Available online at <https://github.com/DavidJohnstonCEO/DecentralizedApplications>, checked on 6/1/2018.

Kagel, John H. (1972): Token economies and experimental economics. In *Journal of Political Economy* 80 (4), pp. 779–785.

Kahneman, Daniel; Knetsch, Jack L.; Thaler, Richard H. (1991): Anomalies: The endowment effect, loss aversion, and status quo bias. In *The Journal of Economic Perspectives* 5 (1), pp. 193–206.

Kaplan, Bonnie; Maxwell, Joseph A. (2005): Qualitative research methods for evaluating computer information systems. In : *Evaluating the organizational impact of healthcare information systems*. New York, NY: Springer, pp. 30–55.

Katz, Michael L.; Shapiro, Carl (1985): Network externalities, competition, and compatibility. In *The American Economic Review* 75 (3), pp. 424–440.

Katz, Michael L.; Shapiro, Carl (1994): Systems competition and network effects. In *The Journal of Economic Perspectives* 8 (2), pp. 93–115.

Kazdin, Alan E. (1982): The token economy: A decade later. In *Journal of Applied Behavior Analysis* 15 (3), pp. 431–445.

Keppel, Geoffrey; Wickens, Thomas D. (2004): Simultaneous comparisons and the control of type I errors. In : *Design and Analysis: A Researcher's Handbook*, vol. 4. Upper Saddle River, NJ: Pearson Prentice Hall, pp. 111–130.

Khaire, Mukti (2010): Young and no money? Never mind: The material impact of social resources on new venture growth. In *Organization Science* 21 (1), pp. 168–185.

- Kim, Keongtae; Viswanathan, Siva (2014): The experts in the crowd: The role of reputable investors in a crowdfunding market. In *Social Science Research Network (SSRN)*, p. 66. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3185559, checked on 1/5/2019.
- Kirsch, Laurie S. (1997): Portfolios of control modes and IS project management. In *Information Systems Research* 8 (3), pp. 215–239.
- Kirzner, Israel M. (1979): Perception, opportunity, and profit. Studies in the theory of entrepreneurship. Chicago: University of Chicago Press.
- Klöhn, Lars; Hornuf, Lars; Schilling, Tobias (2016): The regulation of crowdfunding in the German small investor protection act: content, consequences, critique, suggestions. In *European Company Law* 13 (2), pp. 56–66.
- Knight, Frank H. (1921): Risk, uncertainty, and profit. New York, NY: Augustus M. Kelley.
- Kohler, Thomas; Fueller, Johann; Matzler, Kurt; Stieger, Daniel; Füller, Johann (2011): Co-creation in virtual worlds: The design of the user experience. In *MIS Quarterly* 35 (3), pp. 773–788.
- Kollmann, Tobias; Stöckmann, Christoph; Hensellek, Simon; Kensbock, Julia (2016): European Startup Monitor. Edited by German Startup Association.
- Kondracki, Nancy L.; Wellman, Nancy S.; Amundson, Daniel R. (2002): Content analysis: review of methods and their applications in nutrition education. In *Journal of Nutrition Education and Behavior* 34 (4), pp. 224–230.
- Kunz, Michael; Bretschneider, Ulrich; Leimeister, Jan Marco (2016): Woohoo TinkerBots! The marketing effect of crowdfunding. Teaching Case. In *International Conference on Information Systems, Dublin, Ireland*, p. 17.
- Kuo Chuen, David L. (2017): Fintech tsunami: Blockchain as the driver of the Fourth Industrial Revolution. In *Social Science Research Network (SSRN)*, p. 11. Available online at <https://ssrn.com/abstract=2998093>, checked on 4/10/2018.
- Kuppuswamy, Venkat; Bayus, Barry L. (Eds.) (2015): Crowdfunding creative ideas: The dynamics of project backers. Cham.: Palgrave Macmillan.
- Kuppuswamy, Venkat; Bayus, Barry L. (2018): Crowdfunding creative ideas: The dynamics of project backers. In : *The Economics of Crowdfunding. Startups, Portals and Investor Behavior*. With assistance of Douglas Cumming, Lars Hornuf: Springer, pp. 151–182.
- La Rouviere, Simon de (2017): Curation Markets. Available online at <https://docs.google.com/document/d/1VNkBJjGhcZUV9CyC0ccWYbqeOoVKT2maqX0rK3yXB20/edit>, updated on 5/22/2017, checked on 12/14/2018.
- Lakhani, Karim R.; Boudreau, Kevin J.; Loh, Po-Ru; Backstrom, Lars; Baldwin, Carliss; Lonstein, Eric et al. (2013): Prize-based contests can provide solutions to computational biology problems. In *Nature Biotechnology* 31 (2), p. 108.
- Lakhani, Karim R.; Panetta, Jill A. (2007): The principles of distributed innovation. In *Innovations* 2 (3), pp. 97–112.
- Le, Thuong; Tarafdar, Monideepa (2009): Business ecosystem perspective on value co-creation in the Web 2.0 era: implications for entrepreneurial opportunities. In *International Journal of Entrepreneurial Venturing* 1 (2), pp. 112–130.
- Leavitt, Harold J. (1961): Applied organizational change in industry: Structural, technological and humanistic approaches. In : *Handbook of organizations*. With assistance of James G. March. Chicago: Rand-McNally, pp. 1144–1170.
- Lechner, Christian; Dowling, Michael; Welp, Isabell (2006): Firm networks and firm development: The role of the relational mix. In *Journal of Business Venturing* 21 (4), pp. 514–540.

