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

by

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

- Research in Progress -

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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. However, especially from an economic and financial perspective it is crucial to close this research gap to better understand how technology-driven organizations and cooperating with them reshapes the financial sector and therefore entire economies. Thus, we propose a theoretically founded and empirically proven taxonomy. 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.

Keywords:

Banking, Fintechs, Digital Transformation, Cooperation, Taxonomy

1 Introduction

The banking sector is undergoing fundamental changes owing to digital transformation (Barberis & Chishti, 2016). This new era challenges existing business practices and established structures (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Châlons & Dufft, 2017). 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) (e.g. Schweizer et al., 2017). 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 ways in which customers think and act (e.g. point-of-sale, data privacy) and raises new customer demands (demand-pull) (cf. Nemet, 2009). Further, digital transformation in the banking sector affects IT departments and IT strategies, and transforms business processes and even entire business models (Benlian, Hess, & Leimeister, 2014). Thus, banks are forced to rethink their current value delivery and customer interactions (Marous, 2013).

Meanwhile, financial technology startup companies (fintechs) are creating 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 U.S. \$24.7 billion in 2016 and reinforced their disruptive capabilities (KPMG, 2017). Fintechs are thought to be by far quicker and more agile than traditional banks in implementing and leveraging such opportunities by employing of innovative technology solutions and customer-centered approaches (Ansari & Krop, 2012; Christensen, 2013). Consequently, fintechs have become known for being the innovation drivers in the field, and are therefore predicted to play a key role in the financial services industry in the future (Dapp, 2014). Digital transformation and technology advancements also enable services providers to address customers in a very short time. These conditions favor many fintechs working on alternatives to established banking institutions (Shontell, 2015). Therefore, banks need to keep up with the pace of innovation in order to stay in the market, since innovative companies are said to be growing faster, generate higher revenue, and have a higher likelihood of permanent success (Kim & Mauborgne, 1997). Thus, also in the banking sector, innovation – especially IT innovation – can be considered a key differentiator against competitors, and a critical factor for financial sustainability (Chandy & Tellis, 2000; Fagerberg, 2004; Schumpeter, 1942; Teece, 2010).

Banking practitioners have realized that banks face several challenges, such as a short-term management focus and a lack of internal capabilities to innovate, leading to long innovation cycles and long times-to-market (Tornjanski, Marinković, Săvoiu, & Čudanov, 2015). Thus, banks seek to transform their organizations towards long-term success (Economist Intelligence Unit, 2015). To achieve this, it is crucial to overcome the stated internal problems (Tornjanski et al., 2015) and to create competitive advantages by considering external innovativeness and cooperating with external parties (Chesbrough, 2004; Jaubert, Marcu, Ullrich, Malbate, & Dela, 2014). In a survey among financial services executives, 80% of the participants stated that collaboration with startups brings new ideas into their businesses (Skan, Dickerson, & Masood, 2015). Also, a self-assessment of banks and fintechs reveals a striking match between banks' weaknesses and fintechs' strengths, and vice versa (Economist Intelligence Unit, 2015). Thus, it seems reasonable for banks to evaluate and leverage the potential of external innovation sources originated from startup companies (e.g. acquisitions, alliances, incubations, or joint ventures). Fintechs are not (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 promising bank-fintech cooperation is to preserve innovative fintech characteristics, embodying the mindset towards new ideas and change, while successfully combining them with banking controls, know-how, processes, and assets (Economist Intelligence Unit, 2015; Hurley & Hult, 1998; Rogers, 2003).

However, most banks struggle to meet the challenges and the complexity associated with cooperation scenarios, and the research is lagging behind current developments in the financial sector, especially regarding bank-fintech cooperation (Tornjanski et al., 2015). While previous research has addressed and answered various research questions in the realms of cooperation, innovation, and their coherence, the theory does not fully account for the idiosyncratic nature of bank-fintech cooperation. Although the financial sector is key to almost every economy (McKinnon, 1973; Odedokun, 1996; Schmitt, 1974), to date, neither bank-fintech cooperation, nor associated and relevant characteristics have been analyzed and evaluated. It is crucial to close this research gap, especially from an economic and financial perspective, to better understand how the financial sector and therefore entire economies are reshaped by the current wave of digitization (Dapp, 2015).

