

*Digitalization in the Financial Services Industry:  
Fostering Innovation Through Fintechs and  
Blockchain Technology*

**Dissertation**

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*“The heart and soul of the company is creativity and innovation”*

Robert A. Iger

## **Abstract**

Digitalization is forcing organizations to continuously evaluate and innovate their business models (Bharadwaj et al. 2013). In particular, digital innovation is leading to fundamental changes in the financial services industry (Barberis and Chishti 2016). Agile and innovative financial technology startups (fintechs) are known as a driver of these changes, since they address emerging customer demands by developing innovative technology-based solutions with user-centered approaches (Ansari and Krop 2012; Christensen 2013). Further, experts attribute a fundamental impact on the financial services industry to blockchain technology as an emerging disintermediating digital innovation (Beck et al. 2016; Wright and Filippi 2015). Fintechs and blockchain represent not only threats and sources of disruption for incumbent organizations, but also opportunities for collaboration and enhancement of their innovativeness (Economist Intelligence Unit 2015). For instance, various financial services institutions have initiated cooperations with fintechs, have launched blockchain research projects, and have expedited prototypical blockchain implementations (Fridgen et al. 2018b; Holotiuk et al. 2018; Kaaru 2018).

Although the financial services industry is key to almost every economy (McKinnon 1973; Odedokun 1996; Schmitt 1974), the research has lagged behind in comprehensively analyzing the phenomenon of digitalization in the financial services industry, with a particular focus on fintechs and blockchain technology. To date, neither the cooperation patterns between incumbents and fintechs nor blockchain technology and its characteristics and applications have been thoroughly analyzed or evaluated.

In this thesis, I address this research gap by applying a multimethodological approach, structured in four research essays. Essay 1 identifies and evaluates the design parameters of bank-fintech cooperations and proposes a taxonomy for the classification of real-world cases. This scientifically validated taxonomy will allow one to strategically plan, analyze, and enter cooperations along the design dimensions and characteristics. Essay 2 examines blockchain technology and its potential to disintermediate existing structures, with a specific focus on crowdlending. Particularly, the results show that blockchain represents an alternative to existing IT infrastructures and can enable otherwise unsustainable (social) business models, mainly by replacing intermediaries. Essay 3 analyzes initial coin offerings (ICOs) as a disintermediated

form of crowdfunding and identifies ICO archetypes. Further, essay 3 incorporates an in-depth analysis of the five predominant ICO archetypes: average, liberal, visionary, compliant, and native ICOs. Thus, this thesis – to my best knowledge – is the first to provide a structured analysis of ICO design parameters, ICO performance, and the influence of regulation. Essay 4 evaluates blockchain’s potential in international trade finance. The findings suggest that, while blockchain is evolving and may be widely accepted, incumbents such as banks will be required in the financial services industry, their roles and business models may change significantly.

Overall, this thesis allows the reader to better understand the phenomena of fintechs and blockchain technology; it also generates generalizable knowledge on how they affect the financial services industry. Further, I provide insights into and guidelines on how organizations in the financial services industry may respond to these emerging phenomena and may leverage their potential.

Keywords: Digitalization, innovation, fintech, blockchain, financial services industry

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## **Introduction to Digitalization in the Financial Services Industry: Fostering Innovation Through Fintechs and Blockchain Technology**

### **Abstract**

*In this thesis, I investigate digitalization in the financial services industry, with a particular focus on digital innovation through fintechs and blockchain technology. It comprises four essays, answering distinct research questions and contributing to the thesis' research process. In this introduction, I provide an overview of the overarching motivation, the overall research process, the derivation of specific research questions and essays, and a discussion of the main results of this thesis. After motivating the relevance of digitalization in the financial services industry, I outline the fundamentals of digitalization and innovation. This is followed by the derivation of six research questions and the presentation of the thesis research design. I also highlight the four essays, their research objectives, and main results. Further, I summarize and discuss the overall findings and state its contributions to theory and implications for practice. Finally, I note limitations and outline promising avenues for future research.*

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Keywords: Digitalization, digital innovation, financial services industry, fintech, blockchain

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## 1 Introduction

Digitalization and digital technologies are leading to fundamental changes in all aspects of society and are fostering innovation across various industries at an extraordinary pace (Benlian et al. 2014; Gimpel et al. 2018; Karimi and Walter 2015; Legner et al. 2017). With the increasing digitalization of organizations and their ecosystems, digital innovation is creating challenges and is demanding that incumbent organizations adapt (Tilson et al. 2010; Yoo et al. 2012). Thus, incumbents must continuously observe emerging (digital) technologies and must evaluate their potentials and threats (Bharadwaj et al. 2013). Particularly in the financial services industry, the economic impacts of technologies and digital innovations are visible and manifest through novel approaches such as direct banks, crowdfunding, and cryptocurrencies that push into the market (Bruton et al. 2015; Cainelli et al. 2004; Mollick 2014; Schweizer et al. 2017). Recently, the potentially disruptive innovation blockchain has gained much attention and momentum (Beck et al. 2016; Fridgen et al. 2018b). The World Economic Forum (2015) published results of a survey, forecasting that by 2027, more than 10% of global GDP will be processed via blockchain. Blockchain as a decentral data structure allows for the storing of transactions immutably, chronologically, and transparently in distributed networks (Lemieux 2016). The technology introduces novel consensus and governance mechanisms, allowing for the distribution of power among the network participants and users, without a single central organization controlling the information technology (IT) system and data (Nakamoto 2008). Thus, some experts foresee that blockchain will dramatically change financial intermediaries' roles or will even replace them completely (Moritz and Block 2014).

Financial institutions that fail to react to these changes and are unable to appropriately exploit the technology-based opportunities risk long-term sustainability and success (Holotiuk et al. 2018). In the past few years, fintechs and primarily industry-external organizations have developed and have shaped innovations in the financial services industry (Ansari and Krop 2012). Fintechs leverage their agility and innovativeness to address emerging customer demands and to pressurize incumbents (Niemand et al. 2017; Shontell 2015). Fintechs as generators of innovation are expected to have key roles as an innovation driver and a cooperation partner in the financial services industry (Christensen 2013; Dapp 2014; Holotiuk et al. 2018; Kröner 2017; Paddags

2017). Fintechs are also causing significant shifts in the balance of power in the financial services industry (Barberis and Chishti 2016). A very recent indication of such a shift is the fintech Wirecard, which replaced Commerzbank in the prestigious German blue-chip stock market index DAX (Storbeck 2018). The phenomenon that formerly successful organizations are pressurized by innovative new market participants is recognizable in various industries and is known as the innovator's dilemma (Christensen 2013).

However, in the financial services industry, how incumbents are encountering the phenomena of fintechs and blockchain technology is changing (Economist Intelligence Unit 2015). Only a few years ago, incumbents perceived digital innovation as a threat induced by fintechs and emerging technologies. Nowadays, many incumbents see these developments as opportunities for collaboration and enhancement of innovativeness (Economist Intelligence Unit 2015; Guo and Liang 2016). Various organizations have taken promising first actions to leverage the potential benefits of blockchain technology and cooperations with fintechs (Fridgen et al. 2018b). Worldwide, almost every incumbent financial institution has initiated various such partnerships (Hatami 2018; Juengerkes 2016; Marous 2018; Puschmann 2017). Further, financial institutions have started blockchain pilot projects or are participating in blockchain consortia such as we.trade, B3i, and r3 to work on innovative solutions and to improve existing services (Lacity 2018).

Researchers have begun to analyze digitalization in the financial services industry. Findings support the recent approaches of incumbents (Niemand et al. 2017). For incumbents, entrepreneurial responses are the key to addressing uncertainty and challenges (Niemand et al. 2017). The research also indicates that, in an increasingly digital world, external sources of knowledge and innovation are becoming highly relevant for business success (Chesbrough 2004; Fichman et al. 2014; Jaubert et al. 2014). However, to date, neither innovation based on incumbent-fintech cooperations, nor blockchain as potential disruptive innovation and its characteristics or applications have been thoroughly analyzed or evaluated.