- Lee, Allen S.; Baskerville, Richard L. (2003): Generalizing generalizability in information systems research. In *Information Systems Research* 14 (3), pp. 221–243.
- Lehner, Othmar M.; Grabmann, Elisabeth; Ennsgraber, Carina (2015): Entrepreneurial implications of crowdfunding as alternative funding source for innovations. In *Venture Capital* 17 (1-2), pp. 171–189.
- Leicht, Niklas; Blohm, Ivo; Leimeister, Jan Marco (2016): How to systematically conduct crowdsourced software testing? Insights from an action research project. In *Social Science Research Network (SSRN)*, p. 13. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3159134, checked on 1/5/2019.
- Leimeister, Jan Marco; Huber, Michael; Bretschneider, Ulrich; Krcmar, Helmut (2009): Leveraging crowdsourcing: activation-supporting components for IT-based ideas competition. In *Journal of Management Information Systems* 26 (1), pp. 197–224.
- Lin, Mingfeng; Prabhala, Nagpurnanand R.; Viswanathan, Siva (2013): Judging borrowers by the company they keep: Friendship networks and information asymmetry in online peer-to-peer lending. In *Management Science* 59 (1), pp. 17–35.
- Lindman, Juho; Tuunainen, Virpi Kristiina; Rossi, Matti (2017): Opportunities and risks of blockchain technologies—A research agenda. In *Hawaii International Conference on System Sciences*, pp. 1533–1542.
- Lipsey, Mark W. (1990): Design sensitivity: Statistical power for experimental research. Newbury Park, CA: Sage.
- Lipusch, Nikolaus; Dellermann, Dominik; Oeste-Reiß, Sarah; Ebel, Philipp (2018): Innovating beyond the fuzzy front end: How to use reward-based crowdfunding to co-create with customers. In *Hawaii International Conference on System Sciences*, pp. 4202–4211.
- Locke, John; Laslett, Peter (1988): Locke: Two treatises of government student edition. Cambridge, UK: Cambridge University Press.
- Lopreato, Joseph; Alston, Letitia (1970): Ideal types and the idealization strategy. In *American Sociological Review* 30 (1), pp. 88–96.
- Love, James; Hirschheim, Rudy (2017): Crowdsourcing of information systems research. In *European Journal of Information Systems* 26 (3), pp. 315–332.
- Lowman, Rodney L.; Kilburg, Richard R. (2011): Guidelines for case study submissions to Consulting Psychology Journal: Practice and Research. In *1939-0149 Consulting Psychology Journal: Practice and Research* 63 (1), pp. 1–5.
- Lukkarinen, Anna; Teich, Jeffrey E.; Wallenius, Hannele; Wallenius, Jyrki (2016): Success drivers of online equity crowdfunding campaigns. In *Decision Support Systems* 87 (3), pp. 26–38.
- Lumpkin, G. Tom; Dess, Gregory G. (1996): Clarifying the entrepreneurial orientation construct and linking it to performance. In *Academy of Management Review* 21 (1), pp. 135–172.
- Lyytinen, Kalle; Yoo, Youngjin; Boland Jr, Richard J. (2016): Digital product innovation within four classes of innovation networks. In *Information Systems Journal* 26 (1), pp. 47–75.
- Magnusson, Peter R.; Wästlund, Erik; Netz, Johan (2016): Exploring users' appropriateness as a proxy for experts when screening new product/service ideas. In *Journal of Product Innovation Management* 33 (1), pp. 4–18.
- Mahadevan, Balasubramaniam (2000): Business models for Internet-based e-commerce: An anatomy. In *California Management Review* 42 (4), pp. 55–69.
- Majchrzak, Ann; Malhotra, Arvind (2013): Towards an information systems perspective and research agenda on crowdsourcing for innovation. In *The Journal of Strategic Information Systems* 22 (4), pp. 257–268.

- Majchrzak, Ann; Wagner, Christian; Yates, Dave (2013): The impact of shaping on knowledge reuse for organizational improvement with wikis. In *MIS Quarterly* 37 (2), pp. 455–469.
- Malone, Thomas W.; Yates, Joanne; Benjamin, Robert I. (1987): Electronic markets and electronic hierarchies. In *Communications of the ACM* 30 (6), pp. 484–497.
- Manikas, Konstantinos; Hansen, Klaus Marius (2013): Software ecosystems—A systematic literature review. In *Journal of Systems and Software* 86 (5), pp. 1294–1306.
- Mannes, Albert E.; Larrick, Richard P.; Soll, Jack B. (2012): The social psychology of the wisdom of crowds. In : *Frontiers in social psychology: Social judgment and decision making*. With assistance of J. I. Krueger. New York, NY: Psychology Press, pp. 227–242.
- Manolova, Tatiana S.; Yan, Aimin (2002): Institutional constraints and entrepreneurial responses in a transforming economy: The case of Bulgaria. In *International Small Business Journal* 20 (2), pp. 163–184.
- March, James G.; Zur Shapira (1987): Managerial perspectives on risk and risk taking. In *Management Science* 33 (11), pp. 1404–1418.
- March, Salvatore T.; Smith, Gerald F. (1995): Design and natural science research on information technology. In *Decision Support Systems* 15 (4), pp. 251–266.
- Mark, Gloria; Lyytinen, Kalle; Bergman, Mark (2007): Boundary objects in design: An ecological view of design artifacts. In *Journal of the Association for Information Systems* 8 (11), pp. 547–568.
- Marshall, C.; Rossman, G. B. (2011): *Designing qualitative research* [Kindle version].
- Mason, Winter; Suri, Siddharth (2012): Conducting behavioral research on Amazon’s Mechanical Turk. In *Behavior Research Methods* 44 (1), pp. 1–23.
- Massolution, C. L. (2015): *Crowdfunding industry report*. Edited by Massolution. Available online at <http://reports.crowdsourcing.org/index.php>., checked on 3/25/2018.
- Matlay, Harry; Westhead, Paul (2005): Virtual teams and the rise of e-entrepreneurship in Europe. In *International Small Business Journal* 23 (3), pp. 279–302.
- Mayring, Philipp (2002): *Einführung in die qualitative Sozialforschung. Eine Anleitung zu qualitativem Denken*. 5th ed. Weinheim: Beltz.
- McClelland, David C. (1951): Measuring motivation in phantasy: the achievement motive. In H. Guetzkow (Ed.): *Groups, Leadership and Men*. Pittsburgh: Carnegie Press, pp. 191–205.
- McGrath, Joseph E. (1981): Dilemmatics: The study of research choices and dilemmas. In *American Behavioral Scientist* 25 (2), pp. 179–210.
- McKnight, D. Harrison; Choudhury, Vivek; Kacmar, Charles (2002): Developing and validating trust measures for e-commerce: An integrative typology. In *Information Systems Research* 13 (3), pp. 334–359.
- McMullen, Jeffery S.; Shepherd, Dean A. (2006): Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. In *Academy of Management Review* 31 (1), pp. 132–152.
- Messerschmitt, David G.; Szyperski, Clemens (2005): *Software ecosystem: Understanding an indispensable technology and industry*. 1st ed.: MIT Press (1).
- Meyer, Marc H.; Seliger, Robert (1998): Product platforms in software development. In *MIT Sloan Management Review* 40 (1), pp. 61–74.
- Meyskens, Moriah; Bird, Lacy (2015): Crowdfunding and value creation. In *Entrepreneurship Research Journal* 5 (2), pp. 155–166.
- Mintzberg, Henry (1994): The fall and rise of strategic planning. In *Harvard Business Review* 72 (1), pp. 107–114.

