Integrating the Troublemakers:
A Taxonomy for the Cooperation between Banks and Fintechs

Abstract

The banking sector has been subject to fundamental changes as the digitalization enables novel technology-driven banking services and creates new customer demands. Whereas banks face sluggish innovation processes, fintechs take advantage of the digital era, and deliver customer-centric solutions. Although banks have realized that cooperation with fintechs represents a vital approach to foster innovation, they struggle to address the associated challenges. However, research analyzing this phenomenon to establish best practices is scarce, because neither the cooperation between banks and fintechs, nor associated and relevant characteristics have been evaluated. Therefore, we propose a taxonomy which is theoretically funded and empirically proven. Based on literature, 136 real-world cases, and 12 expert interviews, our results suggest to structure and describe cooperations between banks and fintechs through 13 dimensions. Moreover, the empirical examination allows the identification of prevailing cooperation patterns. Our findings contribute to theory development in the field of fintechs, their integration into the banking sector, and the research area of cross-organizational cooperation. Furthermore, this paper reveals practical implications for both banks and fintechs and opens promising avenues for future research.

Keywords: Fintech, banking, taxonomy, cooperation, innovation, digitalization

1 Introduction

The banking sector is undergoing fundamental changes due to the digital transformation (Barberis, Chishti 2016). This new era challenges existing business practices and established structures (Châlons, Dufft 2017; Bharadwaj et al. 2013). On the one hand, new technologies – also transferred from other business domains – enable new banking applications and services (e.g., crowdlending, online identification services or blockchain services). These developments require appropriate and aligned information technology (IT), which again enables novel applications (e.g. new products or services; technology-push, cf. Nemet 2009). On the other hand, digital transformation changes the way customers think and act (e.g. point-of-sale, data privacy), and raises new customer demands (demand-pull, cf. Nemet 2009). Furthermore, digital transformation in the banking sector does not only affect IT departments and IT strategies, but also transforms business processes and even entire business models (Benlian et al. 2014). Thus, banks are forced to rethink their current value delivery and customer interactions (Marous 2013).

Meanwhile, financial technology startup companies (fintechs) pick up new technology-enabled opportunities to fulfill emerging customer-demanded needs or even create novel customer needs. Consequently, the fintech industry is booming and clearly draws attention: Global venture capital investment in fintech companies has increased to 24.7 billion USD in 2016 and reinforced their disruptive capabilities (KPMG 2017). Fintechs are attributed to be by far quicker and more agile than traditional banks in implementing and leveraging the aforementioned opportunities through the employment of innovative technology solutions and customer-centered approaches (Christensen 2013; Ansari, Krop 2012). Therefore, fintechs have become known for being the innovation drivers in the field, and thus are predicted to play an important role in the financial service industry of the future (Dapp 2014). Digital transformation and technology advancements also enable service providers to address customers in a very short time. These conditions are in favor of many fintechs that work on alternatives to established banking institutions (Shontell 2015). Consequently, banks need to keep up with the pace of innovation in order to stay in the market, since innovative companies are attributed to be growing faster, generate higher revenue and have a higher probability of permanent success (Kim, Mauborgne 1997). Therefore, also in the banking sector, innovation – and especially IT innovation – can be considered as an eminent differentiation against competitors, and a critical factor for financial sustainability (Chandy, Tellis 2000; Fagerberg 2004; Schumpeter 1942; Teece 2010).

Banking practitioners have realized that banks are facing several challenges such as a short-term focus of their management, and a lack of internal capabilities to innovate, leading to long innovation cycles and long times-to-market (Tornjanski et al. 2015). Thus, banks seek for a transformation of their organizations towards long-term success (Economist Intelligence Unit 2015). To achieve this, it is utterly important to overcome the stated internal problems (Tornjanski et al. 2015) and to create competitive advantages through consideration of external innovativeness (Chesbrough 2004; Jaubert et al. 2014) and cooperation with external parties. In a survey among financial services executives, 80% of the participants stated that the collaboration with startups brings new ideas to their business (Skan et al. 2015). Additionally, a self-assessment of banks and fintechs reveals a striking match between banks' weaknesses and fintechs' strength, and vice versa (Economist Intelligence Unit 2015). Therefore, it seems reasonable for banks to evaluate and leverage the potential of external innovation sources originated from startup companies (e.g., acquisition, alliance, incubation or joint venture). No longer are fintechs (only) seen as the source of disruption but as an opportunity for collaboration and enhancement of innovation (Economist Intelligence Unit 2015). A key success factor for a promising cooperation between banks and fintechs is to preserve the innovative fintech characteristics, embodying the mindset towards new ideas and change, whilst combining them successfully with banking controls, know-how, processes and assets (Economist Intelligence Unit 2015; Hurley, Hult 1998; Rogers 2003).

However, the majority of banks struggles to meet the challenges and the complexity associated with cooperation scenarios, and research is lagging behind the current developments in the financial sector, especially regarding cooperation between banks and fintechs (Tornjanski et al. 2015). While previous research has addressed and answered a variety of research questions within the realm of cooperation, innovation and their coherence, theory does not fully account for the idiosyncratic character of cooperation between banks and fintechs. Until now, neither the cooperation itself between banks and fintechs, nor associated and relevant characteristics were analyzed and evaluated. To provide a first categorization and to establish a structure for the topic of interest, we aim at supporting researchers and banking practitioners to better understand and analyze this multi-dimensional problem. Accordingly, we formulate our research question as follows: *What design parameters of cooperation between banks and fintechs can be distinguished?* Whereas, design parameters are accounted as characteristics, which determine the form of the cooperation and allow to dissect possible traits of existing cooperations.

To answer the research question, we propose a taxonomy for the cooperation between banks and fintechs. We follow the iterative approach of Nickerson et al. (2013), using both literature and empirically verified knowledge. The empirical perspective is represented through real-world cases from a database consisting of 136 cooperations of banks and fintechs, and 12 expert interviews with bank and fintech executives as well as industry experts. With our taxonomy, we strive for a twofold contribution: First, we aim at contributing to theory building (Doty, Glick 1994; Iivari 2007) by classifying dimensions of cooperation. Therefore, the proposed taxonomy delivers a structured and systematic organization of the integration of external organizations (Glass, Vessey 1995). Moreover, our research, focuses on developing a theory for analysis (type I) (Gregor 2006) that lays the foundation for further theory development in this domain. Second, our research addresses several opportunities for practitioners, describing typical characteristics to shape cooperation between banks and fintechs (e.g., possible cooperation models, structures of integration). Furthermore, by applying the proposed taxonomy to our case database, we introduce and discuss prevailing cooperation designs between banks and fintechs. Thus, the taxonomy proposed in this paper establishes fundamental parameters for the analysis of current cooperations as well as for the prediction of future cooperation developments (Glass, Vessey 1995).

The paper is organized as follows: In the following section, we lay the theoretical foundations for the proposed taxonomy and discuss existing theory in this particular domain. Afterwards, we introduce the research methodology and describe the taxonomy development process. Hereafter, we present the resulting taxonomy and prevailing cooperation patterns. Finally we discuss limitations and further research and conclude with highlighting the paper's theoretical and practical contribution.

2 Foundations

This section provides an introduction to the current digital transformation and its implications for the banking sector. Furthermore, the relation between the digital transformation and innovation as well as the role of fintechs within the banking sector are stated. Finally, cross-organization cooperation is discussed as a promising solution to foster a bank's innovation capability.

2.1 Digital Transformation of the Banking Sector

Digitalization is a pervasive phenomenon of the 21st century that has changed or disrupted many industries in the past years (Benlian et al. 2014). Digital technologies enable new functionalities and open up promising business opportunities, thus changing the perception and the role of IT (Bharadwaj et al. 2013). Embedded computing power turned products into smart and interconnected things, such as cars, phones, televisions, cameras or bicycles (Yoo 2010). Moreover, the technological improvements also reshape and transform key business operations, products, processes, organizational structures, and management theories (Matt et al. 2015). Consequently, entire value chains across organization boundaries and business models are reshaped

and replaced by innovative solutions, which are enabled through disruptive technological improvements (Downes, Nunes 2013). These developments are based on digitizing – which is a technical process – and invoke digitalization, a sociotechnical process of "applying digitizing techniques to broader social and institutional contexts" (Tilson et al. 2010, p. 749).

As one among many indicators, digitalization is also massively affecting the banking industry and changes the traditional branch system orientated sector (Dapp 2014, 2015; Moutinho et al. 1997). This also influences the banks' capability to create stakeholder value (Walters 2014; Hirt, Willmott 2014). Generally, digitalization provides several opportunities for banks, such as the enhancement of customer interaction, the improvement of management decisions and enabling new value chains and business models (Hirt, Willmott 2014). Beyond, various threats emerge through digital transformation, such as winner-takes-all dynamics, modular and interchangeable business model blocks, and a lack of digital talents (Hirt, Willmott 2014). In addition, borderless global transactions, high transparency, and commoditized products lead to lower switching costs as well as lower market entry barriers (Hirt, Willmott 2014). However, in Europe, the majority (60-80%) of bank processes are still not digitalized and 90% of the European banks invest not even 0.5% of their total spending on digital initiatives (Olanrewaju 2014). Yet, only 50% of the interviewees of an expert paper confirmed that their banks have a strategic approach to replace old technologies (Skan et al. 2015) and only a few understand that the change needs to happen instantaneous and in a fundamental manner (Ernst & Young 2011). Consequentially, banks need to quickly adapt to the challenges of the digital transformation to evolve towards a position as an innovative, digital and agile player which allows them to secure their role as the driver of the field and to succeed in the market (Accenture 2015; Jaubert et al. 2014; Ernst & Young 2011).