In this thesis, I address the aforementioned research gap, analyzing the potentials, challenges, and implications of fintechs and blockchain for the financial services industry. I follow a four-step approach, in which each step is an essay. Essay 1 identifies and evaluates the design parameters of bank-fintech cooperations. Further, it proposes

a theory-based and empirically shaped taxonomy to classify bank-fintech cooperations and derive predominant cooperation patterns. Essay 2 examines blockchain technology and its potential to disintermediate existing structures, with a specific focus on crowdlending platforms. Further, it incorporates the development and analysis of a blockchain prototype that enables otherwise unsustainable (social) business models. Essay 3 introduces a taxonomy for the classification of initial coin offerings (ICOs) and analyzes prevailing ICO configurations and their performances. The findings not only allow for more informed and better-grounded investment decisions, but also provide information on how regulation influences ICOs. Essay 4 includes the development of three design artifacts to evaluate blockchain's potentials and challenges for incumbent banks in international trade finance. Further, essay 4 provides insights into the future roles and business models of stakeholders in the financial services industry.

## **2 The Changing Financial Services Industry**

In this section, I provide an overview of recent changes and innovation in the financial services industry. First, I explain the fundamentals of digital innovation as a key driver of change. I then point out the impacts of fintechs and blockchain technology as prominent examples of digital innovation in the financial services industry.

### **2.1 Digitalization and Digital Innovation in the Financial Services Industry**

The sociotechnical process of digitalization builds on digitizing, which allows for transferring analogous data into digital values (Legner et al. 2017). Digitalization is commonly referred to as the application of “digitizing techniques to broader social and institutional contexts” (Tilson et al. 2010, p. 749). Thus, the basis for digitalization is the widespread use of IT (Chen and Tsou 2006). The rapidly evolving nature of IT, the commodification of technology, and the phenomenon of ubiquitous computing have led to short digital innovation cycles, demanding that organizations react in very agile ways to their ever-changing environments (Fichman et al. 2014; Gimpel et al. 2018). These digital innovations have led to significant changes and various advancements in the financial services industry over the past few decades (Brynjolfsson and Hitt 2000; Chen and Tsou 2006; Yoo 2010). The term *innovation* is widely known and recognized as “the generation, acceptance, and implementation of new ideas, processes, products

or services” (Thompson 1965, p. 2). Further, there is broad consensus that the management of innovation is crucial for organizations’ sustainability and long-term success (Drucker 1984; Schumpeter 1942; Teece 2010; Van de Ven 1986). The research shows that innovative organizations, particularly those that invest in IT, outperform non-innovative organizations in productivity and growth (Cainelli et al. 2004). Yoo et al. (2010) build on this understanding and define digital innovation as a novel combination of digital and physical components to develop new products and services. Owing to the specific focus on products and services, digital innovation may even lead to new business models and strongly influences organizations’ competitiveness (Nambisan et al. 2017).

Hinings et al. (2018) distinguish three digital innovation types: digital organizational forms, digital institutional infrastructures, and digital institutional building blocks. Innovative digital organizational forms, such as Airbnb or Uber, build on digital technologies and enable novel “arrangements of practices, structures, and values constituting an organization’s core that is appropriate in a given institutional context” (Hinings et al. 2018, p. 54). Digital institutional infrastructures challenge existing organizational infrastructures and seek to establish new standards based on novel approaches to inter-organizational collaboration, governance mechanisms, and regulation (Hinings et al. 2018; Raynard 2016). An example of a new digital institutional infrastructure is blockchain technology (Grover et al. 2018; Schweizer et al. 2017; Tapscott et al. 2016). The third category, digital institutional infrastructures, includes plug-and-play-like solution modules such as ERP systems, WordPress, and Slack that include “digital technologies for running or creating an organization” (Hinings et al. 2018, p. 55).

Further, depending on the magnitude of change a digital innovation causes, one can classify it either as a sustaining or a disrupting innovation (Hinings et al. 2018). Sustaining digital innovation is often defined as incremental improvement using an existing and known technological approach (Christensen 2013). Disrupting digital innovations are often also referred to as digital disruptions (Skog et al. 2018), while digital disruption is defined as a process that decouples and combines existing resources in novel ways or creates new resources to fundamentally re-shape traditionally sustainable models of value creation and capture (Skog et al. 2018). The combined effects of multiple digital innovations may also be disruptive, leading to

digital transformation and causing various in-depth changes (Hinings et al. 2018). Existing business practices in organizations, ecosystems, or entire industries may be replaced, complemented, or changed by new roles, actors, values, and structures (Hinings et al. 2018; Krimpmann 2015; Loebbecke and Picot 2015; Mangematin et al. 2014).

Digital innovations strongly impact on the financial services industry, which has many incumbent organizations, such as banks, insurance companies, and credit card companies (Dinçer and Hacıoğlu 2017; Lindman et al. 2017; McFarlane 2017). A main driver of this influence is that financial products entirely build on information, which is easy to digitize (Puschmann 2017). Further, recent advancements in IT have led to increasingly automated processes and significantly re-organized value chains as well as lowered market entry barriers in the financial services industry (Hirt and Willmott 2014; Puschmann 2017). A very vivid example of how digital innovation influences financial services are ongoing changes in customer communication and interaction channels (Hildebrandt et al. 2015; Moutinho et al. 1997). Traditional branch-oriented and branch-centered approaches are being replaced by digital channels such as video calls and online banking (Dapp 2014, 2015).

In the financial services industry, particularly historically successful incumbent organizations struggle to continuously change and innovate continuously, since they focus on existing technologies, lack a clear vision on digitalization, avoid uncertainty, and lack creativity (Niemand et al. 2017; O'Connell 2011). Thus, they risk losing market share and their existence in the long term (Tushman and Nadler 1986).

## **2.2 Fintechs as a Source of Digital Innovation**

Over the past few years, innovation creation processes have changed significantly (Chesbrough 2004). A paradigm shift took place from the traditional approach of creating innovation internally and entirely isolated from other organizations, to the integration of external sources of knowledge and innovation (Chesbrough 2004; Chesbrough et al. 2006; O'Riordan 2013; Westergren and Holmström 2012). Particularly, incumbents often lack internal knowledge about digital technologies and need to obtain external sources of knowledge (Hildebrandt et al. 2015). Thus, today, the creation of digital innovation is often referred to as a collaborative approach, bringing together various stakeholders with diverse knowledge bases to fuel innovation

capacity (Powell and Grodal 2006; Van de Ven 2005). Cooperating organizations have realized that creating innovation is an inter-organization exchange of knowledge and technologies (Becker and Dietz 2004; Hippel 2005). Although these endeavors are challenging and sometimes complex, owing to their inter-organizational nature (Lindgren et al. 2008), they positively affect the involved parties' competitive positions and performances (Ernst et al. 2001; Hitt et al. 2000; Jarillo 1988; Teece 1987). For instance, in the financial services industry, digital innovations such as video-identification services, online social investment strategies, and peer-to-peer money transfers originated from the integration of external know-how (Holotiuk et al. 2018). Thus, incumbents have begun to initiate collaborations to integrate external knowledge and ultimately to foster their innovativeness (Holotiuk et al. 2018).

A promising pattern that is becoming increasingly common in the financial services industry is cooperation between incumbent banks and fintechs (Hatami 2018; Marous 2018). A self-assessment of banks and fintechs revealed complementary strengths of the involved parties (Economist Intelligence Unit 2015; Holotiuk et al. 2018). While the incumbent organizations struggle to recognize technology-driven opportunities, fintechs have become known for their agility and are said to be by far quicker at utilizing the latest technological advancements (Ansari and Krop 2012). However, fintechs struggle to fulfill the high regulatory requirements and to acquire sufficient funding, and have difficulties gaining access to key customer groups (Holotiuk et al. 2018). Owing to their possession of a banking license, financial budgets, and established customer relationships, incumbents can add substantial value to cooperation (Drasch et al. 2018). A study by Hagedoorn and Schakenraad (1994) already identified that the mismatch in skills and knowledge is a fundamental driver of entering inter-organizational cooperations. Further, Holotiuk et al. (2018) conducted an interview study with 18 experts involved in bank-fintech cooperations and identified various valid motives why banks and fintechs cooperate with one another.

Considering the aforementioned developments in innovation management and recent activities in the financial services industry, bank-fintech cooperation seems a sound approach to fostering innovation that needs to be further evaluated and better understood (Holotiuk et al. 2018).