- Mitra, Devashis (2012): The role of crowdfunding in entrepreneurial finance. In *Delhi Business Review* 13 (2), p. 67.
- Mollick, Ethan (2014): The dynamics of crowdfunding: An exploratory study. In *Journal of Business Venturing* 29 (1), pp. 1–16.
- Mollick, Ethan; Nanda, Ramana (2015): Wisdom or madness? Comparing crowds with expert evaluation in funding the arts. In *Management Science* 62 (6), pp. 1533–1553.
- Mollick, Ethan R. (2013): Swept away by the crowd? Crowdfunding, venture capital, and the selection of entrepreneurs. In *Social Science Research Network (SSRN)*, p. 48. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2239204, checked on 1/5/2019.
- Mollick, Ethan R.; Kuppuswamy, Venkat (2014): After the campaign: Outcomes of crowdfunding. In *Social Science Research Network (SSRN)*, p. 18. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2376997, checked on 1/5/2019.
- Morgan, David L. (2007): Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. In *Journal of Mixed Methods Research* 1 (1), pp. 48–76.
- Moritz, Alexandra; Block, Joern; Lutz, Eva (2015): Investor communication in equity-based crowdfunding: a qualitative-empirical study. In *Qualitative Research in Financial Markets* 7 (3), pp. 309–342.
- Mukerji, Chandra; Schudson, Michael (1991): Rethinking popular culture: Contemporary perspectives in cultural studies. London, UK: University of California Press.
- Murck, Patrick (2017): Who controls the blockchain. In : Harvard Business Review. Available online at <https://hbr.org/2017/04/who-controls-the-blockchain>.
- Musk, Elon (2013): Hyperloop Alpha. Hyperloop Preliminary Design Study. White Paper. Available online at http://www.spacex.com/sites/spacex/files/hyperloop_alpha-20130812.pdf, updated on 2013, checked on 11/20/2017.
- Nærland, Kristoffer; Müller-Bloch, Christoph; Beck, Roman; Palmund, Søren (2017): Blockchain to rule the waves-nascent design principles for reducing risk and uncertainty in decentralized environments. In *International Conference on Information Systems, Seoul, Korea*, p. 17.
- Nakamoto, Satoshi (2008): Bitcoin: A peer-to-peer electronic cash system.
- Nambisan, Satish (2002): Designing virtual customer environments for new product development: Toward a theory. In *Academy of Management Review* 27 (3), pp. 392–413.
- Nambisan, Satish (2017): Digital entrepreneurship: Toward a digital technology perspective of entrepreneurship. In *Entrepreneurship Theory and Practice* 41 (6), pp. 1029–1055.
- Nambisan, Satish; Nambisan, Priya (2008): How to profit from a better virtual customer environment. In *MIT Sloan Management Review* 49 (3), p. 53.
- Nambisan, Satish; Sawhney, Mohanbir (2011): Orchestration processes in network-centric innovation: Evidence from the field. In *Academy of Management Perspectives* 25 (3), pp. 40–57.
- Nambisan, Satish; Zahra, Shaker A. (2016): The role of demand-side narratives in opportunity formation and enactment. In *Journal of Business Venturing Insights* 5, pp. 70–75.
- Nickerson, Robert C.; Varshney, Upkar; Muntermann, Jan (2013): A method for taxonomy development and its application in information systems. In *European Journal of Information Systems* 22 (3), pp. 336–359.
- Niehaves, Bjoern; Ortbach, Kevin (2016): The inner and the outer model in explanatory design theory: the case of designing electronic feedback systems. In *European Journal of Information Systems* 25 (4), pp. 303–316.