2.2 Innovation, Innovation Sourcing and Fintechs in the Banking Sector

Many of the new opportunities which are enabled by digitalization are based on innovation, and change the nature of products and services (Yoo et al. 2012). Innovation is "the generation, acceptance, and implementation of new ideas, processes, products or services" (Thompson 1965, p. 2) and its management is crucial for organizations' success (e.g., Drucker 1984; Schumpeter 1942; Teece 2010; Van de Ven 1986). Nevertheless, many organizations – especially in the banking sector – fail to continuously change and innovate (Tushman, Nadler 1986). The target-oriented pursuance of innovation in practice has been a strategic asset and even a market entrance barrier for potential competitors for many centuries (Chesbrough 2004). A company's innovation strategy comprises internal innovation (make), such as R&D activities, and external innovation (buy), such as acquisition and hiring away (Cassiman, Veugelers 2006). Further, the creation of innovation depends on several internal and external factors (O'Riordan 2013). In the past, organizations that invested the most in internal research and development also earned the most of the profits (e.g., DuPont, Merck, IBM, GE and AT&T, c.f. Chesbrough 2004). However, a variety of newcomer organizations strongly challenge industry leaders with only little or no basic research of their own (e.g., Intel, Microsoft, Oracle, Uber, c.f. Chesbrough 2004). Instead, they create innovation based on research activities and discoveries of other organizations (Chesbrough 2004). Thus, external sources of knowledge and innovation become highly relevant for business success (Chesbrough 2004; Jaubert et al. 2014). Nowadays, in a digital world remarkable innovations are closely linked to the fast evolving nature and the advanced market penetration of information technology (Fichman et al. 2014). The fundaments of service innovation are the fast advancements paired with widespread usage of information and communication technologies (Chen, Tsou 2006; Brynjolfsson, Hitt 2000).

In the banking sector, these technology-driven innovations are currently significantly propelled by fintechs. Fintechs are financial technology companies bringing technology solutions and new innovations to the financial sector, providing more effective financial products and services that are aligned to the digital era. These startup companies are agile and consist of dynamic teams with short development cycles and low internal bureaucracy, resulting in a very fast time to market and higher innovative capabilities compared to

big incumbent firms (Christensen 2013; Ansari, Krop 2012). In contrast, large and recently successful companies often focus on their current technology, avoid the risk of uncertainty and new approaches, and face a lack of creativity (O'Connell 2011). To overcome these shortcomings, the literature suggests cooperation across company borders and researchers have studied reasons and effects of cooperation in a wide variety of use cases and methodologies (Teece 1992).

2.3 Cross-organizational Cooperation to Enhance Innovation Capabilities

To support innovation, companies enter cooperations, bringing in their expertise and benefitting from other companies' knowledge and technology (Hippel 2005; Nooteboom 1999). Cooperating companies have realized that innovation is not a single-player activity, but rather an inter-firm exchange of information and resources (Becker, Dietz 2004). Hagedoorn (1993) found the urge for technology and market knowledge to be a significant reasons for companies to cooperate in order to innovate. Ultimately, organizations cooperate to improve their competitive position and performance (e.g., Ernst et al. 2001; Hitt et al. 2000; Jarillo 1988; Teece 1987).

Ever since companies cooperate, questions about different approaches, their implications, and influence on innovation capability are raised. Studies on cross-organizational cooperation suggest strategic alliances, merger and acquisition and incubation as innovation enhancing forms of cooperation (Man, Duysters 2005; Bergek, Norrman 2008). Strategic alliances have a positive effect on innovation, if the involved parties' management is equipped to manage alliances (e.g., Anand, Khanna 2000; Powell et al. 1996; Takeishi 2001), if the involved parties share similar or overlapping knowledge (e.g., Chan et al. 1997; Koh, Venkatraman 1991; Lane, Lubatkin 1998; Mowery et al. 1996), or if the form of cooperation is intense (e.g., Dyer 1996, 2000; Hagedoorn, Schakenraad 1994). In comparison to research on strategic alliances, research regarding the relation between merger and acquisition or incubation and innovation is less extensive. The acquisition of knowledge is found to have a positive impact on post-merger performance and innovation effectiveness (Ahuja, Katila 2001). Bergek, Norrman (2008) review different components of existing incubation literature with a focus on incubation selection strategies, and find a positive influence of incubation on a company's innovation capability (Hackett, Dilts 2004).

Previous research has addressed and answered a variety of research questions within the realm of cooperation, innovation and their coherence, and therefore made an excellent contribution to the understanding. Yet, the cooperation between banks and fintechs differs from the existing theory, as two presumably unsymmetrical aims and market positions collide. For banks and fintechs, the motivation to enter into a cooperation is reasonable for many reasons. Banks aim at profiting through the development of new customer segments, products, and services, expanding into new markets, developing new capabilities, and accessing new technology (Economist Intelligence Unit 2015). In return, fintechs look for the financial resources, infrastructures, customer access, and security reputation. However, research on the new phenomenon in the financial markets is scarce (Tornjanski et al. 2015), whereas the recent developments in the banking sector suggest the necessity to closely look at this specific application of cooperation. The situation in the banking sector differs from former constellations and poses new challenges. The incumbents of the financial sector somehow dependent on fintechs, and fintechs for their part do not fear established institutions, but carefully choose their cooperation partners, often working with more than one. Additionally, the fintechs' innovativeness becomes a driver for customer satisfaction and changes the business models of banks. Nevertheless, the innovation is placed at the center of the cooperation, and in many cases, there is little effort to jointly drive the innovation process. Alongside, with this challenge, we place the corresponding design parameters in the center of our paper, addressing how banks and fintechs can work together in a way that increases banks' innovativeness. To lay the foundations and better understand such phenomenon, taxonomy development has proven its systemization efficacy and serves as the first step into emerging research domains.

3 Research Method

A taxonomy provides a set of unifying constructs, resulting in a structure and a systematic organization of the examined environment (Glass, Vessey 1995). Thus, a taxonomy is "useful in discussion, research, and pedagogy" (Miller, Roth 1994, p. 286) in order to "organize knowledge" (Wand et al. 1995, p. 291) and to help human understanding (Gregor 2006). However, taxonomies not only systematically describe the current developments, relationships and dependencies of a research area, but also lay the fundament for higher-order theory in the examined field (Glass, Vessey 1995), such as theory for explaining and predicting, or theory for design and action (Gregor 2006). We apply the taxonomy development approach of Nickerson et al. (2013), as the method goes beyond previous approaches (e.g. Bailey 1984). The method integrates conceptual and empirical perspectives into one comprehensive method that fosters the iterative usage of both paradigms and has been successfully applied multiple times by several researchers (Glaser, Bezzenberger 2015; Haas et al. 2014).

Taxonomy development according to Nickerson et al. (2013) encompasses seven steps. Step 1 and 2 are introduced to set the field of research and determine the boundaries of the taxonomy. The following steps 3 to 7 are conducted in an iterative manner to define and validate the taxonomy's dimensions and characteristics. In step 1, a meta-characteristic is determined to serve as the base for all dimensions and characteristics that are introduced within the taxonomy development process. Each following characteristic of the taxonomy should be logically derived from the meta-characteristic. This initial step guides the research process and helps researchers to avoid the examination of unrelated characteristics. Consequently, the meta-characteristic needs to be chosen and elaborated thoroughly. Step 2 embodies the determination of ending conditions, which terminate the iterative development process. The ending conditions, also seen as a form of Rich's (1992) guidelines for a classification process, are of great relevance and influence the method's scope and outcome essentially. They determine the quality standard and validity that a taxonomy has to fulfil to be accepted as a temporarily finalized artefact. For step 3 to 7, Nickerson et al. (2013) distinguish between a conceptual-to-empirical (C2E) and an empirical-to-conceptual (E2C) approach. In the C2E approach, the researcher starts with a conceptual or theoretical foundation and derives the dimension's structure through deduction, until it is satisfactorily complete (Bailey 1994). In the E2C approach the researcher starts with data and derives the dimension's structure using analysis of the actual data, detecting similarities or distinctions (Bailey 1994). For each iteration, the researcher decides if either the first or the latter approach is applied and helpful to further develop the taxonomy (step 3). In general, the empirical component of the development method contributes to verify, validate and revise existing dimensions and characteristics as well as to identify the necessity of additional classification criteria. The outcome of step 3 has an influence on how steps 4, 5 and 6 are being shaped. In step 7, the latest taxonomy is compared with the determined ending conditions, and a decision if another iteration will be conducted is made. Due to fast changing targets, the design science literature describes the search for an optimal solution as "intractable for realistic information systems problems" (Hevner et al. 2004, p. 88). Thus, the proposed taxonomy represents an initial structure and a systematic overview of the emerging research field of cooperation between banks and fintechs.

4 Taxonomy Development Process

In our taxonomy development process, we built on existing theoretical knowledge and available expertise to consider both the conceptual and empirical perspective (Nickerson et al. 2013). For the conceptual perspective, we dissected the theoretical background of cooperation patterns and reviewed related literature streams (literature). In this procedure, two researchers independently identified and analyzed relevant papers and condensed their insights in several discussions meetings. For the empirical perspective, we included publicly available data of cooperation cases between banks and Fintechs (secondary data) and conducted interviews with banking executives, fintechs representatives, and industry experts (primary data),.

Following Nickerson et al. (2013), the taxonomy development process itself, as described in the previous section, consists of seven steps. An overview of the applied research steps is provided in Table 1. The associated iteration cycles, are explained in more detail in the following sections. Furthermore, in Appendix II we provide an overview of the evolving taxonomy.