### **2.3 Blockchain as a Potentially Disruptive Digital Innovation**

Rapidly emerging digital technologies continuously challenge existing business practices, stimulate change, and foster innovation (Gimpel et al. 2018; Legner et al. 2017). One such technology that has drawn much attention is blockchain. Research and practice attribute a groundbreaking potential across various industries to blockchain (Hans et al. 2017; Manski 2017; Miscione et al. 2018). Blockchain is commonly referred to as a distributed, tamper-resistant, transparent, and peer-to-peer-based transaction register that uses cryptographic functions to ensure its security (Lemieux 2016). Owing to its ability to disintermediate, blockchain is a potentially disruptive digital innovation and has developed rapidly since its conceptualization in 2008 (White 2017). Based on its first instantiation, a peer-to-peer electronic cash system called bitcoin, the blockchain concept evolved towards a multipurpose technology, enabling use cases that go beyond the functionalities of cryptocurrencies (Fridgen et al. 2018a; Nakamoto 2008).

The idea of blockchain has been primarily developed and propelled by communities that pursue certain ideological objectives and provide an alternative to established centralized systems (Reijers et al. 2016). For instance, the idea behind bitcoin is to establish a transparent and decentral electronic cash system that relies on no intermediaries and no existing financial services industry structures (Nakamoto 2008). However, the development of the second generation of blockchains (e.g. Ethereum) led to an increased interest by businesses in the technology (CB Insights 2018), because these blockchains allow one to run programs – also known as smart contracts – on a distributed system (Buterin 2014). More and more fintechs have begun to develop novel solutions and business models based on blockchain technology. Some ideas go even further in the direction of decentralization and democratization of businesses and industries, building entire organizations on top of blockchain technology (Forte et al. 2015; Wright and Filippi 2015). These organizations are commonly known as decentralized autonomous organizations (DAOs) and rely on smart contracts to incorporate and execute their business logic (Swan 2015). Further, to the community-driven initiatives and the fintech endeavors, financial services incumbents have also begun to work on blockchain-related projects (Guo and Liang 2016; Gupta 2017; Scott et al. 2017). Here, the approaches differ significantly. They either participate in blockchain consortia, partner with blockchain fintechs, or initiate

their own blockchain initiatives (Fridgen et al. 2018a; Glaser 2017; Risius and Spohrer 2017). However, the technology, testing mechanisms, and governance approaches are still in an early stage and need to be further developed, as illustrated for instance by a very prominent example, the DAO Hack, where a user was able to exploit a smart contract owing to errors in the program code (Siegel 2016).

The abovementioned explanations illustrate that blockchain is influencing the financial services industry in multiple ways and may represent an alternative to existing infrastructures and business practices (Grover et al. 2018). Thus, blockchain as a novel research domain requires further in-depth analysis to establish a common knowledge base.

### **3 Derivation of Research Gaps and Research Questions**

I will now provide an overview of existing research in the fields of fintechs, bank-fintech cooperation, and blockchain technology, highlighting existing research gaps, deriving promising research questions, and emphasizing valid starting points for research.

#### **3.1 Bank-Fintech Cooperation to Foster Innovation**

Researchers have only begun to analyze and understand the emergence of fintechs and their characteristics and impacts on incumbents (Zavolokina et al. 2016). Zavolokina et al. (2016) studied 829 articles in 46 different newspapers to gain a better understanding on the media coverage of fintechs. Further, the authors derived a conceptual framework to define the fintech phenomenon based on media perceptions of fintechs (Zavolokina et al. 2016). Riasanow et al. (2018) analyzed 792 fintechs to propose 22 generic roles and value streams of fintechs as well as seven patterns of how fintechs use digital technologies to develop novel business models and transform the financial services industry. Muthukannan et al. (2017) examined how fintech ecosystems emerge in underbanked societies and what social benefits the phenomenon generates. In a taxonomy development research project, Eickhoff et al. (2017) studied a dataset of 2,040 international fintechs so as to better understand elementary business model elements. Their research revealed ten theoretically sound and empirically validated business model archetypes of fintechs (Eickhoff et al. 2017). To analyze existing fintech business models with a specific focus on the value of data,

Schmidt et al. (2018) analyzed 195 fintechs and presented six data-related business model archetypes. In an survey of 244 fintech users, Ryu (2018) derived a benefits and risks framework for user adoption and revealed main determinants and barriers to adoption. Wang and Huang (2018) examined 1,168,607 LinkedIn profiles of professionals in Singapore to identify job profiles of fintechs and noted the crucial role of IT skills in this domain. In their recent study, Schmidt et al. (2018) emphasized that the entire fintech ecosystem, especially bank-fintech cooperations, are not well understood. First steps to close this research gap have been taken by Karagiannaki et al. (2017) and Holotiuk et al. (2018). The latter investigated the motives of banks and fintechs when entering a cooperation. Karagiannaki et al.'s (2017) case study focused on open innovation and how this approach helps incumbents to cooperate with fintechs. However, to date, the research lags behind in providing fundamental and comprehensive analyses of bank-fintech cooperation, as well as associated and relevant characteristics of these cooperations (Holotiuk et al. 2018; Karagiannaki et al. 2017; Schmidt et al. 2018). To close this research gap and provide a structured foundation for further research, I derive the following research question (RQ):

*RQ1: What design parameters of bank-fintech cooperation can be distinguished?*

### **3.2 Blockchain Innovation: A Blessing and a Curse for Incumbents**

With blockchain, incumbents face a double-edged sword. On the one hand, the technology may provide several improvements and may improve their business models. On the other hand, the technology's novelty may also lower the market entry barriers and may help new players and fintechs to increase their market share. However, the technology still needs to prove its promising potential and its applicability in various use cases. Although blockchain's rapid development and assumed or promised potential in the business context has led to a great many research projects and initiatives in practice and science, this research is still in its infancy. While blockchain as an infrastructure is applied and evaluated across industries (Miscione et al. 2018; Murray 2018), the financial services industry is seen as the primary application area (Nofer et al. 2017). Nofer et al. (2017) mentioned three reasons for this: First, the introduction of bitcoin as the first productive blockchain use case originates from the financial services industry. Second, the financial services industry has substantial process inefficiencies and cost base problems that blockchain may be

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able to solve. Third, the recent financial crisis revealed the lack of transparency and traceability of processes, leading to mistrust of financial institutions. Friedlmaier et al. (2018) also revealed that the highest blockchain startup population is active in the financial services industry. Further, they showed that the financial services industry is the main target of venture capital investments funding blockchain startups (Friedlmaier et al. 2018). To better understand the business models used by blockchain startups, Beinke et al. (2018) developed and proposed a taxonomy. Based on this taxonomy and 63 real-world cases, they applied a cluster analysis to identify seven prevailing blockchain business model archetypes (Beinke et al. 2018). In 2016, Hayes (2016) evaluated blockchain's potential as an alternative to the existing central banks. His investigation showed that bitcoin, as a peer-to-peer electronic cash system, does not satisfy the functions of a central bank (Hayes 2016). However, he proposed a conceptual framework that is assumed to fulfill a central bank's requirements by using further developed blockchains that are able to run smart contracts and that enable DAOs (Hayes 2016). Rodrigues et al. (2018) and Diniz et al. (2018) sought to answer a question raised by Scott (2016) concerning blockchain's ability to foster social and solidarity finance. With a multiple-case study approach, Rodrigues et al. (2018) examined blockchain's potential to enable community currencies. Their findings suggest that blockchain as an infrastructure seems to be able to provide the functionalities of community currencies (Rodrigues et al. 2018). Diniz et al. (2018) used a selection of cryptocurrencies to evaluate their abilities to contribute to solidarity finance goals. Since this paper is a work in progress, its final results should soon shed light on this instance. In addition to these approaches, the concept of social business has emerged, combining principles from profit-oriented and non-profit organizations to create social value (Doherty et al. 2014; Wilson and Post 2013; Yunus 2007). Particularly promising approaches are crowdlending platforms that create a marketplace for capital-seekers and investors looking for investment opportunities with social benefits (Agrawal et al. 2014; Blohm et al. 2016; Haas et al. 2014). Yet, most crowdlending platforms have high transaction costs, since they rely on existing bank infrastructures to process and transfer funds (Lehner 2013). To reduce these costs and increase the social value of crowdlending platforms, blockchain may serve as an alternative infrastructure. The research has not yet comprehensively analyzed and evaluated the use of blockchain technology as an enabler of social crowdlending platforms. Thus, I ask:

*RQ2: How can blockchain technology as an alternative infrastructure for crowdlending platforms enable social businesses?*

Taking the idea of blockchain as an infrastructure for crowd-based investments a step further, the phenomenon of ICOs emerged (Arnold et al. 2018). This new funding mechanism combines the smart contracts-based creation of blockchain tokens with crowdfunding and in most cases allows for investments in cryptocurrencies only (Ehrsam 2016; Lee et al. 2018). Thus, the ICO concept is commonly referred to as a novel crowdfunding approach that uses blockchain to enable secure peer-to-peer investments (Ravikant 2014). Particularly, blockchain fintechs use ICOs to overcome the general funding problem of startups (Fridgen et al. 2018c; Porru et al. 2017; Schweizer et al. 2017). Chanson et al. (2018b) introduced the research field and identified the initial ICO building blocks. Further, Chanson et al. (2018a) analyzed various social media channels' effects on organizational legitimacy, with a specific focus on ICOs. Park and Yang (2018) approached fundraising from a broader perspective and examined factors that affect ICO fundraising campaigns. There has been no research into a structured overview of what constitutes an ICO, which ICO types are used, and what their likelihoods of success are. To close this research gap, I ask:

*RQ3-1: What are the design parameters of initial coin offerings as novel approaches of funding?*

*RQ3-2: Which initial coin offerings archetypes do exist and by which design parameter are they characterized?*

*RQ3-3: Which initial coin offerings archetypes are successful and which design parameter values contribute to it?*

It is not only fintechs that are evaluating and using novel technologies and emerging concepts such as ICOs. Blockchain's increasing commercialization is leading incumbents to also examine the technology's potential (CB Insights 2018; Gupta 2017; Scott et al. 2017). Incumbents are particularly interested in evaluating blockchain as new approach to IT infrastructure and governance in complex processes with various stakeholders. Prominent examples of use cases in financial services are inter-bank reconciliation, international payments, and audit procedures (Grover et al. 2018). The research also shows that customer identification and identity management processes are valid application areas for blockchain technology (Lootsma 2017; Sullivan and

Burger 2017). Parra-Moyano and Ross (2017) proposed a blockchain-based prototype for *know-your-customer* due diligence processes and promised increased efficiency and lower cost as well as improved transparency and customer experiences. Additional promising blockchain use cases have originated in international trade. For instance, the international shipping company Maersk initiated a blockchain prototype project to further digitalize the historically paper-based processes around the ownership of goods (Nærland et al. 2017). Based on this research project, Maersk and IBM have launched TradeLens, a blockchain-based system for the shipping industry that fosters collaboration among stakeholders and increases efficiency in international trade (Del Castillo 2018). The solution has proven its usefulness, with more than 90 organizations using TradeLens (Del Castillo 2018). Indeed, not only are the transfer and ownership of goods important (material perspective); the financing of and payment for goods (immaterial perspective) are also central to international trade. A very common payment and finance instrument in international trade is a letter of credit (Grassi 1995). This process includes two banks that take care of customer identification, document processing, international payments, and risk mitigation (Korpela et al. 2017). The processes currently incorporate various manual tasks, paper-based documents, and physical shipping of documents around the world. These activities slow the process and sometimes take longer than the actual shipping of goods (Korpela et al. 2017). To improve the status quo in international trade finance, various bank consortia have begun to develop blockchain-based solutions for international trade finance (Kaaruu 2018; Suberg 2018). Yet researchers have not addressed this issue in international trade finance, and we still lack a comprehensive evaluation of whether blockchain can improve existing finance products (e.g. a letter of credit). Therefore, I ask:

*RQ4: Can blockchain technology provide an alternative compared to centralized approaches for a letter of credit?*

## **4 Research Design**

In the previous sections, I highlighted that the digitalization of the financial services industry is leading to a multitude of consequences and novel research fields. In this thesis, I focus on six research questions to address the diverse research gaps in the realm of fintechs and blockchain technology. To answer these questions, I apply a

multimethodological approach. I will provide an overview of the chosen research methods and will outline why I chose these approaches to answer the research questions.

Research question 1, addressed in essay 1, relates to a fundamental issue in bank-fintech cooperation. To lay the foundation for future research, it focuses on the identification of design parameters to better understand how bank-fintech cooperations are configured. To profoundly address this research gap requires an approach that can combine existing knowledge on cross-organizational cooperation and latest real-world data. Addressing similar fundamental issues, taxonomies have shown their classification efficacy in various research projects across industries and contexts (Fiedler et al. 1996; Glass and Vessey 1995; Sabherwal and King 1995; Williams et al. 2008; Yaari 1993). Thus, with my co-authors, I decided on a taxonomy development approach to pursue the research goal. We follow the research method of Nickerson et al. (2013), which previous studies have successfully utilized in information systems (IS) research (Glaser and Bezenberger 2015; Haas et al. 2014; Jöhnk et al. 2017; Püschel et al. 2016) and which allows for iterative development. The iterative nature of the development method is particularly important, since the research question addresses an emerging phenomenon with new real-world cases introduced almost daily. Also, with my co-authors, I decided to further investigate predominant design parameter configurations through leveraging the final taxonomy as basis for a cluster analysis. This approach is regularly chosen in IS research when classifying specific objects (Balijepally et al. 2011). Here, it allows for a first indication on which issues future research should focus on so as to provide relevant results.

Research question 2 relates to the infrastructural characteristics of blockchain technology and forms part of essay 2. In particular, this question asks whether blockchain represents an alternative to existing IT infrastructures for social crowdlending platforms. To date, research into social finance and blockchain technology has only been conducted on a theoretical level to conceptualize potential solutions (Diniz et al. 2018; Hayes 2016; Rodrigues et al. 2018). To complement these approaches and to respond to researchers who have called for blockchain prototype analyses based on design science research (Glaser 2017; Lindman et al. 2017), with my co-authors, I followed Peffers et al.'s (2007) widely accepted design science research approach. Design science research is an appropriate approach, since it focuses on

solving organizational problems via IT artifacts developed in an iterative build-and-evaluate process (Hevner et al. 2004). Further, design science research seeks to generate generalizable knowledge that is transferable to similar contexts. This is particularly helpful in the young research area of blockchain technology, since it allows one to derive insights for various application areas that previous studies have not yet addressed.

In essay 3, with my co-authors, I answer questions relating to ICOs (RQ3-1, RQ3-2, and RQ3-3). Similar to RQ1, the first ICO-related research question (RQ3-1) focuses on getting a fundamental understanding of this recent phenomenon by identifying and analyzing the design parameters of ICOs. Analogous to essay 1, and to realize the initial systematization of the research domain, with my co-authors, I decided to follow Nickerson et al.'s (2013) well-established taxonomy development approach. To identify existing ICO archetypes and to answer RQ3-2, my co-authors and I performed a two-stage cluster analysis. This approach is in line with the exploratory research objective and IS research (Haas et al. 2014; Malhotra et al. 2005; Püschel et al. 2016). The two-stage cluster analysis is more sophisticated than the cluster analysis conducted in essay 1, because RQ3-2 seeks to not only descriptively analyze predominant archetypes, but also to establish how important each of the design parameters is in specific configurations. To answer the third ICO research question and analyze the second market performance of tokens sold during an ICO, my co-authors and I decided to apply Smith + Crown's (2017) analysis, which allowed us to compare the performance of the identified ICO archetypes and to evaluate their development compared to the overall crypto market. Thus, essay 3 provides a first assessment of potentially more and less important design parameters about second market performance.

Research question 6 investigates the advantages and disadvantages of using blockchain technology in international trade finance and forms part of essay 4. With my co-authors, I also consider the latest developments relating to blockchain use cases, suggesting that there are two paradigms that organizations follow when utilizing blockchain (Beck and Müller-Bloch 2017; Guo and Liang 2016; Gupta 2017). They either apply blockchain to improve existing processes or to re-think their entire value proposition. Based on these observations to comprehensively answer RQ4, multiple research artifacts are required. Thus, to follow this explorative research objective, and

in line with recent approaches in IS research in the blockchain field (Beck et al. 2016; Glaser 2017; Lindman et al. 2017), my co-authors and I decided to apply Peffers et al.'s (2007) iterative design science research approach. This allowed for the development of multiple artifacts, their evaluation, and a comparison among these.