To provide a first categorization and to establish a structure for the topic of interest, we seek to better understand and analyze this multidimensional problem. This approach is in line with the literature, and has proven its applicability as a first systemization of emerging phenomena (Haas, Blohm, & Leimeister, 2014; Sabherwal & King, 1995; Yaari, 1993). Accordingly, our research question is: *What design parameters of bank-fintech cooperation can be distinguished?*

Design parameters are characteristics that determine the form of a cooperation and allow one to dissect possible traits of existing cooperations. To answer the research question, we propose a taxonomy for bank-fintech cooperation. We follow Nickerson, Varshney, and Muntermann's (2013) iterative approach, using both the literature and empirically verified knowledge. 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 represent the empirical perspective. With our taxonomy, we seek to make two contributions: First, we aim to contribute to theory-building (Doty & Glick, 1994; Iivari, 2007) by classifying dimensions of cooperation. Thus, the proposed taxonomy delivers a structured and systematic organization of the integration of external organizations (Glass & Vessey, 1995). Further, 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 bank-fintech cooperation (e.g. possible cooperation models, integration structures). Further, by applying the proposed taxonomy to our case database, we introduce and discuss prevailing cooperation designs between banks and fintechs. Thus, our proposed taxonomy establishes fundamental parameters for the analysis of current cooperation as well as for the prediction of future cooperation developments (Glass & Vessey, 1995).

The remainder of this paper is organized as follows: In Section 2, we lay the theoretical foundations for the proposed taxonomy and discuss existing theory in this domain. We then 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 by highlighting the paper's theoretical and practical contributions.

2 Foundations

In this section, we introduce current digital transformation and its implications for the banking sector. Further, we address the relationship between the digital transformation and innovation as well as fintechs' roles in the banking sector. Finally, we discuss cross-organization cooperation as a promising solution to foster a bank's innovation capability.

2.1 The Digital Transformation of the Banking Sector

Digitalization is a pervasive phenomenon in the 21st century that has changed or disrupted many industries in the past few years (Benlian et al., 2014). Digital technologies enable new functionalities and open up

promising business opportunities, changing perceptions of IT and its roles (Bharadwaj et al., 2013). Embedded computing power have turned products into smart and interconnected things, such as cars, phones, televisions, cameras, or bicycles (Yoo, 2010). Technological improvements are also reshaping and transforming key business operations, products, processes, organizational structures, and management theories (Matt, Hess, & Benlian, 2015). Thus, entire value chains across organizational boundaries and business models are being reshaped and replaced by innovative solutions, which are enabled by 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, Lyytinen, & Sørensen, 2010, p. 749).

As one indicator among many, digitalization is also strongly affecting the banking industry and is changing the traditional branch system orientated sector (Dapp, 2014, 2015; Moutinho, Davies, Deng, Miguel Peris, & Enrique Bigne Alcaniz, 1997). This also influences banks’ capabilities to create stakeholder value (Hirt & Willmott, 2014; Walters, 2014). Generally, digitalization provides several opportunities for banks, such as the enhancement of customer interactions, the improvement of management decisions, and the enabling of new value chains and business models (Hirt & Willmott, 2014). Further, various threats emerge through digital transformation, such as winner-takes-all dynamics, modular and interchangeable business model blocks, and a lack of digital talent (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% to 80%) of bank processes are still not digitized, and 90% of Europe’s banks invest less than 0.5% of their total spending on digital initiatives (Olanrewaju, 2014). Yet, only 50% of the interviewees in 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 be instantaneous and in a fundamental manner (Ernst & Young, 2011). Thus, banks must quickly adapt to the challenges of digital transformation, so as to become innovative, digital, and agile players – drivers in the field and successful in the market (Accenture, 2015; Ernst & Young, 2011; Jaubert et al., 2014).

2.2 Innovation, Innovation Sourcing, and Fintechs in the Banking Sector

Many of the new opportunities enabled by digitalization are based on innovation, and change the nature of products and services (Yoo, Boland Jr, Lyytinen, & Majchrzak, 2012). Innovation is “the generation, acceptance, and implementation of new ideas, processes, products or services” (Thompson, 1965, p. 2), and innovation management is crucial for organizations’ success (e.g. Drucker, 1984; Schumpeter, 1942; Teece, 2010; Van de Ven, 1986). Nonetheless, many organizations – especially in the banking sector – fail to continuously change and innovate (Tushman & Nadler, 1986). The target-oriented pursuit of innovation in practice has been a strategic asset and even a market entry barrier for potential competitors for centuries (Chesbrough, 2004). A company’s innovation strategy comprises internal innovation (e.g. R&D activities), and external innovation (e.g. acquisition and headhunting experts) (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 R&D also earned the most profits (e.g. DuPont, Merck, IBM, GE and AT&T, c.f. Chesbrough, 2004). However, a variety of newcomer organizations are strongly challenging industry leaders with little or no basic own research (e.g. Intel, Microsoft, Oracle, Uber, c.f. Chesbrough, 2004). These companies innovate based on other organizations’ research activities and discoveries (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 rapidly evolving nature and the advanced market penetration of IT (Fichman, Dos Santos, & Zhiqiang, 2014). The foundations of service innovation are rapid advancements coupled with widespread use of information and communication technologies (Brynjolfsson & Hitt, 2000; Chen & Tsou, 2006).