Step 1	**Determine meta-characteristic** *Based on the identified lack of research and according to our research question, we defined the meta-characteristic as follows: Design parameters of cooperations between banks and fintechs in the context of banks' innovation capability enhancement.*
Step 2	**Determine ending conditions** *We chose well established and widely recognized ending conditions and clustered them into objective and subjective criteria (Nickerson et al. 2013). A detailed overview is provided in Table 2.*
Step 3	**Choose between conceptual-to-empirical and empirical-to-conceptual approach** *Based on available real-world cooperation cases, interview partners and identified literature streams we chose a conceptual-to-empirical or an empirical-to-conceptual approach.*

	Conceptual-to-empirical	**Empirical-to-conceptual**
Step 4	**4c. Conceptualize (new) characteristics and dimensions of objects** *We analyzed literature from various fields, such as cross-organizational cooperation, innovation and value creation, in order to conceptualize characteristics and dimensions.*	**4e. Identify (new) subset of objects** *We not only searched for bank and fintech cooperations cases (secondary data) but also utilized insights about cases from the expert interviews (primary data).*
Step 5	**5c. Examine objects for these characteristics and dimensions** *We evaluated the appropriateness and correctness of the proposed characteristics and dimensions through the examination of bank and fintech cooperations cases as well as through insights from the expert interviews.*	**5e. Identify common characteristics and group objects** *We examined the identified objects, clustered them and derived common characteristics. Furthermore, we analyzed literature related to the characteristics to obtain a more objective and comprehensive understanding about the phenomena.*
Step 6	**6c. Create (revise) taxonomy** *If required, we modified the current taxonomy.*	**6e. Group characteristics into dimensions to create (revise) taxonomy** *We grouped the identified characteristics into dimensions and if required, revised the current taxonomy.*
Step 7	**Examine ending conditions** *After each development iteration we evaluated if the ending conditions are met. For instance, we assessed if new characteristics and/or dimensions were added or if the number of characteristics and dimensions allow the taxonomy to be meaningful (concise).*	

Table 1. Applied Taxonomy Development Method of Nickerson et al. (2013)

4.1 Steps 1 and 2

The core activities within the first two steps comprised the definition of the meta-characteristic and the determination of the ending conditions for the taxonomy development process. With a focus on proposing an initial overview of patterns and design parameters of bank and fintech cooperations that aim at fostering banks' innovation capabilities. Therefore, the meta-characteristic was defined as follows: Design parameters of cooperations between banks and fintechs in the context of banks' innovation capability enhancement. Following the approach of Nickerson et al. (2013), the ending conditions were clustered into objective and subjective termination criteria (Table 2). The objective ending conditions focus on the formal correctness of the taxonomy and the development process, while the subjective ending conditions assure the meaningfulness and usefulness of the proposed taxonomy (Nickerson et al. 2013). Conforming to recent taxonomies, we allowed for characteristics that are not mutually exclusive (Püschel et al. 2016; Jöhnk et al. 2017). This requirement could easily be achieved through additional characteristics, which however, would

decrease the transparency of the taxonomy and thus counteract our aim to enhance transparency and understanding of bank-fintech cooperations.

Objective ending conditions	Subjective ending conditions
- A representative sample of bank and fintech cooperations (objects) is examined - Every characteristic of each dimension classifies at least one object - None of the dimensions is duplicated - No combination of characteristics is duplicated - None of the characteristics within one dimension is duplicated - No additional dimension or characteristic is added in the last iteration - No objects, dimensions or characteristics are merged or split in the last iteration	- Conciseness - Robustness - Comprehensiveness - Extendibility - Explanation

Table 2. Objective and subjective ending conditions (based on Nickerson et al. 2013)

4.2   Steps 3 to 7

During the taxonomy development process, we reciprocally conducted a total of 4 conceptual-to-empirical and 13 empirical-to-conceptual iterations. Doing so, we not only relied on secondary data, but obtained an impartial and multifaceted perspective. In step 3 of each development cycle we decided for a conceptual-to-empirical or an empirical-to-conceptual approach based on available cases and identified literature streams.

Each of the conceptual-to-empirical taxonomy development iterations was based on a specific research stream, such as cross-organizational cooperation, innovation and organization architecture, in order to conceptualize dimensions and characteristics (step 4c). Subsequently, the appropriateness and correctness of the proposed dimensions and characteristics was verified through the examination of bank and fintech cooperation cases as well as through insights from the expert interviews (step 5c). Based on the outcome of this examination, we conducted necessary adaptations to the taxonomy (step 6c). In the empirical-to-conceptual iterations, either samples of the cooperation cases or expert interviews served as starting point (step 4e). Then, we analyzed the identified objects and derived common characteristics in line with the meta-characteristic (step 5e). In addition, we studied literature related to the identified dimensions and characteristics to strengthen the observed phenomena and to ensure a maximum of objectivity. Afterwards, we grouped the characteristics into dimensions and revised the current taxonomy (step 6e). In the end of each iteration we measured the fulfillment of our ending conditions and evaluated, if an additional development cycle was required (step 7).

During the seventeenth development cycle, we did not observe the necessity to change or adapt the current taxonomy with its characteristics. Furthermore, none of the dimensions and combinations of the characteristics were duplicated and every characteristic classified at least one object. The resulting taxonomy comprises of 13 dimensions and is meaningful and therefore concise (Miller 1956). As the characteristics provide sufficient differentiation between the objects, the taxonomy is accounted as robust. Moreover, we identified and classified a large proportion of bank and fintech cooperations, and proof that the proposed taxonomy is comprehensive. The taxonomy is extendible as it can easily be adapted by new characteristics and dimensions. Also, the taxonomy suits the intended use and describes the cooperation of banks and fintechs with an appropriate level of detail (explanatory). Thus, after the final iteration, all ending conditions were met and no additional development cycles were conducted.

Overall, we gathered information about 136 cooperation cases between banks and fintechs from a database (Bajorat 2015, cf., Appendix I). Furthermore, we enriched the data by publicly available information on the cooperations, such as published newspapers, company white papers, and company websites. Moreover, we conducted expert interviews with twelve bank and fintech executives as well as industry experts (shown in

Table 3) in a semi-structured manner, with designed questions and interview guidelines to assure comparability and to preserve the explorative nature (Yin 2013). We primarily, framed the interviews around a green field approach, as the experts unbiasedly stated their ideas towards a categorization model of bank and fintech cooperation. This initial step was of vital importance as it allowed us to gain unrestrained insights and thoughts of the interviewees. The second part of the interviews consisted of a discussion of the current taxonomy and the classification of at least one bank and fintech cooperation that the interviewee was involved in. This part of the interview allowed us to evaluate the proposed taxonomy based on real-world experience (Schultze, Avital 2011). Each interview was conducted via phone or personally, lasted between 45 and 70 minutes and was recorded. The recorded interviews were systematically and independently analyzed by two researchers (Saldaña 2009).

ID	Interviewee's Position	Relation to Bank-Fintech interaction	Firm
1	Executive- / C-Level	Involved in strategic alignment to bank-fintech cooperation	Bank
2	Executive- / C-Level	M&A in the banking sector; formerly C-Level central bank	Bank
3	Executive- / C-Level	Involved in bank-fintech cooperation	Bank
4	Middle management	Involved in bank-fintech cooperation	Bank
5	Middle management	Involved in bank-fintech cooperation	Bank
6	Middle management	Involved in bank-fintech cooperation	Bank
7	Middle management	Involved in bank-fintech cooperation	Fintech
8	Middle management	Involved in bank-fintech cooperation	Fintech
9	Middle management	Involved in bank-fintech cooperation	Fintech
10	Middle management	Involved in bank-fintech cooperation	Fintech
11	Advisor	Involved in regulatory requirements of bank-fintech cooperation	Regulator
12	Senior Project Manager	Involved in structuring of bank-fintech cooperation project	Consulting

Table 3.　　Overview of interviewees

5　Results

The results of the taxonomy development process are twofold. First, we describe the final taxonomy and the respective dimensions and characteristics. Second, we apply the taxonomy to our dataset and present cooperation patterns that are prevailing.

5.1　Taxonomy for Cooperation between Banks and Fintechs

The final taxonomy consists of 13 relevant dimensions encompassing 106 characteristics (Table 4). The dimensions and characteristics were derived according to the meta-characteristic to describe and explain the cooperation between banks and fintechs to foster innovation.

	Dimensions	Characteristics			
Cooperation	**Cooperation type**	Acquisition (7)	Alliance (119)	Incubation (9)	Joint venture (1)
	Innovation type	Bank-2-Customer Process (22)	Customer-2-Customer Process (16)	Product (98)	
	Maturity of innovation	Introduction / Uncoordinated (28)	Growth / Segmental (105)	Maturity / Systemic (3)	
	Value-chain location	Customer common interface (21)	Channel solutions and interaction platforms (21)	Customer-oriented financial market infrastructure (54)	Core banking systems (37) — Financial market infrastructure
	Business ecosystem	Restricted by bank (24)	Restricted by fintech (90)	Restricted by both (20)	No restriction (2)
	Holder of innovation	Fintech (125)		Bank (11)	
Bank	**Type of bank**	Commercial bank (119)	Cooperative bank (14)	Saving bank (3)	
	Bank's main distribution channel	Branches (83)		Online (53)	
	Role of bank	Service Provider (64)	Service consumer (28)	Investor (44)	
	Bank's strategic objective	Market access (57)		Technology access (79)	
Fintech	**Category of fintech**	API and Infrastructure (16)	Cross product service (20)	Current account (7)	
		Lending (23)	Payment (39)	Investing (30)	Insurance (1)
	Maturity of fintech	Start-up (33)	Emerging growth (98)	Mature stage (5)	
	Fintech holding full banking license	Yes (3)		No (133)	

Table 4. Taxonomy for the Cooperation between Banks and Fintechs

The derived dimensions either characterize the cooperation, or the involved participants bank and fintech. In the following sections, we reason the inclusion and the structuring of each dimension into characteristics.

Cooperation Type

Cooperations between banks and fintechs differ in terms of their legal connection (Seo, Hill 2005). In line with literature and the conducted interviews, we derived the characteristics ***acquisition***, ***alliance***, ***incubation*** and ***joint venture*** (e.g., Bøllingtoft, Ulhøi 2005; Seo, Hill 2005). An alliance is a contractual arrangement between companies to share resources and knowledge to achieve common goals (e.g., bank and fintech cooperate in a beneficial manner, Teece 1992). An acquisition is a corporate action, with which the acquiring company buys a majority of the target company and integrates it into the existing structures (e.g., the bank determines the strategy and decisions of the fintech company, Seo, Hill 2005). Incubation is the fostering of early-stage companies through financial, managerial, or other assistance (Wanklin 2002; e.g., the fintechs are founded within the realm of the bank, Bøllingtoft, Ulhøi 2005; Kogut 1988; Teece 1992). In a joint venture, resources are pooled, in a specifically independent but common entity, whereas its risks and responsibilities are carried by the participating organizations (e.g. a bank and a fintech company jointly

found a new company, Kogut 1988). The database and expert interviews supported the classification of these four characteristics.