## 5 Thesis Structure and Results

I will now concisely explain the structure of the thesis and will provide an overview of the main results. Overall, the thesis comprises four research essays that follow this introduction chapter. As described, each essay focuses on a specific research area and addresses specific questions. All essays contribute to the overall body of knowledge on the digitalization in the financial services industry. This thesis follows a cumulative approach, allowing communication of research results through conferences and journal publications. Thus, the essays and previous versions have either been presented at conferences, published in journals, or are currently in the review process of well-recognized journals. Table 1 contains an overview of the publications and current review processes. In the following sections, I summarize and present the main results of each essay.

Table 1. Publication Histories of Research Essays in this Thesis

<b>Title</b>	<b>Publication medium</b>	<b>Publication status</b>	<b>VHB JQ3 ranking</b>
<b>Essay 1:</b> Integrating the 'Troublemakers': A Taxonomy for Cooperation between Banks and Fintech	Journal of Economics & Business (JEB)	Published	C
<b>Essay 2:</b> Unchaining Social Businesses – Blockchain as the Basic Technology of a Crowdlending Platform	Proceedings of the 38th International Conference on Information Systems (ICIS 2017)	Published	A
<b>Essay 3:</b> Tarzan and Chain: Exploring the ICO Jungle and Evaluating Design Archetypes	Electronic Markets (em)	Under review	B
	<b>Previous version:</b> Proceedings of the 26th European Conference on	Published	B

	Information Systems (ECIS 2018) <b>Previous version:</b> Proceedings of the 14th Internationale Tagung Wirtschaftsinformatik (WI)	Published	C
<b>Essay 4:</b> Blockchain Won't Kill the Banks: Why Disintermediation Doesn't Work in International Trade Finance	Electronic Markets (em)	Under review	B

### 5.1 **Essay 1: Integrating the 'Troublemakers': A Taxonomy for Cooperation between Banks and Fintechs**

Essay 1 analyzes the multidimensional phenomenon of bank-fintech cooperation to foster innovation in the financial services industry. To classify the novel research domain and to provide a foundation for future research, the resulting artifact of this essay is a theoretically founded and empirically proven taxonomy. Based on the literature, 136 real-world cases, and 12 expert interviews, the results suggest structuring and describing bank-fintech cooperations through 13 dimensions. Further, the empirical examination allows for the identification of prevailing cooperation patterns. Thus, the findings contribute to theory development on fintechs, their integration into the banking sector, and the cross-organizational cooperation research domain. This essay also has practical implications for both banks and fintechs, and opens promising avenues for future research.

### 5.2 **Essay 2: Unchaining Social Businesses – Blockchain as the Basic Technology of a Crowdlending Platform**

In essay 2, my co-authors and I discuss the rapidly emerging blockchain technology as a novel infrastructure approach in the social businesses field. Following a design science research approach, my co-authors and I design, develop, and evaluate a blockchain-based crowdlending platform prototype of a social business. Further, we compare the proposed prototype to a non-blockchain solution. The results show that blockchain enables otherwise unsustainable social business models, mainly by

replacing intermediaries. Further, the results suggest that programming smart contracts on a blockchain requires changes to software engineering practices. Overall, this essay generates generalizable knowledge and derives implications for both research and practice. It also illustrates that blockchain still faces challenges and uncertainties that represent promising avenues for further research.

### **5.3 Essay 3: Tarzan and Chain: Exploring the ICO Jungle and Evaluating Design Archetypes**

Essay 3 focuses on a new blockchain-based funding mechanism, the ICO. To provide a coherent understanding of what constitutes an ICO, my co-authors and I propose a taxonomy, introducing the design parameters of ICOs. Based on this taxonomy and 84 real-world ICO cases, applying a cluster analysis allows to identify predominant ICO archetypes. Further, essay 3 includes an in-depth analysis of the five resulting archetypes: the average ICO, the liberal ICO, the visionary ICO, the compliant ICO, and the native ICO. My co-authors and I also include a performance analysis of the ICO archetypes. Thus, this essay contributes to a comprehensive and in-depth understanding of the ICO phenomenon and its implications. It also offers concrete design suggestions to practitioners for future ICOs and their potential performance.

### **5.4 Essay 4: Blockchain Won't Kill the Banks: Why Disintermediation Doesn't Work in International Trade Finance**

In essay 4, my co-authors and I investigate and evaluate blockchain technology's potential in international trade finance, where organizations follow two fundamentally different paradigms: First, using blockchain to improve existing processes (blockchain-based business process optimization / BPO). Second, utilizing blockchain as an approach to disrupt existing processes, foster disintermediation, and enable disruptive business models (blockchain-based business process disruption / BPD). However, we lack best practices on how to use blockchain in international trade finance. In this essay, my co-authors and I apply a design science research approach to deliver a comprehensive analysis of blockchain in international trade finance, introducing the two blockchain prototypes BPO and BPD and conceptualizing a third approach based on blockchain-based business process re-engineering (BPRE). The third approach represents a combination of the BPO and the BPD prototypes, leading to superior results concerning efficiency, cost, and flexibility. Thus, this essay enhances

the current body of knowledge through theoretical knowledge about the uses and benefits of blockchain technology. Further, it delivers first insights on how the futures of third parties (e.g. banks) are developing in blockchain ecosystems.

## **6 Discussion of Results and Research Summary**

The essays that make up this thesis incorporate their individual discussions, contributions to theory and practice, and limitations sections. Thus, I will now briefly highlight the essays' main findings and discuss the overarching results of this thesis.

### **6.1 Contributions to Theory and Implications for Practice**

In this thesis, I investigate important steps towards a comprehensive understanding of the emerging phenomena of fintechs and blockchain, contributing to the current body of knowledge in material ways. First, based on the identified demand for a structured and shared understanding of bank-fintech cooperation, I propose a taxonomy. The empirically evaluated taxonomy not only provides a classification scheme for the analysis of specific cooperations, but also serves as a basis for a cluster analysis to identify predominant cooperation design patterns. Second, it illustrates how a design science research approach can be used to evaluate blockchain technology as infrastructural component of social businesses. In particular, the developed crowdlending platform prototype suggests that blockchain is superior to a centralized transaction processing system. The criteria-based comparison and evaluation that allow me to derive this conclusion form a foundation for similar approaches in other industries. Third, this thesis – to my best knowledge – is the first to provide a structured analysis of ICO design parameters. The proposed ICO design parameter taxonomy integrates multiple perspectives on ICOs as a novel funding approach to allow for comprehensive and multifaceted investigations. It also shows how multiple methods can be combined in an overall research approach to identify and compare prevailing ICO archetypes. Fourth, with this thesis, I am among the first to utilize design science research to analyze and evaluate differing ways to apply blockchain technology in the financial services industry. I reveal that blockchain leverages different disintermediation levels, and the findings suggest that full disintermediation is not necessarily a desirable outcome.

Practitioners can benefit from this thesis in several ways. First, the proposed taxonomy

for cooperation between banks and fintechs allows decision-makers in incumbent financial institutions and fintechs to better understand their current cooperation activities. Further, this taxonomy is the first scientifically validated artifact that allows practitioners to strategically plan and enter cooperations along the design dimensions and characteristics. Second, it provides insights into how blockchain as a novel building block for social entrepreneurs can help them to better achieve their social objectives. It also provides findings that may allow formerly unsustainable social businesses to become sustainable. In addition, the results from the social businesses field may serve as valid starting point and guideline for incumbents and other startups, evaluating blockchain as a potential alternative to existing IT infrastructures. Third, this thesis provides practice with a structured approach for the evaluation of ICOs. Practitioners may use the taxonomy for ICOs as an analysis artifact that helps to enrich information on ICOs prior to an investment decision. The derived ICO archetypes and the market performance analysis benefit both startups that seek funding and investors, who can capitalize on the transparent and criteria-based matching between their requirements and available ICO configurations. Fourth, the thesis provides practitioners with an in-depth analysis of what the benefits of blockchain in international trades are and how incumbents can utilize them.