In the banking sector, these technology-driven innovations are currently significantly propelled by fintechs. Fintechs are financial technology companies that bring 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 large incumbent firms (Ansari & Krop, 2012; Christensen, 2013). 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 usage cases and methodologies (Teece, 1992).

2.3 Cross-organizational Cooperation to Enhance Innovation Capabilities

To support innovation, companies enter cooperations, bringing their expertise and benefitting from other companies' knowledge and technologies (Hippel, 2005; Nooteboom, 1999). Cooperating companies have realized that innovation is not a single-player activity, but 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 reason for companies to cooperate in order to innovate. Ultimately, organizations cooperate in order to improve their competitive position and performance (e.g. Ernst, Halevy, Monier, & Sarrazin, 2001; Hitt, Dacin, Levitas, Arregle, & Borza, 2000; Jarillo, 1988; Teece, 1987).

Since companies began to cooperate, there have been questions about different approaches, their implications, and influences on innovation capability. Studies of cross-organizational cooperation suggest that strategic alliances, merger and acquisitions, and incubation are innovation-enhancing forms of cooperation (Bergek & Norrman, 2008; Man & Duysters, 2005). Strategic alliances positively affect innovation if the involved parties' managers are equipped to manage alliances (e.g. Anand & Khanna, 2000; Powell, Koput, & Smith-Doerr, 1996; Takeishi, 2001), if the involved parties share similar or overlapping knowledge (e.g. Chan, Kensinger, Keown, & Martin, 1997; Koh & Venkatraman, 1991; Lane & Lubatkin, 1998; Mowery, Oxley, & Silverman, 1996), or if the form of cooperation is intense (e.g. Dyer, 1996, 2000; Hagedoorn & Schakenraad, 1994). Compared to research into strategic alliances, there has been less extensive research into the relationships between mergers and acquisitions or incubation with innovation. The acquisition of knowledge is found to positively impact on post-merger performance and innovation effectiveness (Ahuja & Katila, 2001). Bergek and Norrman (2008) reviewed different components of the existing incubation literature with a focus on incubation selection strategies, and found a positive influence of incubation on a company's innovation capability (Hackett & Dilts, 2004).

Previous research has addressed and answered various research questions in the realm of cooperation, innovation, and their coherence, and has therefore made excellent contributions to understanding. Yet, bank-fintech cooperation differs from the existing theory, since two presumably unsymmetrical aims and market positions collide. For banks and fintechs, the motivation to enter into a cooperation is sound, for many reasons. Banks seek to profit from the development of new customer segments, products, and services, expanding into new markets, developing new capabilities, and accessing new technologies (Economist Intelligence Unit, 2015). In return, fintechs look for the financial resources, infrastructures, access to customers, and security reputation. However, there has been very little research into this new phenomenon in the financial markets (Tornjanski et al., 2015), while recent developments in the banking sector suggest the need 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 in the financial sector somehow depend on fintechs, and fintechs don't fear established institutions, but carefully choose their cooperation partners, often working with more than one. Further, fintechs' innovativeness becomes a driver of customer satisfaction and challenges as well as changes the business models in the banking sector. Alongside this challenge, we place the corresponding design parameters at the center of our paper, addressing how banks

and fintechs can work together to increase banks' innovativeness. To lay the foundations and better understand this phenomenon, taxonomy development has proven its systemization efficacy numerous times across several industries (Fiedler, Grover, & Teng, 1996; Sabherwal & King, 1995; Williams, Chatterjee, & Rossi, 2008; Yaari, 1993).