- Nonaka, Ikujiro; Takeuchi, Hirotaka; Umemoto, Katsuhiko (1996): A theory of organizational knowledge creation. In *International Journal of Technology Management* 11 (7-8), pp. 833–845.
- Normann, Richard; Ramirez, Rafael (1994): Werte schaffen mit Kunden und Lieferanten. In *Harvard Business Manager: Theorie und Praxis des Managements*, Bd 16, pp. 53–64.
- Notheisen, Benedikt; Hawlitschek, Florian; Weinhardt, Christof (2017): Breaking down the blockchain hype—Towards a blockchain market engineering approach. In *European Conference on Information Systems, Guimarães, Portugal*, p. 20.
- Nylén, Daniel; Holmström, Jonny (2015): Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. In *Business Horizons* 58 (1), pp. 57–67.
- Ojala, Arto (2016): Business models and opportunity creation: How IT entrepreneurs create and develop business models under uncertainty. In *Information Systems Journal* 26 (5), pp. 451–476.
- Okolloh, Ory (2009): Ushahidi, or ‘testimony’: Web 2.0 tools for crowdsourcing crisis information. In *Participatory Learning and Action* 59 (1), pp. 65–70.
- Ondrejka, Cory (2007): Collapsing geography (Second Life, innovation, and the future of national power). In *Innovations: Technology, Governance, Globalization* 2 (3), pp. 27–54.
- Ordanini, Andrea; Miceli, Lucia; Pizzetti, Marta; Parasuraman, Ananthanarayanan (2011): Crowd-funding: Transforming customers into investors through innovative service platforms. In *Journal of Service Management* 22 (4), pp. 443–470.
- Orlikowski, Wanda J. (1996): Improvising organizational transformation over time: A situated change perspective. In *Information Systems Research* 7 (1), pp. 63–92.
- Ozer, Muammer (2009): The roles of product lead-users and product experts in new product evaluation. In *Research Policy* 38 (8), pp. 1340–1349.
- Parker, Geoffrey G.; van Alstyne, Marshall W.; Choudary, Sangeet Paul (2016): Platform revolution: How networked markets are transforming the economy and how to make them work for you. New York, NY: Norton & Company.
- Patton, Michael Quinn (1990): Qualitative evaluation and research methods. Thousand Oaks, CA: SAGE Publications.
- Pedersen, Jay; Kocsis, David; Tripathi, Abhishek; Tarrell, Alvin; Weerakoon, Aruna; Tahmasbi, Nargess et al. (2013): Conceptual foundations of crowdsourcing: A review of IS research. In *Hawaii International Conference on System Sciences*, pp. 579–588.
- Peppers, Ken; Tuunanen, Tuure; Rothenberger, Marcus A.; Chatterjee, Samir (2007): A design science research methodology for information systems research. In *Journal of Management Information Systems* 24 (3), pp. 45–77.
- Peters, Gareth W.; Panayi, Efstathios (2016): Understanding modern banking ledgers through blockchain technologies: Future of transaction processing and smart contracts on the internet of money. In : *Banking Beyond Banks and Money. A Guide to Banking Services in the Twenty-First Century*. With assistance of Paolo Tasca, Tomaso Aste, Lorian Pelizzon, Nicolas Perony: Springer, pp. 239–278.
- Pierce, Jon L.; Kostova, Tatiana; Dirks, Kurt T. (2001): Toward a theory of psychological ownership in organizations. In *Academy of Management Review* 26 (2), pp. 298–310.
- Pierce, Jon L.; Kostova, Tatiana; Dirks, Kurt T. (2003): The state of psychological ownership: Integrating and extending a century of research. In *Review of General Psychology* 7 (1), pp. 84–107.
- Piezunka, Henning; Dahlander, Linus (2015): Distant search, narrow attention: How crowding alters organizations’ filtering of suggestions in crowdsourcing. In *Academy of Management Journal* 58 (3), pp. 856–880.

- Piller, Frank; Ihl, Christoph; Vossen, Alexander (2011): Customer co-creation: Open innovation with customers. In : New Forms of Collaborative Innovation and Production on the Internet. With assistance of V. Wittke, H. Hanekop. Göttingen: Universitätsverlag Göttingen, pp. 31–62.
- Piller, Frank; Reichwald, Ralf; Tseng, Mitchell M. (2006): Editorial. In *International Journal of Mass Customization* 1 (2), pp. 157–165.
- Piller, Frank T.; Ihl, Christoph; Vossen, Alexander (2010): A typology of customer co-creation in the innovation process. In *Social Science Research Network (SSRN)*, p. 26. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1732127, checked on 1/5/2019.
- Piller, Frank T.; Walcher, Dominik (2006): Toolkits for idea competitions: A novel method to integrate users in new product development. In *R&D Management* 36 (3), pp. 307–318.
- Pitt, Leyland F.; Watson, Richard T.; Berthon, Pierre; Wynn, Donald; Zinkhan, George (2006): The penguin's window: Corporate brands from an open-source perspective. In *Journal of the Academy of Marketing Science* 34 (2), pp. 115–127.
- Plattner, Hasso; Meinel, Christoph; Weinberg, Ulrich (2009): Design thinking. Landsberg am Lech: Mi-Fachverlag.
- Plug and Play Tech Center (2015): Listen to Startup Advice of Hyperloop CEO, Dirk Ahlborn. Edited by Plug and Play Tech Center. Available online at <https://www.youtube.com/watch?v=sQCfE1Lrxuo>, checked on 11/25/2017.
- Poetz, Marion K.; Schreier, Martin (2012): The value of crowdsourcing: can users really compete with professionals in generating new product ideas? In *Journal of Product Innovation Management* 29 (2), pp. 245–256.
- Polit, Denise F.; Beck, Cheryl Tatano (2004): Nursing research: Principles and methods. Philadelphia, PA: Lippincott Williams & Wilkins.
- Prahalad, Coimbatore K.; Ramaswamy, Venkatram (2000): Co-opting customer competence. In *Harvard Business Review* 78 (1), pp. 79–90.
- Prahalad, Coimbatore K.; Ramaswamy, Venkatram (2004): Co-creation experiences: The next practice in value creation. In *Journal of Interactive Marketing* 18 (3), pp. 5–14.
- Prelinger, Ernst (1959): Extension and structure of the self. In *The Journal of Psychology* 47 (1), pp. 13–23.
- Priem, Richard L. (2007): A consumer perspective on value creation. In *Academy of Management Review* 32 (1), pp. 219–235.
- Prpic, John; Shukla, Prashant (2013): The theory of crowd capital. In *Hawaii International Conference on System Sciences*, pp. 3505–3514.
- Prpic, John; Shukla, Prashant (2016): Crowd science: Measurements, models, and methods. In *Hawaii International Conference on System Sciences*, pp. 4365–4374.
- Prpić, John (2017): Unpacking blockchains. In *arXiv preprint arXiv:1703.06117*.
- Prpić, John; Shukla, Prashant P.; Kietzmann, Jan H.; McCarthy, Ian P. (2015): How to work a crowd: Developing crowd capital through crowdsourcing. In *Business Horizons* 58 (1), pp. 77–85.
- Putnam, Robert (2001): Social capital: Measurement and consequences. In *Canadian Journal of Policy Research* 2 (1), pp. 41–51.
- Rayna, Thierry; Striukova, Ludmila; Darlington, John (2015): Co-creation and user innovation: The role of online 3D printing platforms. In *Journal of Engineering and Technology Management* 37, pp. 90–102.
- Read, Stuart; Sarasvathy, Saras D. (2005): Knowing what to do and doing what you know: Effectuation as a form of entrepreneurial expertise. In *The Journal of Private Equity* 9 (1), pp. 45–62.