## **6.2 Limitations**

I acknowledge limitations and propose ways to overcome these limitations in future research. The first limitation relates to the underlying datasets used in the essays. Although all research activities focused on an objective approach, the results may be influenced by the data samples used. For instance, applying a different data sample to develop the taxonomies and archetypes in essays 1 and 3 may lead to differing results. Further, the specific application areas of a social business and a letter of credit in essays 2 and 4 may have stimulate the research process. The aforementioned issues are generally valid drawbacks that further research can address, applying a divergent dataset to further evaluate and refine the initial results. The second limitation relates to the generalizability of the results of this thesis. Each essay addresses a very specific question in a specific context. For instance, essay 1 focuses on the cooperation between banks and fintechs, while essay 2 focuses on social businesses. Thus, not all results are transferable into other contexts without adaptation. Further research may use this thesis as a starting point and may analyze how the results apply in other financial

service industry settings or even across industries. The application of the research methods represents the third limitation. The research in this thesis is largely explorative and follows a design approach. This means that the research process included several decisions on how different design phases are ordered and integrated. For instance, the taxonomy development in essays 1 and 3 includes several iterations that follow either a conceptual-to-empirical or an empirical-to-conceptual approach. Here, the application of a divergent sequence of research steps may lead to modified results. Thus, further research may evaluate the effects of choosing a varying sequence of design and development iterations.

### **6.3 Conclusion**

In this thesis, I investigate digitalization and its consequences in the financial services industry. In particular, the emerging phenomena of fintechs and blockchain are integral objects of examination. The four essays of this thesis show that incumbents in the financial services industry face increasing pressure through agile fintechs and emerging blockchain technology. The results show that the innovator's dilemma is a pervasive challenge for incumbents in the financial services industry. Further, the results illustrate how fintechs and blockchain challenge and at the same time provide opportunities to these incumbents. On the one hand, in specific cases, for instance for social crowdlending platforms and ICOs, blockchain can be an alternative to existing infrastructures. On the other hand, the findings also suggest that the increased competition in the financial services industry provides multiple opportunities for incumbents. For instance, the thesis shows that bank-fintech cooperation is a valid approach to foster innovation and innovativeness in incumbents. Further, based on the use case of trade finance, the findings suggest that a solution that combines both blockchain technology and incumbent institutions is superior to both a solution without this emerging technology and a solution that relies only on blockchain. Thus, the results reveal that fintechs and blockchain do not necessarily supersede financial services incumbents. However, they indicate that fintechs and blockchain influence and change incumbents' roles and value creation in the financial services industry.

Overall, this thesis is among the first to study the emerging phenomena of fintech and blockchain following an inclusive, multimethodological approach. It answers six research questions in order to close the derived research gaps. Thus, the four essays

respond to recent calls to extend the current bodies of knowledge in the fields of fintechs and blockchain (Glaser 2017; Holotiuk et al. 2018).

## **6.4 Outlook**

The explorative nature of this thesis and its essays establish a foundation for further research and raise multiple questions, which require further analysis. Also, in this thesis, I could not address all the questions around fintechs and blockchain (Mending et al. 2018; Risius and Spohrer 2017). Thus, I propose a twofold approach to further explore and better understand the phenomena of fintechs and blockchain. On the one hand, future research should initiate in-depth analyses to address the limitations and promising starting points of investigation stated in this thesis. In Section 6.2, I provided an overview of the limitations and mentioned ways to overcome them. Further, each essay includes a detailed explanation of its limitations and stated suggestions for related further research. On the other hand, future studies should focus on a broader research horizon and should investigate aspects that this thesis only partially addresses. I will now outline four promising areas that future research should focus on.

Bank-fintech cooperations are increasingly gaining attention, with more and more organizations entering such business alliances. Essay 1 provides design parameters for such cooperations and states predominant cooperation patterns. However, the essays and existing research into bank-fintech cooperation have not yet investigated the success rates and long-term benefits for banks and fintechs (e.g. Holotiuk et al. (2018)). Thus, I suggest that future research should consider the success perspective of such endeavors and should analyze critical success and failure factors of bank-fintech cooperations.

Another research area that needs to be tackled relates to the technological challenges of blockchain. The essays 2, 3, and 4 indicate that blockchain can have significant benefits for both startups and incumbents. However, the developed solutions and most other researchers' work rely on prototypical implementations that do not address the complex challenges of a real-world environment (e.g. Nærland et al. 2017; Beck et al. 2016; Grover et al. 2018; Fridgen et al. 2018b). Thus, future research should pay specific attention to questions of scalability, secure smart contract programming, and interoperability of different blockchain implementations in real-world cases.

The third research area that requires further in-depth research relates to governance structures of blockchain solutions. In line with recent research by Beck et al. (2018), I note that various questions need to be addressed prior to a widespread application in business environments. For instance: *How can decisions making processes in consortia settings be orchestrated? How can disputes between consortia partners be solved?*

Further, user adoption's role in blockchain solutions must be addressed. Some authors argue that users are not specifically interested in a solution's underlying technology, but focus on a service's overall convenience. Although this might be true, it is still not clear, and we lack empirical data about how blockchain fulfills parameters that are relevant for user adoption (Wang et al. 2016). Thus, future research should apply well-established methods such as the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT) to the blockchain field (Awa et al. 2017; Gangwar et al. 2015). This would allow us to better understand blockchain solutions' current readiness regarding user adoption and would also allow us to derive the biggest challenges to be overcome in order to foster widespread adoption of blockchain.

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## Appendix

### Appendix A: Declaration of Co-authorship and Individual Contribution

Here, I outline the contributions of all co-authors to the essays<sup>1</sup>.

#### **Essay 1: Integrating the ‘Troublemakers’: A Taxonomy for Cooperation between Banks and Fintechs**

I co-authored this research paper with Benedict Drasch and Nils Urbach. The co-authors contributed as follows:

##### *Benedict Drasch (co-author)*

Benedict Drasch contributed by initiating, developing, and elaborating the entire research project. He conducted the literature analysis, developed the taxonomy, evaluated the taxonomy, conducted the cluster analysis, and carried out the textual elaboration. Thus, Benedict’s co-authorship is reflected in the entire research project.

##### *André Schweizer (co-author)*

I contributed by initiating, developing, and elaborating the entire research project. I conducted the literature analysis, developed the taxonomy, evaluated the taxonomy, conducted the cluster analysis, and carried out the textual elaboration. Thus, my co-authorship is reflected in the entire research project.

##### *Nils Urbach (co-author)*

Nils Urbach supervised the research project and provided mentorship. He contributed by engaging in the research idea development. Further, he provided feedback to the research content, article structure, and textual elaboration. Thus, Nils’s co-authorship is reflected in the entire research project.

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<sup>1</sup> Signed copies declaring the authors’ individual contributions for each essay has been submitted with this thesis. This section’s content was translated from these German original documents.

## **Essay 2: Unchaining Social Businesses – Blockchain as the Basic Technology of a Crowdlending Platform**

I co-authored this research paper with Vincent Schlatt, Nils Urbach, and Gilbert Fridgen. The co-authors contributed as follows:

*André Schweizer (leading co-author)*

I contributed by initiating, developing, and elaborating the entire research project. I conducted the literature analysis, conceptualized and programmed the blockchain prototype, evaluated and compared the solution to a non-blockchain approach, and conducted the textual elaboration. Thus, my co-authorship is reflected in the entire research project.

*Vincent Schlatt (subordinate co-author)*

Vincent Schlatt contributed by supporting the literature analysis, the blockchain prototype evaluation, and the textual elaboration.

*Nils Urbach (subordinate co-author)*

Nils Urbach supervised the research project and provided mentorship. He contributed by providing feedback to the article structure, the article's foundations, and the textual elaboration.

*Gilbert Fridgen (subordinate co-author)*

Gilbert Fridgen supervised the research project and provided mentorship. He contributed by providing feedback to the article structure and its foundations.