Innovation Type

Existing research distinguishes between product and process innovation (Utterback, Abernathy 1975). First, a "product innovation is the introduction of a good or service that is new or significantly improved regarding its characteristics or intended uses" (OECD Oslo Manual 2005, p. 48; Porter 2001). Second, a "process innovation is the implementation of a new or significantly improved production or delivery method" (OECD Oslo Manual 2005, p. 49; Porter 2001). As, the interviews revealed that innovations primarily focus on specific processes, we further divided the process innovation into *customer-to-customer* and *bank-to-customer* process innovation. Since, the analyzed cooperation cases revealed similar characteristics, this segmentation is a better description of the innovation type.

Maturity of Innovation

While examining the cooperation cases, it is notable that the related innovations show differing maturity stages. Literature on product life cycle models suggests to represent different maturities via multi-step models. Therefore, the product life cycle is represented through a four-step model composing of the *introduction* of a new product into its potential market, *growth* of sales, market share and profitability, *maturity* with stabilizing sales and market shares, and *decline* with sales and shares dropping and the product no longer being relevant or useful (Day 1981). As specifically innovative products are of interest in the conducted research, the decline stage was neither represented in the analyzed sample nor suggested by the experts, and therefore not included in the taxonomy. Comparable to the product life cycle, the process maturity is divided into three stages. First, the processes follow an *uncoordinated* approach and are able to easily respond to environmental change (Utterback, Abernathy 1975). The second stage, called *segmental*, is characterized through a higher degree of process integration and automation in some segments (Utterback, Abernathy 1975). Third, the *systemic* stage describes highly developed and integrated processes with resistance to change (Utterback, Abernathy 1975). In the dimension "Innovation Maturity", the characteristics "Introduction / Uncoordinated", "Growth / Segmental" and "Maturity / Systemic" were included to address both product and process innovations.

Value-chain Location

The analysis of the expert interviews revealed that bank fintech cooperations focus on specific parts of the value-chain. This is also in line with the target of fintechs, as they aim at addressing specific customer needs, rather than an exhaustive solution. This is also confirmed by the evaluated dataset. For the proposed taxonomy we follow Alt, Puschmann (2012) and divide the banking industry value-chain into five sections: *Customer common interface*, *channel solutions and interaction platforms (CS and IP)*, *customer-oriented financial market infrastructure (FMI)*, *core banking systems*, and *financial market infrastructure*. The customer common interface is an integrated financial cockpit, within which customers are able to manage and plan their financial profiles, e.g. plan liquidity, accumulation of capital (Alt, Puschmann 2012). The CS and IP facilitates the interaction between bank and customer, e.g. online banking, mobile banking (Alt, Puschmann 2012). The customer-oriented FMI relates to platforms or marketplaces that provide products and services directed toward the customer. The core banking systems are the back-end systems that process daily banking transactions and post updates to accounts and other financial records. Finally, financial market infrastructures are inter-bank processes and capabilities such as stock exchange, clearing organization, and payment organization (Alt, Puschmann 2012). The value-chain location is included to describe the aim of the fintech's innovation.

Business Ecosystem

The majority of interviewed experts stated that innovations in the digital era support or even constitute the existence of business ecosystems. Business ecosystems are defined as economic communities involving

several companies working cooperatively and comparatively to gain advantages through their symbiotic relationships (Moore 1993). The members of the ecosystem – including suppliers, lead producers, competitors, and other stakeholders – co-evolve their capabilities and roles, and align themselves with the other players in the ecosystem (Moore 1993). The direction is set by one or more central companies. For banks as well as for fintechs, the aim of their actions is to build an ecosystem for their customers. The cases in the database show that the cooperation is usually directed towards making the innovation accessible for a certain customer target group. Thus, the use of the innovation is restricted either through membership (account) with the fintech (*Restricted by fintech*), with the bank (*Restricted by bank*), or *restricted by both*. Only in some cases, the access is *not restricted*. We divide all four possibilities in order to categorize, which party is the restricting element of the cooperation, and therefore manages to bring itself towards the center of the ecosystem.

Holder of Innovation

A specific interest with the cooperation lays on how the involved parties proceed with the innovation and the corresponding ownership. In a cooperation, the innovation can either remain with the *fintech*, or it can be fully integrated by the *bank*. The database revealed a distinction of where the innovation is located in the cooperation– within the bank or within the fintech. Also the interviewed experts noted the distinction and recommended to include it as characteristic in the taxonomy.

Type of Bank

The next relevant characteristics is based on literature on banking systems and encompass three groups of banks: C*ommercial banks*, *cooperative banks* and *saving banks* (Schmidt, Krahnen 2004). The commercial banks are privately owned and act more profit oriented than the other two groups (Behr, Schmidt 2015). Although the cooperative banks indicate characteristics of commercial banks, the internal structure differs significantly, as the bank is owned by its members (Behr, Schmidt 2015). The saving banks are characterized through a specific business focus on savings and savings mobilization as well as a focus on local markets (Behr, Schmidt 2015). While analyzing the sample objects in depth, this categorization was confirmed.

Bank's Main Distribution Channel

Moreover, for the cooperation, the main bank's distribution channel plays an important role, as it influences the ability to establish connection points with the fintech and provides insights on customer relationships. While branch-oriented banks often focus on the physical interaction with their customers, this complicates the integration of innovative online fintech solutions. Therefore, in line with the expert interviews, we include the bank's main distribution channel into the taxonomy and distinguish between *online* distribution and *branch* orientation.

Role of Bank

The experts stated that similar to the banks' strategic objective, the role of banks differs within cooperations. Banks either act as *service provider*, enabling fintechs' products by providing banking services, or as *service consumer*, using the fintech's innovation to improve own products or processes. Furthermore, we observed that some banks act as *investor* and hold shares of fintech companies. As the interviewed experts ascertained the same phenomenon, the three characteristics were endorsed and included.

Bank's Strategic Objective

Another important aspect of cooperations between banks and fintechs is the bank's strategic objective. Previous research suggests predominately two reasons why banks enter interfirm cooperations. First, motives are related to characteristics of technological development. This entails the leverage of synergies (cf. e.g., Mariti, Smiley 1983; Porter, Fuller 1986), reduction and sharing of uncertainty (cf. e.g., Berg et al. 1982; Ohmae 2002) or costs of technology development(cf. e.g., Ohmae 2002). This can be either the capturing of partner's tacit knowledge of technology, technology transfer, technology application and technological leapfrogging (Mariti, Smiley 1983; cf. e.g., Harrigan 1985; Pisano et al. 1988). Second,

motives are related to market access and search for opportunities. These can be monitoring of environmental changes and opportunities (cf. e.g., Mariotti, Ricotta 1986), internationalization and globalization (cf. e.g., Ohmae 2002), as well as new products and markets, market entry, branding and expansion of product range (cf. e.g., Hladik 1985, 1988). Therefore, we distinguished between *market access* and *technology access*.

Category of Fintech

The examination of the sample cases revealed a variety of fintech categories. These categories are based on the list of regular financial products or services. These are *lending*, *investing*, *insurance*, *payment*, *current account* as well as *cross product service*. Further, fintechs also provide *API and infrastructure* as digital interfaces for other companies and customers. Fintechs in the category lending work on innovation, where customers can lend money via a platform directly from other customers or a financial institutions (e.g., crowdfunding, instant lending). Fintechs in the category investing focus on delivering innovative investment solutions to improve the customers' investment opportunities (e.g., robo-advisory, investment intermediation). Fintechs in the category insurance market novel insurance models for customers (e.g., insurance solutions and services). Fintechs in the category payment develop payment solutions (e.g., mobile payment, crypto-currency). Fintechs in the category current account supply innovation that focuses on account management and invoicing solutions (e.g., integrated digital accounting solutions). Fintechs in the category cross product service develop applications that support customers' interaction with their contracting parties, such as banks and insurance companies (e.g., video identification, bank switching). Fintechs in the category API and Infrastructure work on digital interfaces that allow other companies to provide solutions for customers or connect with other companies (e.g., integrated warehousing). As fintechs search for innovation potential to provide untapped value for customers, the categorization is not conclusive at this point. Our initial categorization based on regular financial products and services can only serve as a starting point. A validation through literature is not possible at this point. Nevertheless, the expert interviewees follow the suggested itemization, and all cases from the database are matched into one category.

Maturity of Fintech

Research distinguishes four stages of an organizational lifecycle. The *start-up* stage with the development of a business plan and the entrance into the market place, *emerging growth* stage with expansion efforts, *mature* stage with slow rate of growth, and *decline transition* stage with the slip from the mature stage into the stage of transition (Jawahar, McLaughlin 2001). According, to the interviewed experts the maturity of a fintech is important for two reasons. First, the maturity indicates how well the organization and internal processes are established in the market. Second, the maturity is closely related to the bargaining power within a cooperation. Per definition, fintechs are startup companies in the early stage of the life cycle model. The decline transition stage was neither existent in the case sample, nor was it suggested by the experts. Thus, this characteristic was not included in the taxonomy.

Fintech Holding Full Bank License

The taxonomy development process revealed that the majority of fintechs do not possess a full banking license. Nevertheless, the banking license plays an important role in the bank and fintech cooperation as it defines the abilities of fintechs to offer and process financial products without a bank. To offer banking products and services in the regulated banking industry, a banking license is mandatory. Consequently, we added this dimension with the characteristics *yes* and *no* to the taxonomy.

5.2   Cooperation Patterns of Banks and Fintechs

In this section we present the results of the taxonomy application to the used dataset and discuss peculiarities of our taxonomy characteristics. In addition, we conduct a k-nearest neighbor cluster analysis and introduce prevailing cooperation patterns of banks and fintech.