- Recker, Jan (2013): Scientific research in information systems. A beginner's guide. Heidelberg: Springer (Progress in IS).
- Reynolds, Paul D. (2005): Understanding business creation: Serendipity and scope in two decades of business creation studies. In *Small Business Economics* 24 (4), pp. 359–364.
- Richter, Chris (2015): Crowdcreation as a dimension of crowdsourcing: conditions for entrepreneurs. In *International Journal of Entrepreneurial Venturing* 7 (4), pp. 324–340.
- Riedl, Christoph; Blohm, Ivo; Leimeister, Jan Marco; Krcmar, Helmut (2010): Rating scales for collective intelligence in innovation communities: Why quick and easy decision making does not get it right. In *Social Science Research Network (SSRN)*, p. 21. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1714524, checked on 1/5/2019.
- Ries, Eric (2011): *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. New York: Crown Books.
- Rochberg-Halton, Eugene W. (1980): *Cultural signs and urban adaptation: the meaning of cherished household possessions*. Doctoral dissertation. University of Chicago, Chicago.
- Rochet J.-C.; Tirole J. (2003): Platform competition in two-sided markets. In *Journal of the European Economic Association* 1 (4), pp. 990–1029.
- Roethlisberger, Fritz J. (1977): *The elusive phenomenon: An autobiographical account of my work in the field of organizational behaviour at the Harvard Business School*. Boston, MA: Harvard University Press.
- Romberg, Tim (2007): Software platforms--How to win the peace. In *Hawaii International Conference on System Sciences*, pp. 1–10.
- Roser, Thorsten; DeFillippi, Robert; Samson, Alain (2013): Managing your co-creation mix: co-creation ventures in distinctive contexts. In *European Business Review* 25 (1), pp. 20–41.
- Rudmin, Floyd W.; Berry, John W. (1987): Semantics of ownership: A free-recall study of property. In *The Psychological Record* 37 (2), pp. 257–268.
- Ruef, Martin; Aldrich, Howard E.; Carter, Nancy M. (2003): The structure of founding teams: Homophily, strong ties, and isolation among US entrepreneurs. In *American Sociological Review* 68 (2), pp. 195–222.
- Rysman, Marc (2009): The economics of two-sided markets. In *The Journal of Economic Perspectives* 23 (3), pp. 125–143.
- Sanchez, R.; Mahoney, J. T. (1996): Modularity, flexibility, and knowledge management in product and organization design. In *Strategic Management Journal* 17 (2), pp. 63–76.
- Sarason, Yolanda; Dean, Tom; Dillard, Jesse F. (2006): Entrepreneurship as the nexus of individual and opportunity: A structuration view. In *Journal of Business Venturing* 21 (3), pp. 286–305.
- Sarasvathy, Saras D. (2001): Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. In *Academy of Management Review* 26 (2), pp. 243–263.
- Sarasvathy, Saras D.; Dew, Nicholas; Velamuri, S. Ramakrishna; Venkataraman, Sankaran (2010): Three views of entrepreneurial opportunity. In : *Handbook of Entrepreneurship Research*. With assistance of Zoltan J. Acs, David B. Audretsch: Springer, pp. 77–96.
- Sarker, S.; Xiao, X.; Beaulieu, T. (2013): Qualitative studies in information systems: A critical review and some guiding principles. In *MIS Quarterly* 37 (4), pp. iii–xviii.
- Sayama, Mari; Sayama, Hiroki (2011): Positive stereotyping and multicultural awareness: An online experiment. In *Current Research in Social Psychology* 16 (6), pp. 1–13.
- Schenk, Eric; Guittard, Claude (2011): Towards a characterization of crowdsourcing practices. In *Journal of Innovation Economics & Management* (1), pp. 93–107.