3 Research Method

A taxonomy provides a set of unifying constructs, resulting in a structure and a systematic organization of an 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, Monarchi, Parsons, & Woo, 1995) and to increase understanding (Gregor, 2006). However, taxonomies not only systematically describe a research area's current developments, relationships, and dependencies, but also lay the foundation for higher-order theory in an examined field (Glass & Vessey, 1995), such as theory for explaining and predicting, or theory for design and action (Gregor, 2006). We apply Nickerson et al.'s (2013) taxonomy development approach, since it goes beyond previous approaches (e.g. Bailey, 1984). This 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 & Bezenberger, 2015; Haas et al., 2014; Jöhnk, Röglinger, Thimmel, & Urbach, 2017; Püschel, Röglinger, & Schlott, 2016).

According to Nickerson et al. (2013), taxonomy development encompasses seven steps. Steps 1 and 2 set the research field and determine the taxonomy's boundaries. Steps 3 to 7 are conducted iteratively, 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 introduced in the taxonomy development process. Each taxonomy characteristic logically follows the meta-characteristic. This initial step guides the research process and helps researchers to avoid the examination of unrelated characteristics. Thus, the choice of the meta-characteristic is very important, and needs to be elaborated thoroughly and with care. 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 strongly relevant and determine the method's scope and outcome. They determine the quality standard and validity taxonomies must fulfill for acceptance as a temporarily finalized artifact. For steps 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 via 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). The empirical component of the development method generally 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 influences how steps 4, 5, and 6 are shaped. In step 7, the latest taxonomy is compared to the determined ending conditions, and a decision is made about whether another iteration will be conducted. Owing to fast-changing targets, the design science literature describes the search for an optimal solution as “intractable for realistic information systems problems” (Hevner, March, Park, & Ram, 2004, p. 88). Thus, our proposed taxonomy represents an initial structure and a systematic overview of the emerging research field of bank-fintech cooperation.

4 The Taxonomy Development Process

In our taxonomy development process, we built on existing theoretical knowledge and available expertise to consider both the conceptual and the empirical perspectives (Nickerson et al., 2013). For the conceptual

perspective, we dissected the theoretical background of cooperation patterns and reviewed related literature streams. 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, fintech representatives, and industry experts (primary data). An overview of the applied research steps appears in Table 1. We explain the associated iteration cycles in greater detail in the following sections. Further, in Appendix II, we provide an overview of the evolving taxonomy.

Step 1	Determine the meta-characteristic <i>Based on the identified lack of research and according to our research question, we defined the meta-characteristic as follows: Design parameters of bank-fintech cooperations in the context of banks' innovation capability enhancement</i>	
Step 2	Determine ending conditions <i>We chose well-established and widely recognized ending conditions and clustered them into objective and subjective criteria (Nickerson et al., 2013). A detailed overview appears in Table 2.</i>	
Step 3	Choose between a C2E and an E2C approach <i>Based on available real-world cooperation cases, interview partners, and identified literature streams, we chose a C2E or an E2C approach.</i>	
	Conceptual-to-empirical (C2E)	Empirical-to-conceptual (E2C)
Step 4	4c. Conceptualize (new) characteristics and dimensions of objects <i>We analyzed literature from various fields, such as cross-organizational cooperation, innovation, and value creation in order to conceptualize characteristics and dimensions.</i>	4e. Identify (new) objects subsets <i>We searched for bank and fintech cooperations cases (secondary data) and utilized insights about cases from the expert interviews (primary data).</i>
Step 5	5c. Examine objects for these characteristics and dimensions <i>We evaluated the appropriateness and correctness of the proposed characteristics and dimensions by examining bank-fintech cooperation cases as well as via insights from the expert interviews.</i>	5e. Identify shared characteristics and group objects <i>We examined the identified objects, clustered them, and derived shared characteristics. We also analyzed literature relating to the characteristics to obtain a more objective and comprehensive understanding of the phenomena.</i>
Step 6	6c. Create or revise the taxonomy <i>If required, we modified the current taxonomy.</i>	6e. Group characteristics into dimensions to create or revise the taxonomy <i>We grouped the identified characteristics into dimensions and, if required, revised the current taxonomy.</i>
Step 7	Examine ending conditions <i>After each development iteration, we evaluated whether the ending conditions were met. For instance, we assessed whether new characteristics and/or dimensions were added or if the number of characteristics and dimensions allow the taxonomy to be meaningful (concise).</i>	

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

4.1 Steps 1 and 2

The core activities in the first two steps comprise the definition of the meta-characteristic and the determination of the ending conditions for the taxonomy development process. Hence we focused on proposing an initial overview of design parameters of bank and fintech cooperations and defined the meta-characteristic as follows: Design parameters of bank-fintech cooperations in the context of banks' innovation capability enhancement. Following Nickerson et al.'s (2013) approach, 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 proposed taxonomy's meaningfulness and usefulness (Nickerson et al., 2013).