Application of the Taxonomy for Cooperation between Banks and Fintech

In the taxonomy development, we dissected and classified 136 cooperations with a total of 46 banks and 100 fintech companies. Our dataset encompasses European and American banks, as well as international fintechs. Overall, the majority of cooperations are alliances (78%) and focus on product innovation (72%) in the customer-oriented financial market infrastructure (39%). Acquisition (5%) and incubation (9%) play only a minor role, whereas joint-ventures are only represented through one case (1%) in our sample. In most cases (91%), the innovation remains with the fintech. Focusing on the innovation and fintech maturity, both lay in the earlier stages of their life cycles with 97% of the innovations in stages before maturity, and 96% of the fintech in the start-up or growth-stage. In over 66% of the cooperations the fintech builds a business ecosystem and banks try to enter the restricted ecosystem. The banks in our dataset are primarily commercial banks (87%) with a branch-oriented distribution network (61%) and act as service provider 47% by e.g. providing account management services or the bank license for the cooperation. However, it is conspicuous that 64 % of the classified American banks act as investors, whereas only 24 % of the European banks provide investment support. In general, the banks primarily aim to get access to innovative technology that fintechs offer. The category of a fintech is diverse. The majority is located in the fields of payment (28%) and investing (22%). Fintech categories lending (16%), cross product service (14%), API and Infrastructure (11%), current account (5%) and insurance (1%) are not predominantly represented in our dataset. It is also apparent that only 3 (2%) out of 100 fintechs are listed as a regulated financial institution, holding a banking license.

Prevailing Cooperation Patterns

To better understand and identify prevailing cooperation patterns of banks and fintechs, we conducted a cluster analysis. The results of this analysis illustrate typical combinations, dominance, and retention of categories within the database. For clarity and comprehensibility we restrict the number of clusters to six. We utilize the simple-K-means algorithm (distance function: Manhattan distance; initialization method: Farthest first; number of clusters: 6) in our cluster analysis. The results of the cluster analysis are summarized in Table 5 and hereinafter, we illustrate each of the identified clusters.

	Cluster 1 (38%)	**Cluster 2 (6%)**	**Cluster 3 (3%)**
Cooperation type	Alliance (90%)	Acquisition (75%)	Alliance (100%)
Innovation type	Product (75%)	Product (100%)	B-2-C process (100%)
Innovation maturity	Growth (88%)	Introduction (62%)	Introduction (75%)
Value-chain location	Core banking systems (38%)	CS and IP (50%)	Core banking systems (75%)
Business ecosystem	Restricted by fintech (80%)	Restricted by bank (75%)	Restricted by bank (50%)
Holder of innovation	Fintech (96%)	Bank (100%)	Fintech (75%)
Type of bank	Commercial bank (92%)	Commercial bank (87%)	Commercial bank (100%)
Main distribution channel	Branches (94%)	Branches (100%)	Online (75%)
Role of bank	Investor (61%)	Provider (62%)	Provider (75%)
Banks strategic objective	Technology (86%)	Technology (75%)	Market (50%)
Fintech category	Payment (48%)	Payment (50%)	Lending (75%)
Fintech maturity	Growth (88%)	Growth (75%)	Growth (75%)
Bank license	No (100%)	No (87%)	No (100%)
	Cluster 4 (33%)	**Cluster 5 (10%)**	**Cluster 6 (10%)**
Cooperation type	Alliance (95%)	Alliance (84%)	Alliance (100%)
Innovation type	Product (86%)	B-2-C process (100%)	Product (85%)
Innovation maturity	Growth (93%)	Growth (92%)	Introduction (92%)
Value-chain location	Customer-oriented FMI (80%)	Core banking systems (46%)	CS and IP (57%)
Business ecosystem	Restricted by fintech (68%)	Restricted by bank (61%)	Restricted by fintech (85%)
Holder of innovation	Fintech (100%)	Fintech (100%)	Fintech (100%)
Type of bank	Commercial bank (84%)	Commercial bank (69%)	Commercial bank (92%)
Main distribution channel	Online (84%)	Online (61%)	Branches (92%)
Role of bank	Provider (93%)	Consumer (92%)	Investor (64%)
Banks strategic objective	Market (91%)	Technology (100%)	Technology (64%)
Fintech category	Investing (60%)	Cross product service (100%)	Lending (28%)
Fintech maturity	Growth (73%)	Growth (69%)	Introduction (92%)
Bank license	No (97%)	No (100%)	No (92%)

Table 5. Results of the cluster analysis

Cluster 1: Invest in fintechs to form an alliance and access the fintech ecosystem
Cluster 1 represents the largest group of the cooperation cases. It encompasses cooperations where primarily branch-oriented banks invest in fintechs to access fintech-centered ecosystems. The value-chain location and the fintech category are unclear for this cluster.

Cluster 2: Acquire and integrate channel solutions and interaction platform innovation
The prevailing pattern of cluster 2 can be illustrated as cooperation between branch-oriented banks that aim for CS and IP technologies. The banks in this cluster acquire the fintech, restrict the ecosystem, and integrate the innovation to become the holder of it. The proportion of fintechs holing a bank license is the highest of all clusters.

Cluster 3: Innovate lending core banking systems to optimize bank-to-customer processes
This cluster is the smallest and represents only 3% of the analyzed cooperations. Cooperations within this cluster aim at innovating core banking systems of commercial banks in the field of lending to optimize bank-to-customer processes.

Cluster 4: Access investment markets by providing banking services to fintechs

The second largest cluster comprises banks cooperating with fintechs to access new investment innovations. The banks act as service providers and aim at accessing the market share of the fintech restricted ecosystem.

Cluster 5: Cross product services to innovate bank-to-customer processes in bank ecosystems

In cluster 5, the prevailing pattern consists of banks building alliances with fintechs that offer cross product services. The main focus within this cluster lays on novel technological solutions for bank-to-customer processes, and the bank contributes as a service consumer. Although the innovation remains with the fintech, the bank restricts the ecosystems.

Cluster 6: Early-stage cooperation to access technology

In cluster 6, banks cooperate with early stage fintechs focusing on early stage innovations. The ecosystem is restricted by the fintech and the innovation remains with the fintech, too. The objective of the bank is to access the innovation technology, whereas the category of the fintech is unclear.

6 Conclusion and Outlook

This research paper discusses the far-reaching implications of digital transformation in the financial sector, especially for banks (Mols 1998; Tilden 1996). Banks face various internal problems, leading to a lack of innovation capability (Tornjanski et al. 2015). To overcome these challenges, cross-organizational cooperation has proven its applicability and its positive effect. Consequently, cooperation with fintechs becomes an increasingly prominent option for banks to foster innovation (Economist Intelligence Unit 2015). Based on previous research, we bridge the aforementioned research gap by applying a taxonomy development method that combines a conceptual-to-empirical and an empirical-to-conceptual approach (Nickerson et al. 2013). Consequently, we propose a taxonomy to establish an initial overview of dimensions and design parameters of cooperation between banks and fintechs that aim at fostering banks' innovation capability. For this purpose, we collected data of 136 cooperations between banks and fintechs, and conducted 12 expert interviews with bank and fintech executives as well as industry experts.

Before concluding with recommendations and emphasizing our contribution to both research and practice, we acknowledge some limitations of our paper, and highlight promising starting points for future research. First, the resulting taxonomy is influenced by the applied database and the sequence of iterations in the development process, which depicts a generally valid drawback. By applying a divergent sequence of iterations in the taxonomy development process may influence the outcome. Second, the classification of each object requires further in-depth analysis to identify determining factors and to analyze interdependencies. To obtain a more detailed understanding of these interdependencies, further research building on the proposed taxonomy is required. Especially research streams within the realm of Management literature provide promising aspects to capture existing concepts, such as absorptive capacity (Cohen, Levinthal 1990; Lane, Lubatkin 1998; e.g., Cohen, Levinthal 1989), the relation between internal and external innovation (e.g., Hillebrand, Biemans 2003), and proximity in cooperation (e.g., Knoben, Oerlemans 2006). Third, this paper focuses on general cooperation patterns on a higher level. Therefore, we analyzed a large sample of cooperations and gathered information from public sources. Nevertheless, a more detailed case analysis of specific cooperations would reveal more insights about the intentions, such as contribution to the cooperation (e.g. expertise, data access, governance, shared processes, c.f. Dapp 2014, 2015) or strategic objective (e.g. trust, risk perception, or control, c.f. Das, Teng 2001). These additional categories need to be evaluated in smaller, case-driven research approaches.

The theoretical contribution of the proposed classification artefact addresses the aforementioned research gap in a threefold manner: First, this paper lays the foundation for further research in the area of fintechs and their integration into the banking sector. By addressing the development of a descriptive theory, our taxonomy depicts an important step towards a deeper understanding of the field, and the development of a

higher-order theory (e.g., predictive theory, theory for design and action, cf. Gregor 2006). Taking our taxonomy and its first application as a basis, future research will be able to focus on particular cooperation patterns and understand its specific characteristics and dynamics. Second, we suggest the first range of relevant dimensions and characteristics that proved to be valid, useful, and effective. Moreover, we present prevailing cooperation patterns and identify dominant categories. The multi-dimensional nature of the taxonomy lays the foundations for analyzing interdependencies amongst the dimensions and characteristics – a future research area that we find promising. Third, as the digital transformation is increasingly accelerating developments in several businesses, similar phenomena are likely to shape other industries in an analogous manner. Therefore, the work of this paper can serve as a guideline for other industries, where similar challenges arise. For example, in the automotive industry, car manufacturing companies still provide the engineering capabilities to build the car as a platform, but digital transformation enables other companies to provide a new value for customer, e.g. by providing apps for cars, driving software. Information systems, in general, become more and more important, as these changes are predominantly driven by information-based approaches, occur within organizational information systems, and demand cooperation across organizational borders. Thus, we find that the research disciplines should be pioneers in understanding and providing explanations of the new phenomena arising from the digital transformation of the business world.