- Schjoedt, Leon; Monsen, Erik; Pearson, Allison; Barnett, Tim; Chrisman, James J. (2013): New venture and family business teams: Understanding team formation, composition, behaviors, and performance. In *Entrepreneurship Theory and Practice* 37 (1), pp. 1–15.
- Schlagwein, Daniel; Bjørn-Andersen, Niels (2014): Organizational learning with crowdsourcing: The revelatory case of LEGO. In *Journal of the Association for Information Systems* 15 (11), pp. 754–778.
- Schlegel, Manuel; Zavolokina, Liudmila; Schwabe, Gerhard (2018): Blockchain technologies from the consumers' perspective: What is there and why should who care? In *Hawaii International Conference on System Sciences*, pp. 3477–3486.
- Schreieck, Maximilian; Wiesche, Manuel (2017): How established companies leverage IT platforms for value co-creation—Insights from banking. In *European Conference on Information Systems, Guimarães, Portugal*.
- Schweitzer, Fiona Maria; Buchinger, Walter; Gassmann, Oliver; Obrist, Marianna (2012): Crowdsourcing: Leveraging innovation through online idea competitions. In *Research-Technology Management* 55 (3), pp. 32–38.
- Schweizer, André; Schlatt, Vincent; Urbach, Nils; Fridgen, Gilbert (2017): Unchaining social businesses—Blockchain as the basic technology of a crowdlending platform. In *International Conference on Information Systems, Seoul, Korea*, p. 22.
- Schwienbacher, Armin; Larralde, Benjamin (2010): Crowdfunding of small entrepreneurial ventures. In *Social Science Research Network (SSRN)*, p. 23. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1699183, checked on 1/5/2019.
- Seale, Clive (1999): Quality in qualitative research. In *Qualitative inquiry* 5 (4), pp. 465–478.
- Serarols, Christian (2008): The process of business start-ups in the internet: a multiple case study. In *International Journal of Technology Management* 43 (1-3), pp. 142–159.
- Serarols, Christian; Urbano, David (2008): Do dot. com and traditional entrepreneurs succeed in the same way? A multiple case study in Catalonia. In *International Journal of Technoentrepreneurship* 1 (4), pp. 405–429.
- Seybold, Patricia B. (2006): *Outside innovation: How your customers will co-design the future of your business*. New York, NY: Collins.
- Shane, Scott; Venkataraman, Sankaran (2000): The promise of entrepreneurship as a field of research. In *Academy of Management Review* 25 (1), pp. 217–226.
- Shane, Scott Andrew (2003): *A general theory of entrepreneurship: The individual-opportunity nexus*. Northampton, MA: Edward Elgar Publishing.
- Sheehan, Kim; Pittman, Matthew (2016): *Amazon's mechanical turk for academics: The HIT handbook for social science research*: Melvin & Leigh.
- Shepherd, Dean A. (2011): *Multilevel entrepreneurship research: Opportunities for studying entrepreneurial decision making*. Los Angeles, CA: SAGE Publications.
- Sidorova, Anna; Evangelopoulos, Nicholas; Valacich, Joseph S.; Ramakrishnan, Thiagarajan (2008): Uncovering the intellectual core of the information systems discipline. In *MIS Quarterly* 32 (3), pp. 467–482.
- Sillaber, Christian; Walzl, Bernhard (2017): Life cycle of smart contracts in blockchain ecosystems. In *Datenschutz und Datensicherheit - DuD*, vol. 41: Springer, pp. 497–500.
- Smith, Adrian; Hielscher, Sabine; Dickel, Sascha; Soderberg, Johan; van Oost, Ellen (2013): Grassroots digital fabrication and makerspaces: Reconfiguring, relocating and recalibrating innovation? In *Social Science Research Network (SSRN)*, p. 23. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2731835, checked on 1/5/2019.

- Sonnenberg, C.; Vom Brocke, J. (2012): Evaluations in the science of the artificial—Reconsidering the build-evaluate pattern in design science research. In *International Conference on Design Science Research in Information Systems, Las Vegas, Nevada*, pp. 381–397.
- Stam, Wouter; Elfring, Tom (2008): Entrepreneurial orientation and new venture performance: The moderating role of intra-and extra-industry social capital. In *Academy of Management Journal* 51 (1), pp. 97–111.
- Stanko, Michael A.; Henard, David H. (2016): How crowdfunding influences innovation. In *MIT Sloan Management Review* 57 (3), p. 15.
- Stanko, Michael A.; Henard, David H. (2017): Toward a better understanding of crowdfunding, openness and the consequences for innovation. In *Research Policy* 46 (4), pp. 784–798.
- Star, Susan Leigh; Griesemer, James R. (1989): Institutional ecology, translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. In *Social Studies of Science* 19 (3), pp. 387–420.
- State of the Dapps (2018): Dapp Statistics. Available online at <https://www.stateofthedapps.com/stats>, updated on 12/14/2018, checked on 12/14/2018.
- Stevenson, Howard H.; Jarillo, J. Carlos (2007): A paradigm of entrepreneurship: Entrepreneurial management. In : *Entrepreneurship. Concepts, Theory and Perspective*. With assistance of Álvaro Cuervo, Domingo Ribeiro, Salvador Roig: Springer, pp. 155–170.
- Stone, Robert W.; Henry, John W (2003): The roles of computer self-efficacy and outcome expectancy in influencing the computer end-user's organizational commitment. In *Advanced Topics in End User Computing* 15 (1), pp. 38–54.
- Stuart, Robert W.; Abetti, Pier A. (1990): Impact of entrepreneurial and management experience on early performance. In *Journal of Business Venturing* 5 (3), pp. 151–162.
- Surowiecki, James (2004): *The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business*. London, UK: Little Brown (296).
- Swan, Melanie (2015): *Blockchain: Blueprint for a new economy*. 1st ed. Sebastopol, CA: O'Reilly.
- SXSW (2016): Dirk Ahlborn. Crowdsourcing the Hyperloop. Edited by SXSW Interactive 2016. Available online at <https://www.youtube.com/watch?v=NE8f1fO5CaU&t=2118s>, checked on 11/10/2017.
- SXSWECO (2015): Dirk Ahlborn Keynote. Transportation of the Future. Edited by SXSWECO. Available online at <https://www.youtube.com/watch?v=8S5IPxy3LBQ>, checked on 11/15/2017.
- Taleb, Nassim Nicholas (2018): *Skin in the Game: Hidden Asymmetries in Daily Life*. New York, NY: Random House.
- Tapscott, Don; Williams, Anthony D. (2008): *Wikinomics: How mass collaboration changes everything*. New York, NY: Penguin.
- Tasca, Paolo; Thanabalasingham, Thayabaran; Tessone, Claudio J. (2017): Ontology of blockchain technologies. Principles of identification and classification. In *arXiv preprint arXiv:1708.04872*.
- Tashakkori, Abbas; Teddlie, Charles (1998): *Mixed methodology. Combining qualitative and quantitative approaches*. London, UK: SAGE Publication.
- Tech Open Air (2015): Jumpstarting the Hyperloop - Disrupting Transportation? with Dirk Ahlborn. Edited by Tech Open Air. Available online at https://www.youtube.com/watch?v=z_7JkEevTg&t=1342s, checked on 11/12/2017.
- Terwiesch, Christian; Ulrich, Karl T. (2009): *Innovation tournaments: Creating and selecting exceptional opportunities*. Cambridge, MA: Harvard Business Press.