### **Essay 3: Tarzan and Chain: Exploring the ICO Jungle and Evaluating Design Archetypes**

I co-authored this research paper with Nina Bachmann, Benedict Drasch, Gilbert Fridgen, Michael Miksch, Ferdinand Regner, and Nils Urbach. The co-authors contributed as follows:

#### *Nina Bachmann (co-author)*

Nina Bachmann contributed to the taxonomy revision, cluster analysis, and token performance analysis. She developed the initial taxonomy and conducted the two-stage cluster analysis and the token performance analysis, and carried out the textual elaboration. Thus, Nina's co-authorship is reflected in the entire research project, with a focus on the cluster and token performance analysis.

#### *Benedict Drasch (co-author)*

Benedict Drasch contributed to the taxonomy revision, cluster analysis, and token performance analysis. He evaluated the taxonomy, the cluster analysis, and the token performance analysis, and carried out the textual elaboration. Thus, Benedict's co-authorship is reflected in the entire research project, with a focus on the cluster and token performance analysis.

#### *Gilbert Fridgen (co-author)*

Gilbert Fridgen supervised the entire research project and provided mentorship. He contributed by providing feedback to the article structure and foundations, and the textual elaboration.

#### *Michael Miksch (co-author)*

Michael Miksch contributed to the taxonomy revision, cluster analysis, and token performance analysis. He further developed the initial taxonomy and conducted the two-stage cluster analysis and the token performance analysis, and carried out the textual elaboration. Thus, Michael's co-authorship is reflected in the entire research project, with a focus on the cluster and token performance analysis.

#### *Ferdinand Regner (co-author)*

Ferdinand Regner contributed by initiating the research idea and developing the initial taxonomy. He conducted the literature analysis, developed and evaluated the taxonomy, and carried out the textual elaboration. Thus, Ferdinand's co-authorship is

reflected in the entire research project, with a focus on the taxonomy development.

*André Schweizer (co-author)*

I contributed by initiating, developing, and elaborating the entire research project. I conducted the literature analysis, developed and evaluated the taxonomy, the cluster analysis, and the token performance analysis, and carried out the textual elaboration. Thus, my co-authorship is reflected in the entire research project.

*Nils Urbach (co-author)*

Nils Urbach supervised the entire research project and provided mentorship. He contributed by providing feedback to the article structure and foundations as well as the textual elaboration.

#### **Essay 4: Blockchain Won't Kill the Banks: Why Disintermediation Doesn't Work in International Trade Finance**

I co-authored this research paper with Gilbert Fridgen, Sven Radszuwill, and Nils Urbach. The co-authors contributed as follows:

##### *Gilbert Fridgen (co-author)*

Gilbert Fridgen supervised the research project and provided mentorship. He contributed by providing feedback to the research idea, content, article structure, and textual elaboration. Gilbert's co-authorship is reflected in the various concepts for future blockchain-based international trade finance solutions.

##### *Sven Radszuwill (co-author)*

Sven Radszuwill contributed by introducing, developing, and elaborating the entire research project. He conducted the literature analysis, developed various concepts for future blockchain-based international trade finance solutions, conducted the evaluation, and carried out textual elaboration. Thus, Sven's co-authorship is reflected in the entire research project.

##### *André Schweizer (co-author)*

I contributed by developing and elaborating the entire research project. I conducted the literature analysis, developed various concepts for future blockchain-based international trade finance solutions, conducted the evaluation, and carried out textual elaboration. Thus, my co-authorship is reflected in the entire research project.

##### *Nils Urbach (co-author)*

Nils Urbach supervised the research project, provided mentorship, and conducted textual elaboration.

## Appendix B: Other Publications and Working Papers

Table 2. Overview of Other Publications and Working Papers

Reference	Title	Publication medium	Publication state	VHB JQ3 ranking
Schlatt, Schweizer, Urbach, and Fridgen (2016)	Blockchain: Grundlagen, Anwendungen und Potenziale	Fraunhofer White Paper	Published	-
Kühn, Eymann, Urbach, and Schweizer (2016)	From Professionals to Entrepreneurs: HR Practices as an Enabler for Fostering Corporate Entrepreneurship in Professional Service Firms	German Journal of Human Resource Management (GHRM)	Published	C
Fridgen, Radszuwill, Schweizer, and Urbach (2017)	Entwicklung Disruptiver Innovationen mit Blockchain: Der Weg zum Richtigen Anwendungsfall	Wirtschaftsinformatik & Management	Published	-
Buhl, Schweizer, and Urbach (2017)	Blockchain-Technologie als Schlüssel für die Zukunft?	Zeitschrift für das gesamte Kreditwesen	Published	-
Fridgen, Guggenmos, Lockl, Rieger, Schweizer, and Urbach (2018)	Developing an Evaluation Framework for Blockchain in the Public Sector: The Example of the German Asylum Process	Proceedings of the 1 <sup>st</sup> ERCIM Blockchain Workshop 2018	Published	-
Fridgen, Lockl, Radszuwill, Rieger, Schweizer, and Urbach (2018)	A Solution in Search of a Problem: A Method for the Development of Blockchain Use Cases	Proceedings of the 24 <sup>th</sup> Americas Conference on Information Systems (AMCIS 2018)	Published	D
Arnold, Brennecke, Camus, Fridgen, Guggenberger, Radszuwill, Rieger, Schweizer, and Urbach (2018)	Blockchain Initial Coin Offerings: Blockchain's Implications for Crowdfunding	Book chapter in: Business Transformation through Blockchain: Volume I	Published	-
Kremser, Radszuwill, Schweizer, and Steffek (2019)	The Fear of the Dump: How Large Stakes Influence Bitcoin Performance – Evidence from the Mt. Gox Liquidation Case	Proceedings of the 27 <sup>th</sup> European Conference on Information Systems (ECIS 2019)	Under review	B
Hardjono, Knoll, Schweizer, Urbach, and Van der Gracht (2019)	The Role of the Blockchain Technology in the Machine Economy: An Explorative Delphi Study	IEEE Transactions on Engineering Management	Work in progress	B

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Harth, Lockl, Schlatt, Schweizer, and Urbach (2019)	Towards Trust in the Internet of Things: A Remote Sensor Data Monitoring System based on Blockchain	IEEE Transactions on Engineering Management	Work in progress	B
Buck, Eymann, Oesterle, and Schweizer (2019)	Privacy as Part of the Preference Structure of Users' App Buying Decisions	Business & Information Systems Engineering (BISE)	Work in progress	B

## **Integrating the ‘Troublemakers’: A Taxonomy for Cooperation between Banks and Fintechs<sup>2</sup>**

### **Abstract**

The banking sector has been subject to fundamental changes as digitalization is enabling novel technology-driven banking services and is creating new customer demands. While banks face sluggish innovation processes, fintechs take advantage of the digital era, delivering customer-centric solutions. Although banks have realized that cooperation with fintechs is a key approach to foster innovation, they struggle to address the associated challenges. Yet, there has been very little research into this phenomenon, so as to establish best practices, because neither bank-fintech cooperation, nor associated and relevant characteristics have been evaluated. We propose a taxonomy that is theoretically founded and empirically proven. Based on the literature, 136 real-world cases, and 12 expert interviews, our results suggest structuring and describing bank-fintech cooperation through 13 dimensions. Further, the empirical examination allows for the identification of prevailing cooperation patterns. Our findings contribute to theory development on fintechs, their integration into the banking sector, and the cross-organizational cooperation research area. This paper also has practical implications for both banks and fintechs, and opens promising avenues for future research.

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Keywords: Banking, fintechs, digital transformation, cooperation, taxonomy

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<sup>2</sup> This essay was co-authored with Benedict Drasch and Nils Urbach. It has been published in the Journal of Economics & Business (JEB):

- Drasch, Benedict; Schweizer, André; Urbach, Nils (2018): Integrating the ‘Troublemakers’: A taxonomy for cooperation between banks and fintechs. In Journal of Economics and Business. DOI: 10.1016/j.jeconbus.2018.04.002.