Besides the paper's theoretical contribution, our taxonomy also provides valuable insights for practitioners in the banking industry. First, we propose a classification scheme for banking practitioners to evaluate their efforts at the interaction between banks and fintechs. Applying our taxonomy, practitioners are able to analyze their own endeavors in integrating fintechs and innovation, and evaluate their value proposition within the cooperation. For this purpose, we deliver the key findings from a real-world database. Thus, managers are able to gain insights into the common practices and related outcomes. Second, considering the number of cooperations, it is understood and instituted as an eligible strategy for promoting innovation. We also find that both parties benefit from the model, and complement each other's strengths and weaknesses. Third, fintechs play an important role and do not remain the silent and small partner within the cooperation. Therefore, alliances are the predominant form of cooperation in our empirical database, and acquisitions and incubations only play a minor role. The important role of the fintech is also underlined by the fact that the innovation stays with the fintech in most cases, thus external from the bank's perspective. This allows two contradictory interpretations, which require further verification: On the one hand, fintechs are not willing and forced to sell their innovation, and banks lack the opportunity to fully integrate the product or process into their organization. On the other hand, banks prefer to interact with fintechs as service providers, avoiding expensive and sophisticated integration efforts. This is also emphasized by the fact that both parties cooperate with numerous entities, which suggests that the modularity and interfaces, as well as the adaptability of business models, are vital components to overcome future challenges.

Publication bibliography

Accenture (2015): The Agile Bank - Transforming the Customer Experience. Available online at https://www.accenture.com/t20150916T152712__w__/us-en/_acnmedia/Accenture/Conversion-Assets/Microsites/Documents19/Accenture-AgileBanking-Infographic.pdf#zoom=50, checked on 3/29/2016.

Ahuja, Gautam; Katila, Riitta (2001): Technological Acquisitions and the Innovation Performance of Acquiring Firms: A Longitudinal Study. In *Strategic Management Journal* 22 (3), pp. 197–220.

Albani, Antonia; Dietz, Jan L. G. (2009): Current Trends in Modeling Inter-Organizational Cooperation. In *Journal of Enterprise Information Management* 22 (3), pp. 275–297.

Alt, Rainer; Puschmann, Thomas (2012): The rise of customer-oriented banking - electronic markets are paving the way for change in the financial industry. In *Electron Markets* 22 (4), pp. 203–215. DOI: 10.1007/s12525-012-0106-2.

Anand, Bharat N.; Khanna, Tarun (2000): Do Firms Learn to Create Value? The Case of Alliances. In *Strategic Management Journal* 21 (3), pp. 295–315.

Ansari, Shahzad Shaz; Krop, Pieter (2012): Incumbent Performance in the Face of a Radical Innovation: Towards a Framework for Incumbent Challenger Dynamics. In *Research Policy* 41 (8), pp. 1357–1374.

Bailey, Kenneth D. (1984): A Three-Level Measurement Model. In *Quality & Quantity* 18 (3), pp. 225–245.

Bailey, Kenneth D. (1994): Typologies and Taxonomies: An Introduction to Classification Techniques. Thousand Oaks, CA: Sage Publications.

Bajorat, André M. (2015): Banken und FinTechs – Das Hecheln nach der Möhre kostet Zeit, Fokus und nimmt den großen Hunger. Available online at http://www.it-finanzmagazin.de/banken-und-fintechs-das-hecheln-nach-der-moehre-kostet-zeit-fokus-und-nimmt-den-grossen-hunger-20330/, checked on 5/7/2016.

Barberis, Janos; Chishti, Susanne (Eds.) (2016): The FinTech Book. The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries. Chichester, West Sussex, United Kingdom: John Wiley & Sons Ltd.

Becker, Wolfgang; Dietz, Jürgen (2004): R&D Cooperation and Innovation Activities of Firms — Evidence for the German Manufacturing Industry. In *Research Policy* 33 (2), pp. 209–223.

Behr, Patrick; Schmidt, Reinhard H. (2015): The German Banking System: Characteristics and Challenges. Goethe University Frankfurt, Research Center SAFE-Sustainable Architecture for Finance in Europe.

Benlian, Alexander; Hess, Thomas; Leimeister, Jan Marco (2014): Business Models. In *Business & Information Systems Engineering* 6 (1), pp. 45–53.

Berg, Sanford V.; Duncan, Jerome; Friedman, Philip (1982): Joint Venture Strategies and Corporate Innovation. Cambridge, MA: Oelgeschlager, Gunn & Hain.

Bergek, Anna; Norrman, Charlotte (2008): Incubator Best Practice: A Framework. In *Technovation* 28 (1), pp. 20–28.

Bharadwaj, Anandhi; El Sawy, Omar A.; Pavlou, Paul A.; Venkatraman, N. (2013): Digital Business Strategy: Toward a Next Generation of Insights. In *Management Information Systems Quarterly* 37 (2), pp. 471–482.

Bøllingtoft, Anne; Ulhøi, John P. (2005): The Networked Business Incubator - Leveraging Entrepreneurial Agency?,. In *Journal of Business Venturing* 20 (2), pp. 265–290.

Brynjolfsson, Erik; Hitt, Lorin M. (2000): Beyond Computation: Information Technology, Organizational Transformation and Business performance. In *The Journal of Economic Perspectives* 14 (4), pp. 23–48.

Cassiman, Bruno; Veugelers, Reinhilde (2006): In Search of Complementarity in Innovation Strategy. Internal R&D and External Knowledge Acquisition. In *Management Science* 52 (1), pp. 68–82. DOI: 10.1287/mnsc.1050.0470.

Châlons, Christophe; Dufft, Nicole (2017): The Role of IT as an Enabler of Digital Transformation. In : The Drivers of Digital Transformation: Springer, pp. 13–22.

Chan, Su Han; Kensinger, John W.; Keown, Arthur J.; Martin, John D. (1997): Do Strategic Alliances Create Value? In *Journal of Financial Economics* 46 (2), pp. 199–221.

Chandy, Rajesh K.; Tellis, Gerard J. (2000): The Incumbent's Curse? Incumbency, Size, and Radical Product Innovation. In *Journal of Marketing* 64 (3), pp. 1–17.

Chen, J. S.J.; Tsou, Hung-tai (2006): Information Technology Adoption for Service Innovation Practices and Competitive Advantage: The Case of Financial Firms. In *Information Research* 12 (3), p. 7.

Chesbrough, Henry (2004): Managing Open Innovation. In *Research Technology Management* 47 (1), pp. 23–26.

Christensen, Clayton (2013): The Innovator's Dilemma. When New Technologies Cause Great Firms to Fail. Boston, MA: Harvard Business Review Press.

Cohen, Wesley M.; Levinthal, Daniel A. (1989): Innovation and Learning: The Two Faces of R&D. In *The economic journal* 99 (397), pp. 569–596.

Cohen, Wesley M.; Levinthal, Daniel A. (1990): Absorptive Capacity: A New Perspective on Learning and Innovation. In *Administrative Science Quarterly*, pp. 128–152.

Dapp, Thomas M (2014): Fintech - The Digital (R)evolution in the Financial Sector. Algorithm-based Banking with the Human Touch. Deutsche Bank Research.

Dapp, Thomas M (2015): Fintech Reloaded - Traditional Banks as Digital Ecosystems. With Proven Walled Garden Strategies into the Future. Deutsche Bank Research.

Das, Tushar Kanti; Teng, Bing-Sheng (2001): Trust, control, and risk in strategic alliances. An integrated framework. In *Organization studies* 22 (2), pp. 251–283.

Day, George S. (1981): The Product Life Cycle. Analysis and Applications Issues. In *Journal of Marketing* 45 (4), pp. 60–67. DOI: 10.2307/1251472.

Doty, D. Harold; Glick, William H. (1994): Typologies as a Unique Form of Theory Building: Toward Improved Understanding and Modeling. In *Academy of Management Review* 19 (2), pp. 230–251.

Downes, Larry; Nunes, Paul (2013): Big Bang Disruption. In *Harvard Business Review*, pp. 44–56.

Drucker, Peter F. (1984): The Discipline of Innovation. In *Harvard Business Review* 63 (3), pp. 67–72.

Dyer, Jeffrey H. (1996): Specialized Supplier Networks as a Source of Competitive Advantage: Evidence from the Auto Industry. In *Strategic Management Journal*, pp. 271–291.

Dyer, Jeffrey H. (2000): Collaborative Advantage. Winning through Extended Enterprise Supplier Networks. New York, NY: Oxford University Press.

Economist Intelligence Unit (2015): Strategic Partnerships for the Digital Age. Telstrea report. Available online at http://connectingcompanies.economist.com/whitepaper/about-the-report/, checked on 4/19/2016.

Ernst, David; Halevy, Tammy; Monier, Jean-Hugues J.; Sarrazin, Hugo (2001): A Future for E-Alliances. In *The McKinsey Quarterly*, p. 92.

Ernst & Young (2011): The Digitisation of Everything. How Organisations Must Adapt to Changing Consumer Behaviour. Available online at http://www.ey.com/Publication/vwLUAssets/The_digitisation_of_everything_-_How_organisations_must_adapt_to_changing_consumer_behaviour/$FILE/EY_Digitisation_of_everything.pdf, checked on 3/29/2016.

Fagerberg, Jan (2004): Innovation: A Guide to the Literature. In *Proceedings of the the First Globelics Academy, Ph.D. School on National Systems of Innovation and Economic Development, Lisbon, Portugal*, pp. 1–26.

Federal Reserve (2015): Consumers and Mobile Financial Services 2015. With assistance of Board of Governors of the Federal Reserve System. Washington, DC. Available online at http://www.federalreserve.gov/econresdata/consumers-and-mobile-financial-services-report-201503.pdf, checked on 3/19/2016.

Fichman, Robert G.; Dos Santos, Brian L.; Zhiqiang, Zheng (Eric) (2014): Digital Innovation as a Fundamental and Powerful Concept in the Information Systems Curriculum. In *Management Information Systems Quarterly* 38 (2), pp. 329–343.

Glaser, Florian; Bezzenberger, Luis (2015): Beyond Cryptocurrencies - A Taxonomy of Decentralized Consensus Systems. In *Proceedings of the European Conference on Information Systems, Münster, Germany*.