- Thaler, Richard (1980): Toward a positive theory of consumer choice. In *Journal of Economic Behavior & Organization* 1 (1), pp. 39–60.
- Thies, Ferdinand; Wessel, Michael; Benlian, Alexander (2014): Understanding the dynamic interplay of social buzz and contribution behavior within and between online platforms—Evidence from crowdfunding. In *International Conference on Information Systems, Auckland, New Zealand*, p. 18.
- Thompson, Cynthia K. (2006): Single subject controlled experiments in aphasia: The science and the state of the science. In *Journal of Communication Disorders* 39 (4), pp. 266–291.
- Thompson, Mark (2011): Ontological shift or ontological drift? Reality claims, epistemological frameworks, and theory generation in organization studies. In *Academy of Management Review* 36 (4), pp. 754–773.
- Tilson, D.; Lyytinen, K.; Sørensen, C. (2010): Research commentary --Digital infrastructures. The missing IS research agenda. In *Information Systems Research* 21 (4), pp. 748–759.
- Tilson, D.; Sørensen, C.; Lyytinen, K. (2012): Change and control paradoxes in mobile infrastructure innovation: The Android and iOS mobile operating systems cases. In *Hawaii International Conference on System Sciences*, pp. 1324–1333.
- Tiwana, A. (2013): *Platform ecosystems: Aligning architecture, governance, and strategy*. Waltham, MA: Morgan Kaufmann.
- Tiwana, A. (2015): Evolutionary competition in platform ecosystems. In *Information Systems Research* 26 (2), pp. 266–281.
- Tiwana, Amrit; Konsynski, Benn; Bush, Ashley A. (2010): Research commentary—Platform evolution: Coevolution of platform architecture, governance, and environmental dynamics. In *Information Systems Research* 21 (4), pp. 675–687.
- Tiwana, Amrit; Konsynski, Benn; Venkatraman, N. (2013): Special issue: Information technology and organizational governance: The IT governance cube. In *Journal of Management Information Systems* 30 (3), pp. 7–12.
- Tocher, Neil; Oswald, Sharon L.; Hall, Dianne J. (2015): Proposing social resources as the fundamental catalyst toward opportunity creation. In *Strategic Entrepreneurship Journal* 9 (2), pp. 119–135.
- Token (2018). Available online at <https://de.bitcoinwiki.org/wiki/Token>, updated on 10/17/2018, checked on 12/14/2018.
- Topchishvili, A. (2018): How to launch an Initial Coin Offering. Available online at <https://medium.com/swlh/how-to-launch-an-initialcoin-offering-7fa000ba3f59>.
- Treiblmaier, Horst; Roman, Beck (Eds.) (2019): *Business transformation through blockchain*. Basingstoke, UK: Palgrave Macmillan.
- Tsang, Eric W. K.; Williams, John N. (2012): Generalization and induction: Misconceptions, clarifications and a classification of induction. In *MIS Quarterly* 36 (3), pp. 729–748.
- Tseng, Mitchell M.; Piller, Frank T. (Eds.) (2003): *The customer centric enterprise. Advances in Mass Customization and Personalization*. Berlin: Springer.
- Tsoukas, Haridimos (2009): A dialogical approach to the creation of new knowledge in organizations. In *Organization Science* 20 (6), pp. 941–957.
- Uzzi, Brian (1996): The sources and consequences of embeddedness for the economic performance of organizations: The network effect. In *American Sociological Review* 61 (4), pp. 674–698.
- Vaillant, Yancy; Lafuente, Esteban (2007): Do different institutional frameworks condition the influence of local fear of failure and entrepreneurial examples over entrepreneurial activity? In *Entrepreneurship & Regional Development* 19 (4), pp. 313–337.