## **Unchaining Social Businesses – Blockchain as the Basic Technology of a Crowdlending Platform<sup>3</sup>**

### **Abstract**

Social businesses are increasingly gaining relevance as alternatives to traditional businesses. Nonetheless, such organizations face specific problems. The emerging blockchain technology may represent an opportunity to solve several problems of social businesses and an alternative to established technologies. However, evidence about the potential of blockchain in social businesses is missing. We bridge this gap by designing, developing, and evaluating a blockchain-based crowdlending platform of a social business, following the design science research approach. The evaluation and comparison to a non-blockchain solution allows us to generate generalizable knowledge and derive implications for both research and practice. Our research shows that blockchain enables otherwise unsustainable social business models, mainly by replacing intermediaries and requires changes in software engineering practices. Further, our findings illustrate that blockchain raises challenges and uncertainties and opens promising avenues for further research.

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Keywords: Blockchain, social business, smart contracts, crowdlending, design science, prototype

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<sup>3</sup> This essay was co-authored with Gilbert Fridgen, Vincent Schlatt and Nils Urbach. It has been published in the Proceedings of the 38th International Conference on Information Systems (ICIS 2017):

- Schweizer, André; Schlatt, Vincent; Urbach, Nils; Fridgen, Gilbert (2017): Unchaining Social Businesses - Blockchain as the Basic Technology of a Crowdlending Platform. In Proceedings of the 38th International Conference on Information Systems. Seoul, South Korea.

## **Tarzan and Chain: Exploring the ICO Jungle and Evaluating Design Archetypes<sup>4</sup>**

### **Extended Abstract**

The phenomenon of a blockchain use case called initial coin offering (ICO) is drawing increasing attention as a novel funding mechanism. ICO is a form of crowdfunding that utilizes blockchain tokens to allow for truly peer-to-peer investments. Although more than \$7bn have been raised globally via ICOs in 2018, the concept and its implications are not yet entirely understood. In particular, a systematic understanding of what exactly constitutes an ICO is missing but required to establish a common knowledge base and enable a widespread use as a commodity service. Regulators and many governmental institutions have just started to take action in the so far mostly unregulated ICO market. A major problem is that, although there are first approaches of standardization, ICOs are still very heterogeneous (EFSA 2017). In addition, similarly to investments in cryptocurrencies like Bitcoin and Ethereum so far, it remains unclear how beneficial ICOs are in short- and long-term for both issuers and investors. So far, research lacks behind in providing a comprehensive and in-depth analyses of ICO designs and their chances of success.

We address this research gap by following a three-phase approach. First, we develop a taxonomy of empirically validated ICO design parameters. Taxonomies as frameworks are well suited to lay the groundwork for emergent fields of research and serve as the first step into systematizing the emerging research domain (Williams et al. 2008). We follow the established and well-recognized taxonomy development method proposed by Nickerson et al. (2013). Second, we build upon our taxonomy and empirically investigate ICOs archetypes to obtain an in-depth understanding of prevailing

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<sup>4</sup> This essay was co-authored with Nina Bachmann, Benedict Drasch, Gilbert Fridgen, Michael Miksch, Ferdinand Regner and Nils Urbach. At the time of the publication of this thesis, this essay is in the review process of a scientific journal. Thus, I provide an extended abstract that covers the essay's content. Earlier versions of this essay have been published in the Proceedings of the 26th European Conference on Information Systems (ECIS 2018) and accepted for publication in the Proceedings of the 14th Internationale Tagung Wirtschaftsinformatik (WI 2019):

- 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: Proceedings of the 26th European Conference on Information Systems (ECIS2018). Portsmouth, UK.
- Bachmann, Nina; Drasch, Benedict; Miksch, Michael; Schweizer, André (2019): Dividing the ICO Jungle: Extracting and Evaluating Design Archetypes. In: Proceedings of the 14th Internationale Tagung Wirtschaftsinformatik (WI 2019). Siegen, Germany.

dimensions and characteristics. To identify meaningful archetypes of ICOs, we perform a two-stage cluster analysis (Aldenderfer and Blashfield 1984; Hair et al. 2013; Ketchen and Shook 1996). Further, we apply Pearson X<sup>2</sup>, Carmer's V and pairwise post-hoc tests to validate the significance of our clusters. As a result, we identify five ICO archetypes which illustrate different combinations and dominant aspects within the ICO design parameters. Third, we conduct an analysis of the secondary market performance of 84 real-world ICO cases. Doing so, we follow the research approach of Smith + Crown (2017). To increase the expressiveness of our results, we compare our findings to the overall token market performance and analyze multiple time-dependent scenarios. As a result, we identify differing performances among the five ICO archetypes. Our research allows to derive three key findings:

- 1) Low ICO success seems to be associated with strict regulation
- 2) ICOs building upon market mechanisms for regulation seem promising
- 3) ICOs incorporating collaboration between issuers and investors seem promising

We thereby contribute to theory building in the fields of ICOs and provide practitioners with various backgrounds and perspectives on the phenomenon. First, we provide a systematic and comprehensive overview of predominant ICO designs allowing to structure the complex domain in a comprehensible way. Second, the archetypes extend existing classifications of ICOs by various aspects and allow for generalizable findings, instead of taking into account single characteristics. Further, the classification into predominant archetypes provides structured guidance for ventures that plan to conduct an ICO. Third, for traditional financial intermediaries, including early stage venture capitalists or crowdfunding platforms, the taxonomy and archetypes may help to characterize potential competitors. Fourth, our findings of the short- and long-term ICO archetype performance analysis are of vital importance for research on ICOs and blockchain governance issues, since they allow to derive the impact of different governance configurations.

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Keywords: Blockchain, ICO, taxonomy, archetypes, success analysis

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## **Blockchain Won't Kill the Banks: Why disintermediation Doesn't Work in International Trade Finance<sup>5</sup>**

### **Extended Abstract**

Particularly in the financial services industry, blockchain is assumed to have significant impact. From research and practice, we observe two main paradigms of how organizations interact with blockchain technology. First, organizations use blockchain to optimize existing processes (blockchain-based business process optimization – BPO). Second, organizations regard blockchain as an approach to disrupt existing processes, foster disintermediation, and enable disruptive business models (blockchain-based business process disruption – BPD). Although the technology is entering the market and promises significant improvements compared to existing approaches, scientific research that evaluates its de facto potential is scarce.

We bridge this gap by following a design science research approach (Hevner et al. 2004; Peffers et al. 2007) aiming at a blockchain-based business process re-engineering (BPRES) for a letter of credit (LoC) that combines the advantages of BPO and BPD. We conduct three design cycles and develop three artefacts: a BPO, a BPD, and a BPRES approach. We particularly investigate how the BPO and BPD prototypes differ and which approach may be favored in which regard. The BPO prototype is still very close to the current process of an LoC, and primarily aims at incremental process improvements. In contrast, the BPD prototype builds on an entirely different, disintermediated process for LoCs. We evaluate the approaches in detail by examining eight design evaluation criteria (process time, process flexibility, process transparency and tracking, process costs, reliable and secure transaction processing, trust and identification mechanism, dependency on intermediary services, capital tie-up period) and through expert interviews. The evaluation indicates that both the BPO and BPD approach are not a perfect fit for the LoC process requirements. However, it also reveals a striking match between the BPO prototype's weaknesses and BPD prototype's strengths, and vice versa. Thus, combining the two approaches, the BPRES solution seeks to leverage the blockchain-specific characteristics and potential advantages,

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<sup>5</sup> This essay was co-authored with Gilbert Fridgen, Sven Radszuwill and Nils Urbach. At the time of the publication of this thesis, this essay is in the review process of a scientific journal. Thus, I provide an extended abstract that covers the essay's content.

while incorporating the holistic business objectives. Although full disintermediation seems unlikely for LoCs, we outline that blockchain-based processes like the BPRE approach can lead to increased efficiency and new market structures including fewer participants in the future.

With our research we address four of the future research directions for blockchain technology in business process management raised by Mendling et al. (2018). First, with our design science research, we developed two prototypes, evaluated them comprehensively, and derived a re-engineered solution for an LoC. Thus, we not only demonstrate the feasibility of blockchain as basis of execution and monitoring systems (process-aware information systems), but also indicate benefits and challenges of different implementations. Second, our research approach responds to the call for valid methods of analysis and engineering for business processes based on blockchain. Third, through our iterative research and the integration of experts from practice, we illustrate and confirm how blockchain allows for redesigning processes. Fourth, we demonstrate how blockchain influences existing structures and roles of ecosystem participants.

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Keywords: Blockchain; business process management; disintermediation; letter of credit; international trade finance; smart contract

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