Glass, Robert L.; Vessey, Iris (1995): Contemporary Application - Domain Taxonomies. In *IEEE Software* 12 (4), pp. 63–76.

Gregor, Shirley (2006): The Nature of Theory in Information Systems. In *Management Information Systems Quarterly* 30 (3), pp. 611–642.

Haas, Philipp; Blohm, Ivo; Leimeister, Jan Marco (2014): An Empirical Taxonomy of Crowdfunding Intermediaries. In *Proceedings of the International Conference on Information Systems, Auckland, New Zealand*.

Hackett, Sean M.; Dilts, David M. (2004): A Systematic Review of Business Incubation Research. In *The Journal of Technology Transfer* 29 (1), pp. 55–82.

Hagedoorn, John (1993): Understanding the Rationale of Strategic Technology Partnering. Interorganizational Modes of Cooperation and Sectoral Differences. In *Strategic Management Journal* 14 (5), pp. 371–385.

Hagedoorn, John; Schakenraad, Jos (1994): The Effect of Strategic Technology Alliances on Company Performance. In *Strategic Management Journal* 15 (4), pp. 291–309.

Harrigan, K R (1985): Strategies for Joint Ventures. Lexington, MA: Lexington Books.

Hevner, Alan. R.; March, Salvatore T.; Park, Jinsoo; Ram, Sudha (2004): Design Science in Information Systems Research. In *Management Information Systems Quarterly* 28 (1), pp. 75–105.

Hillebrand, Bas; Biemans, Wim G. (2003): The Relationship Between Internal and External Cooperation: Literature Review and Propositions. In *Journal of Business Research* 56 (9), pp. 735–743.

Hippel, Eric von (2005): Democratizing innovation: The evolving Phenomenon of User Innovation. In *Journal für Betriebswirtschaft* 55 (1), pp. 63–78.

Hirt, Martin; Willmott, Paul (2014): Strategic Principles for Competing in the Digital Age. In *McKinsey Quarterly*, pp. 1–13.

Hitt, Michael A.; Dacin, M. Tina; Levitas, Edward; Arregle, Jean-Luc; Borza, Anca (2000): Partner Selection in Emerging and Developed Market Contexts: Resource-based and Organizational Learning Perspectives. In *Academy of Management journal* 43 (3), pp. 449–467.

Hladik, Karen J. (1985): International Joint Ventures: An Economic Analysis of US-Foreign Business Partnerships. Lexington Books: Lexington, MA (Cooperative Strategies in Internation Business).

Hladik, Karen J. (1988): R&D and International Joint Ventures. In *Cooperative Strategies in International Business*, pp. 187–204.

Hurley, Robert F.; Hult, G. Tomas M. (1998): Innovation, Market Orientation, and Organizational Learning. An Integration and Empirical Examination. In *Journal of Marketing* 62 (3), p. 42.

Iivari, Juhani (2007): A Paradigmatic Analysis of Information Systems as a Design Science. In *Scandinavian Journal of Information Systems* 19 (2), p. 5.

Jarillo, J. Carlos (1988): On Strategic Networks. In *Strategic Management Journal* 9 (1), pp. 31–41.

Jaubert, Michel; Marcu, Stefan; Ullrich, Mathias; Malbate, Jean-Baptiste; Dela, Renaud (2014): Going Digital: The Banking Transformation Roadmap. AT Kearney, checked on 3/29/2016.

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.

Jöhnk, Jan; Röglinger, Maximilian; Thimmel, Markus; Urbach, Nils (2017): How to Implement Agile IT Setups: A Taxonomy of Design Options. In *Twenty-Fifth European Conference on Information Systems (ECIS)*.

Kim, W. Chan; Mauborgne, Renée (1997): Value Innovation. In *Harvard Business Review*.

Knoben, J.; Oerlemans, L.A.G. (2006): Proximity and Inter-organizational Collaboration. A literature review. In *International Journal of Management Reviews* 8 (2), pp. 71–89.

Kogut, Bruce (1988): Joint Ventures: Theoretical and Empirical Pperspectives. In *Strategic Management Journal* 9 (4), pp. 319–332.

Koh, Jeongsuk; Venkatraman, Nathan (1991): Joint Venture Formations and Stock Market Reactions: An assessment in the Information Technology Sector. In *Academy of Management journal* 34 (4), pp. 869–892.

KPMG (2017): The Pulse of Fintech Q4 2016. Global analysis of investment in fintech. Available online at https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/02/pulse-of-fintech-q4-2016.pdf, checked on 6/15/2017.

Lane, Peter J.; Lubatkin, Michael (1998): Relative Absorptive Capacity and Interorganizational Learning. In *Strategic Management Journal* 19 (5), pp. 461–477.

Man, Ard-Pieter de; Duysters, Geert (2005): Collaboration and Innovation: A Review of the Effects of Mergers, Acquisitions and Alliances on Innovation. In *Technovation* 25 (12), pp. 1377–1387.

Mariotti, P.; Ricotta, S. (1986): Diversification, Agreements Among Firms and Innovative Behaviour. In *Proceedings of the International Conference on Innovation Diffusion, Venice, Italy*.

Mariti, Paolo; Smiley, Robert H. (1983): Co-operative Agreements and the Organization of Industry. In *The Journal of Industrial Economics* 31 (4), pp. 437–451.

Marous, Jim (2013): Top 10 Retail Banking Trends and Predictions for 2014. The Financial Brand. Available online at http://thefinancialbrand.com/36367/2014-top-bank-trends-predictions-forecast-digital-disruption/, checked on 4/9/2016.

Matt, Christian; Hess, Thomas; Benlian, Alexander (2015): Digital Transformation Strategies. In *Business & Information Systems Engineering* 57 (5), pp. 339–343.

Miller, George A. (1956): The magical Number Seven, Plus or Minus Two. Some Limits on our Capacity for Processing Information. In *Psychological review* 63 (2), p. 81.

Miller, Jeffrey G.; Roth, Aleda V. (1994): A Taxonomy of Manufacturing Strategies. In *Management Science* 40 (3), pp. 285–304.

Mols, Niels Peter (1998): The Internet and the banks' strategic distribution channel decisions. In *Internet Research* 8 (4), pp. 331–337. DOI: 10.1108/10662249810231087.

Moore, James F. (1993): Predators and prey. A new ecology of competition. In *Harvard Business Review* 71 (3), pp. 75–83. Available online at http://blogs.harvard.edu/jim/files/2010/04/Predators-and-Prey.pdf.

Moutinho, Luiz; Davies, Fiona; Deng, Shengliang; Miguel Peris, Salvador; Enrique Bigne Alcaniz, J. (1997): The future role of bank branches and their managers. Comparing managerial perceptions in Canada and Spain. In *Intl Jnl of Bank Marketing* 15 (3), pp. 99–105. DOI: 10.1108/02652329710166019.

Mowery, David C.; Oxley, Joanne E.; Silverman, Brian S. (1996): Strategic Alliances and Interfirm Knowledge Transfer. In *Strategic Management Journal* 17 (S2), pp. 77–91.

Nemet, Gregory F. (2009): Demand-Pull, Technology-Push, and Government-Led Incentives for Non-Incremental Technical Change. In *Research Policy* 38 (5), pp. 700–709.

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.

Nooteboom, Bart (1999): Innovation and Inter-firm linkages: New Implications for Policy. In *Research Policy* 28 (8), pp. 793–805.

O'Connell, Donal (2011): Harvesting External Innovation. Managing External Relationships and Intellectual Property. Surrey, UK: Gower Pubishing Limited.

OECD Oslo Manual (2005): Proposed Guidelines for Collecting and Interpreting Technological Innovation Data. Paris.

Ohmae, Kenichi (2002): Triad Power. New York, NY: The Free Press.

Olanrewaju, T. (2014): The Rise of the Digital Bank. In *McKinsey on Business Technology* (33).

O'Riordan, Niamh (2013): Knowledge Creation: Hidden Driver of Innovation in the Digital Age. In *Proceedings of the International Conference on Information Systems, Milan, Italy*.

Pisano, Gary P.; Shan, Weijian; Teece, David J. (1988): Joint Ventures and Collaboration in the Biotechnology Industry. Cambridge, MA: Ballinger Publishing Company.

Porter, M. E. (2001): The Technological Dimension of Competitive Strategy. In Robert Burgelman, Henry Chesbrough (Eds.): Research on Technological Innovation, Management and Policy, vol. 7. Greenwich, CT: JAI Press.

Porter, M. E.; Fuller, Mark B. (1986): Coalitions and Global Strategy. In *Competition in Global Industries* 315, p. 344.

Powell, Koput; Koput, K W; Smith-Doerr, L (1996): Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology. In *Administrative Science Quarterly* 41 (1), pp. 116–145.

Püschel, Louis; Röglinger, Maximilian; Schlott, Helen (2016): What's in a Smart Thing? Development of a Multi-Layer Taxonomy. In *37th International Conference on Information Systems (ICIS)*, pp. 1–19.

Rich, Philip (1992): The Organizational Taxonomy: Definition and Design. In *Academy of Management Review* 17 (4), pp. 758–781.

Rogers, Everett M. (2003): The Diffusion of Innovation. Fifth Edition. New York, NY: The Free Press.

Saldaña, J. (2009): The Coding Manual for Qualitative Researchers. London: Sage.

Schmidt, Reinhard H.; Krahnen, J. P. (2004): The German Financial System: Oxford University Press.

Schultze, Ulrike; Avital, Michel (2011): Designing interviews to generate rich data for information systems research. In *Information and Organization* 21 (1), pp. 1–16.

Schumpeter, Joseph A. (1942): Capitalism, Socialism, and Democracy. New York, NY: Harper and Row.

Seo, Myeong-Gu; Hill, N. Sharon (2005): Understanding the Human Side of Merger and Acquisition an Integrative Framework. In *The Journal of Applied Behavioral Science* 41 (4), pp. 422–443.

Shontell, Alyson (2015): Jamie Dimon: Silicon Valley Startups are Coming to eat Wall Street's Lunch. Edited by Business Indisder - TECH. Available online at http://www.businessinsider.com/jamie-dimon-shareholder-letter-and-silicon-valley-2015-4?IR=T, checked on 3/20/2016.