- Vaishnavi, Vijay; Kuechler, William (2004): Design research in information systems. In *Association for Information Systems*. Available online at <http://www.isworld.org>.
- Vaishnavi, Vijay K.; Kuechler, William (2008): Design science research methods and patterns: innovating information and communication technology. Boston, MA: Auerbach Publications.
- van de Sande, Alex (2015): Ethereum in practice part 1. how to build your own cryptocurrency without touching a line of code. Available online at <https://blog.ethereum.org/2015/12/03/how-to-build-your-own-cryptocurrency/>, updated on 12/3/2015, checked on 12/14/2018.
- van de Ven, H. (1993): The development of an infrastructure for entrepreneurship. In *Journal of Business Venturing* 8 (3), pp. 211–230.
- van de Vrande, Vareska; Lemmens, Charmianne; Vanhaverbeke, Wim (2006): Choosing governance modes for external technology sourcing. In *R&D Management* 36 (3), pp. 347–363.
- Venable, John; Pries-Heje, Jan; Baskerville, Richard (2016): FEDS. A framework for evaluation in design science research. In *European Journal of Information Systems* 25 (1), pp. 77–89.
- Venkataraman, Sankaran; Sarasvathy, Saras D.; Dew, Nicholas; Forster, William R. (2012): Reflections on the 2010 AMR decade award: Whither the promise? Moving forward with entrepreneurship as a science of the artificial. In *Academy of Management Review* 37 (1), pp. 21–33.
- Venkatesh, Viswanath; Brown, Sue; Bala, Hillol (2013): Bridging the qualitative–quantitative divide: Guidelines for conducting mixed methods research in information systems. In *MIS Quarterly* 37 (1), pp. 21–54.
- Venkatesh, Viswanath; Brown, Sue; Sullivan, Yulia (2016): Guidelines for conducting mixed-methods research: An extension and illustration. In *Journal of the Association for Information Systems* 17 (7), pp. 436–494.
- Vogelsteller, F. (2015): RC - Token standard #20. Available online at <https://github.com/ethereum/EIPs/issues/20>, checked on 5/1/2018.
- Voshmgir, Shermin (2018): Blockchain tokens & cryptographic assets. Available online at <https://blockchainhub.net/blog/blockchain-tokens-cryptographic-assets-blockchainhub/>, checked on 12/14/2018.
- Vukovic, Maja (2009): Crowdsourcing for enterprises. In : World Conference on Services I, 2009, pp. 686–692.
- Weber, Max (2011): Methodology of social sciences. 1st edition (February 1, 2011). New York, NY: Routledge.
- Weick, Karl E. (1993): The collapse of sensemaking in organizations: The Mann Gulch disaster. In *Administrative Science Quarterly* 38 (4), pp. 628–652.
- Weil, Simone (1952): The need for roots: Prelude to a declaration of duties towards mankind, trans. New York: Routledge.
- West, J.; Sims, J.; Afuah, A.; Tucci, C. L.; Viscusi, G. (2017): Creating and capturing value through crowdsourcing. London, UK: Oxford University Press Oxford.
- West, Joel; Gallagher, Scott (2006): Challenges of open innovation: The paradox of firm investment in open-source software. In *R&D Management* 36 (3), pp. 319–331.
- West, Joel; O'mahony, Siobhan (2008): The role of participation architecture in growing sponsored open source communities. In *Industry and Innovation* 15 (2), pp. 145–168.
- West, Joel; Salter, Ammon; Vanhaverbeke, Wim; Chesbrough, Henry (2014): Open innovation: The next decade. In *Research Policy* 43 (5), pp. 805–811.
- West, Joel; Vanhaverbeke, Wim; Chesbrough, Henry (2006): Open innovation: A research agenda. In *Open Innovation: Researching a New Paradigm*, pp. 285–307.

- Wieck, Enrico; Bretschneider, Ulrich; Leimeister, Jan Marco (2013): Funding from the crowd: An internet-based crowdfunding platform to support business set-ups from universities. In *International Journal of Cooperative Information Systems* 22 (03), pp. 1–12.
- Wikström, Solveig (1996): The customer as co-producer. In *European Journal of Marketing* 30 (4), pp. 6–19.
- Williams, Ruth L.; Cothrel, Joseph (2000): Four smart ways to run online communities. In *MIT Sloan Management Review* 41 (4), pp. 81–91.
- Winkler, R. C. (1970): Management of chronic psychiatric patients by a token reinforcement system. In *Journal of Applied Behavior Analysis* 3 (1), pp. 47–55.
- Winkler, R. C. (1971): The relevance of economic theory and technology to token reinforcement systems. In *Behaviour Research and Therapy* 9 (2), pp. 81–88.
- Wood, Gavin (2014): Ethereum: A secure decentralised generalised transaction ledger. In *Ethereum Project Yellow Paper*. Available online at <https://gavwood.com/paper.pdf>, checked on 1/5/2019.
- Wood, Matthew S.; McKinley, William (2010): The production of entrepreneurial opportunity: A constructivist perspective. In *Strategic Entrepreneurship Journal* 4 (1), pp. 66–84.
- Xu, Bo; Zheng, Haichao; Xu, Yun; Wang, Tao (2016): Configurational paths to sponsor satisfaction in crowdfunding. In *Journal of Business Research* 69 (2), pp. 915–927.
- Yin, Robert K. (2008): Case study research: Design and methods. 4th edition: SAGE Publications.
- Yoo, Youngjin; Boland Jr, Richard J.; Lyytinen, Kalle; Majchrzak, Ann (2012): Organizing for innovation in the digitized world. In *Organization Science* 23 (5), pp. 1398–1408.
- Yoo, Youngjin; Henfridsson, Ola; Lyytinen, Kalle (2010): Research commentary. The new organizing logic of digital innovation: an agenda for information systems research. In *Information Systems Research* 21 (4), pp. 724–735.
- Yuan, Y.; Wang, F. Y.: Towards blockchain-based intelligent transportation systems. In : International Conference on Intelligent Transportation, Rio de Janeiro, Brazil, p. 6.
- Zhang, Juanjuan (2013): The wisdom of crowdfunding. In *Communities and Banking*, pp. 30–31.
- Zhao, Yuxiang; Zhu, Qinghua (2014): Evaluation on crowdsourcing research: Current status and future direction. In *Information Systems Frontiers* 16 (3), pp. 417–434.
- Zhu, Feng; Zhang, Xiaoquan (2010): Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics. In *Journal of Marketing* 74 (2), pp. 133–148.
- Ziegler, T.; Shneor, R.; Garvey, K.; Wenzlaff, K.; Yerolemou, N.; Hao, R.; Zhang, B. (2018): Expanding Horizons. The 3rd European Alternative Finance Industry Report. In *Social Science Research Network (SSRN)*, p. 123. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3106911, checked on 1/5/2019.
- Zittrain, Jonathan L. (2006): The generative internet. In *Harvard Law Review* 119 (07), pp. 1974–2040.
- Zobel, Ann-Kristin; Lokshin, Boris; Hagedoorn, John (2017): Formal and informal appropriation mechanisms: The role of openness and innovativeness. In *Technovation* 59, pp. 44–54.
- Zogaj, Shkodran; Bretschneider, Ulrich (2012): Customer integration in new product development: A literature review concerning the appropriateness of different customer integration methods to attain customer knowledge. In *Social Science Research Network (SSRN)*, p. 14. Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2485240, checked on 1/5/2019.
- Zvilichovsky, David; Inbar, Yael; Barzilay, Ohad (2015): Playing both sides of the market: Success and reciprocity on crowdfunding platforms. In *Social Science Research Network (SSRN)*, p. 45.

Available online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2304101, checked on 1/5/2019.