Objective ending conditions	Subjective ending conditions
<ul style="list-style-type: none"> • A representative sample of bank-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 in one dimension are 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 	<ul style="list-style-type: none"> • 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 four C2E and 13 E2C iterations. Thus, 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 C2E or an E2C approach based on available cases and identified literature streams.

We based each of the C2E taxonomy development iterations on a specific research stream, such as cross-organizational cooperation, innovation, and organization architecture, in order to conceptualize dimensions and characteristics (step 4c). Subsequently, we verified the appropriateness and correctness of the proposed dimensions and characteristics by examining bank and fintech cooperation cases as well as via 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 E2C iterations, either samples of the cooperation cases or expert interviews served as the starting point (step 4e). We then analyzed the identified objects and derived common characteristics in line with the meta-characteristic (step 5e). We also studied the literature related to the identified dimensions and characteristics, to strengthen the observed phenomena and to ensure maximum objectivity. Afterwards, we grouped the characteristics into dimensions and revised the current taxonomy (step 6e). At the end of each iteration, we measured the fulfillment of our ending conditions and evaluated whether or not an additional development cycle was required (step 7).

During the 17th development cycle, we did not observe the need to change or adapt the current taxonomy. Further, none of the dimensions and combinations of the characteristics were duplicated, and every characteristic classified at least one object. The resulting taxonomy has 13 dimensions and is meaningful and therefore *concise* (Miller, 1956). Since the characteristics provide sufficient differentiation between the objects, we considered the taxonomy to be *robust*. Moreover, we identified and classified a large proportion of bank and fintech cooperations, and indicated that the proposed taxonomy is *comprehensive*. The taxonomy is *extendible*, since 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 17th iteration, our taxonomy met all ending conditions, and we conducted no additional development cycle.

Overall, we gathered information about 136 bank-fintech cooperation cases from a database (Bajorat, 2015, cf., Appendix I). Further, we enriched the data by publicly available information on the cooperations, such as published newspapers, company white papers, and company websites. We also conducted expert interviews with 12 bank and fintech executives as well as industry experts (Table 3) in a semi-structured manner, with designed questions and interview guidelines to assure comparability and to preserve explorativeness (Yin, 2013). We primarily framed the interviews around a greenfield approach, since the experts unbiasedly stated their ideas towards a categorization model of bank-fintech cooperation. This initial step was crucial, since it allowed us to gain unrestrained interviewee insights and thoughts. Part 2 of the

interviews consisted of a discussion of the current taxonomy and the classification of at least one bank-fintech cooperation 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). Every 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	Relationship to bank-fintech interaction	Firm
1	Executive or C-level	Involved in the strategic alignment of bank-fintech cooperation	Bank
2	Executive or C-level	M&A in the banking sector; formerly C-level central bank	Bank
3	Executive or 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 cooperations	Regulator
12	Senior Project Manager	Involved in the structuring of bank-fintech cooperation project	Consulting

Table 3. Overview of interviewees

5 Results

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

5.1 A Taxonomy for Bank-Fintech Cooperation

The final taxonomy consists of 13 relevant dimensions, encompassing 106 characteristics (Table 4). We derived the dimensions and characteristics according to the meta-characteristic to describe and explain the bank-fintech cooperation to foster innovation.

	Dimensions	Characteristics				
	Cooperation type	Acquisition (7)	Alliance (119)	Incubation (9)	Joint venture (1)	
	Innovation type	Bank-to-customer process (22)	Customer-to-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 (3)
	Business ecosystem	Restricted by bank (24)	Restricted by fintech (90)	Restricted by both (20)	No restriction (2)	
	Innovation holder	Fintech (125)			Bank (11)	
Bank	Bank type	Commercial bank (119)	Cooperative bank (14)	Savings bank (3)		
	Bank's main distribution channel	Branches (83)		Online (53)		
	Bank's role	Services provider (64)	Services consumer (28)	Investor (44)		
	Bank's strategic objective	Market access (57)		Technology access (79)		
Fintech	Fintech category	API and infrastructure (16)		Cross-product services (20)	Current account (7)	
		Lending (23)	Payment (39)	Investing (30)	Insurance (1)	
	Fintech's maturity	Startup (33)		Emerging growth (98)	Mature stage (5)	
	Fintech holding a full banking license	Yes (3)			No (133)	