Skan, Julian; Dickerson, James; Masood, Samad (2015): The Future of Fintech and Banking: Digitally disrupted or reimagined? Edited by Accenture. Available online at http://www.fintechinnovationlablondon.co.uk/media/730274/Accenture-The-Future-of-Fintech-and-Banking-digitallydisrupted-or-reima-.pdf, checked on 3/29/2016.

Statista (2015): Online Banking Penetration in Selected European Markets in 2015. Edited by Eurostat. Available online at http://www.statista.com/statistics/222286/online-banking-penetration-in-leading-european-countries/, checked on 4/14/2016.

Takeishi, Akira (2001): Bridging Inter- and Intra- firm Boundaries: Management of Supplier Involvement in Automobile Product Development. In *Strategic Management Journal* 22 (5), pp. 403–433.

Teece, D. J. (1987): Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing, and Public Policy. In D. J. Teece (Ed.): The Competitive Challenge. Cambridge, MA: Ballinger Publishing Company, pp. 185–220.

Teece, David J. (1992): Competition, Cooperation, and Innovation: Organizational Arrangements for Regimes of Rapid Technological Progress. In *Journal of Economic Behavior & Organization* 18 (1), pp. 1–25.

Teece, David J. (2010): Business Models, Business Strategy and Innovation. In *Long Range Planning* 43 (2-3), pp. 172–194. DOI: 10.1016/j.lrp.2009.07.003.

Thompson, Victor A. (1965): Bureaucracy and Innovation. In *Administrative Science Quarterly* 10 (1), pp. 1–20.

Tilden, M. (1996): Channel vision. In *Retail Banker International* 28, pp. 12–15.

Tilson, David; Lyytinen, Kalle; Sørensen, Carsten (2010): Research Commentary - Digital Infrastructures. The Missing IS Research Agenda. In *Information Systems Research* 21 (4), pp. 748–759.

Tornjanski, Vesna; Marinković, Sanja; Săvoiu, Gheorghe; Čudanov, Mladen (2015): A Need for Research Focus Shift: Banking Industry in the Age of Digital Disruption. In *Econophysics, Sociophysics & Other Multidisciplinary Sciences Journal* 5 (3), pp. 11–15.

Tushman, Michael; Nadler, David (1986): Organizing for Innovation. In *California Management Review* 28 (3), pp. 74–92.

Utterback, James M.; Abernathy, William J. (1975): A Dynamic Model of Process and Product Innovation. In *Omega* 3 (6), pp. 639–656.

Van de Ven, Andrew H. (1986): Central Problems in the Management of Innovation. In *Management Science* 32 (5), pp. 590–607.

Walters, Tim (2014): Beyond Marketing: Why Digital Disruption Requires a Deeper Transformation. Digital Clarity Group, Inc. Available online at https://cloudflare.acquia.com/sites/default/files/library/attachment/acquia_beyond-marketing.pdf.

Wand, Yair; Monarchi, David E.; Parsons, Jeffrey; Woo, Carson C. (1995): Theoretical Foundations for Conceptual Modelling in Information Systems Development. In *Decision Support Systems* 15 (4), pp. 285–304.

Wanklin, Toni (2002): Understanding business incubation. In *Nature biotechnology* 20, pp. BE23-BE24.

Yin, Robert K. (2013): Case Study Research: Design and Methods. Thousand Oaks, CA: Sage Publications.

Yoo, Youngjin (2010): Computing in Everyday Life: A Call for Research on Experiential Computing. In *Management Information Systems Quarterly* 34 (2), pp. 213–231.

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.

I. Appendix Bank-Fintech Cooperations

ID	Bank	Fintech
1	Fidor	smava
2	Fidor	bankless24
3	BIW AG	ZINSPILOT
4	Sparda Bank	zencap (Funding circle)
5	comdirect	moneymeets
6	MHB Bank	WeltSparen
7	Deutsche Bank	Gini Pay
8	DAB BANK	GINMON
9	HVB	Gini Pay
10	DAB BANK	easyfolio
11	Volksbanken	Startnext
12	Hauck & Aufhäuser	easyfolio
13	ING Diba	Gini Pay
14	Wirecard	HOLVI
15	Wirecard	zencap
16	net-m	VEXCASH
17	DKB	FinReach
18	DKB	webID solutions
19	consorsbank	Seedmatch crowdfunding
20	Augsburger Aktienbank	moneymeets
21	Fidor	bitcoin.de
22	Santander	payever
23	BIW AG	auxmoney
24	Sparkasse Berlin	SumUp
25	comdirect	Gini Pay
26	Wirecard	orderbird
27	DKB	easyfolio
28	Fidor	FUNDSTER
29	FFB	vaamo
30	1822 direkt	easyfolio
31	Berliner Volksbank	simplesurance GmbH
32	DZ BANK	iZettle
33	DAB BANK	moneymeets
34	BIW AG	SAVEDO
35	comdirect	TopTrade
36	Commerzbank	IDnow
37	UBS	EASYSYS
38	HVB	SumUp
39	BIW AG	IDnow
40	UBS	figo
41	DKB	Cringle
42	VOBA Hellweg	lendstar
43	Berliner Volksbank	Bergfürst
44	Commerzbank	Gini Pay
45	comdirect	easyfolio
46	consorsbank	easyfolio
47	BIW AG	Qnips
48	Commerzbank	traxpay
49	ING Diba	webID solutions
50	BIW AG	talent-invest.de
51	SWK Bank	auxmoney
52	ebase	easyfolio
53	Sutor Bank	fairr.de
54	Sutor Bank	ZINSPILOT
55	Augsburger Aktienbank	CASHBOARD
56	Wirecard	RatePAY
57	SWK Bank	webID solutions
58	FFB	moneymeets

59	onvista	easyfolio
60	ING Diba	easyfolio
61	BIW AG	optiopay
62	Wirecard	Lendico
63	comdirect	wikifolio
64	Commerzbank	CRXMARKETS
65	wüstenrot	easyfolio
66	Sutor Bank	FinReach
67	Wirecard	SumUp
68	Sparkassen-Finanzgruppe	Payone
69	Commerzbank	BILENDO
70	Commerzbank	BYEBUY
71	Commerzbank	optiopay
72	UBS	SumUp
73	SEB	Tink
74	SEB	Amelia
75	SEB	Ripple
76	SEB	Coinify
77	SEB	Leasify
78	Swedbank	Sprinklebit
79	Danske Bank	MobilePay
80	HSBC	Tradeshift
81	Santander	iZettle
82	Santander	Kabbage
83	Santander	myCheck
84	Santander	Ripple
85	Santander	Socure
86	Santander	Monitise
87	Santander	Elliptic
88	Santander	SIGFIG
89	Lloyds Banking Group	Worapay
90	BNP Paribas	Hello bank!
91	BBVA	ATOM
92	BBVA	Holvi
93	BBVA	SpringStudio
94	BBVA	MADIVA
95	Barclays	analoganalytics
96	Barclays	thelogicgroup
97	Barclays	accesspay
98	RBS	Oakam
99	RBS	Funding Circle
100	RBS	Assetz Capital
101	Goldman Sachs	Square
102	Goldman Sachs	Digital Asset
103	Goldman Sachs	Circle
104	Goldman Sachs	CompareAsiaGroup
105	Goldman Sachs	Nubank
106	Goldman Sachs	Plaid
107	Goldman Sachs	Bluefin Payment Systems
108	Goldman Sachs	FreedomPay
109	Goldman Sachs	UNX
110	Goldman Sachs	Momo
111	Goldman Sachs	Inveshare
112	JP Morgan Chase	Square
113	JP Morgan Chase	Avant
114	JP Morgan Chase	OpenFin
115	Bank of Amerika	Yodlee
116	Wells Fargo	EyeVerify
117	Citigroup	Digital Asset
118	Citigroup	Selerity
119	Morgan Stanley	Square

120	Morgan Stanley	SoFi
121	Morgan Stanley	Affirm
122	Morgan Stanley	Betabrand
123	Morgan Stanley	Moneytree
124	Santander	Tradeshift
125	Santander	Digital Asset
126	Santander	PayKey
127	UBS	Fantex
128	UBS	UNX
129	BBVA	Coinbase
130	BBVA	Prosper
131	BBVA	Personal Capital
132	BBVA	Taulia
133	BBVA	Kasisto
134	Barclays	Square
135	Deutsche Bank	Inxight
136	Deutsche Bank	G2 Microsystems

II. Appendix II: Taxonomy Development Iterations

Iteration#	Name of Dimension	Approach (C2E, E2C)	Included characteristics of dimension
1	Cooperation type	C2E	Acquisition, alliance, incubation
2	Holder of innovation	E2C	Bank, fintech
3	Maturity of innovation	C2E	Introduction / uncoordinated, growth / segmental, maturity / systemic
4	Entire taxonomy	E2C	No new characteristics, but additional input to deeper analyze the banking system and new objects
5	Type of bank / Value-chain location	C2E	Commercial bank, cooperative bank, saving bank / Customer common interface, channel solutions and interaction platforms, customer-oriented financial market infrastructure, core banking systems, financial market infrastructure
6	Maturity of Fintech	E2C	Start-up, emerging growth, mature stage
7	Bank's main distribution channel / Business ecosystem	E2C	Branches, online / restricted by bank, restricted by fintech, restricted by both, no restriction
8	Fintech category	E2C	API and Infrastructure, lending, payment
9	Entire taxonomy	E2C	No new characteristics, but additional input to deeper analyze literature on innovation types and new objects
10	Innovation type	C2E	Product, process
11	Innovation type	E2C	Bank-2-customer process, Customer-2-customer process
12	Fintech holding bank license / Fintech category	E2C	Yes, no / Investing, current account, insurance
13	Cooperation type	E2C	Joint venture
14	Bank's strategic objective	E2C	Technology access, market access
15	Role of bank	E2C	Service consumer, service provider
16	Fintech category / Role of bank	E2C	Cross product service / Investor
17	Entire taxonomy	E2C	-