Table 4. A Taxonomy for Bank-Fintech Cooperation

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

Cooperation Type

Bank-fintech cooperations differ in their legal connections (Seo & Hill, 2005). In line with the 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 shared goals (e.g. bank and fintech cooperate in a beneficial manner, Teece, 1992). An acquisition is a corporate action in which the acquiring company buys a majority of the target company and integrates it into its 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 (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 shared entity, while 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

The 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). Because the interviews revealed that innovations primarily focus on specific processes, we further divided the process innovation into *customer-to-customer* and *bank-to-customer* (B2C) 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, notably, the related innovations show different maturity stages. The literature on product lifecycle models suggests representing different maturities via multistep models. Thus, the product lifecycle is represented in a four-step model: 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 relevant or useful (Day, 1981). Since specifically innovative products are in the focus of the research, the decline stage was neither represented in the analyzed sample nor suggested by the experts, and was therefore not included in the taxonomy. Comparable to the product lifecycle, process maturity has 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 by a higher process integration and higher 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 innovation maturity dimension, we included the characteristics *Introduction / Uncoordinated*, *Growth / Segmental*, and *Maturity / Systemic* 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 aims of fintechs, since they seek to address specific customer needs rather than an exhaustive solution. This is also confirmed by the evaluated dataset. For the proposed taxonomy, we follow Alt and Puschmann (2012), dividing the banking industry value chain into five sections: *customer common interface*, *channel solutions (CS) and interaction platforms (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, for instance plan liquidity, accumulation of capital (Alt & Puschmann, 2012). The CS and IP facilitate bank-customer interaction (e.g. online banking, mobile banking) (Alt & Puschmann, 2012). The customer-oriented FMI relates to platforms or marketplaces that provide products and services directed towards customers. 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

Most 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 that involve several companies working cooperatively and comparatively to gain advantages through their symbiotic relationships (Moore, 1993). An ecosystem’s members – 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. Banks and fintechs

seek 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 innovation's use is restricted either through membership (account) in the fintech (*restricted by fintech*), in the bank (*restricted by bank*), or *restricted by both*. Only in some cases is the access *not restricted*. We divide all four possibilities in order to categorize which party is the restricting element in the cooperation, thus placing itself in the center of the ecosystem.

Innovation Holder

A specific interest with a cooperation is 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 concerning where the innovation is located in a cooperation – in the bank or in the fintech. The interviewed experts also noted the distinction and recommended including it as a characteristic in the taxonomy.

Bank Type

The next relevant characteristics are based on literature on banking systems and encompass three groups of banks: *commercial banks*, *cooperative banks*, and *savings banks* (Schmidt & Krahn, 2004). The commercial banks are privately owned and are more profit-oriented than the other two groups (Behr & Schmidt, 2015). Although cooperative banks have characteristics of commercial banks, their internal structure differs significantly, since the bank is owned by its members (Behr & Schmidt, 2015). Saving banks are characterized by 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

Further, for the cooperation, the main bank's distribution channel plays a key role, since it influences the ability to establish connection points with the fintech and provides insights into customer relationships. While branch-oriented banks often focus on the physical interaction with their customers, this complicates the integration of innovative online fintech solutions. Thus, 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.

Bank's Role

The experts stated that, similar to a bank's strategic objective, banks' roles differ in cooperations. Banks either act as a *service provider*, enabling fintechs' products by providing banking services, or as *service consumer*, using the fintech's innovation to improve own products or processes. Further, we observed that some banks act as an *investor* and hold shares in fintech companies. Since the interviewed experts ascertained the same phenomenon, the three characteristics were endorsed and included.

Bank's Strategic Objective

Another important aspect of bank-fintech cooperations is the bank's strategic objective. Previous research suggests predominately two reasons why banks enter interfirm cooperations. First, motives relate 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, Duncan, & Friedman, 1982; Ohmae, 2002) or technology development costs (cf. e.g. Ohmae, 2002). This can be either the capturing of a partner's tacit knowledge of technology, technology transfer, technology application, and technological leapfrogging (cf. e.g. Harrigan, 1985; Mariti & Smiley, 1983; Pisano, Shan, & Teece, 1988). Second, motives relate to market access and the search for opportunities. These can be the 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

product range expansion (cf. e.g. Hladik, 1985, 1988). Thus, we distinguished between *market access* and *technology access*.

Fintech Category

Our examination of the sample cases revealed various categories of fintechs. These categories are based on the list of regular financial products or services. These are *lending, investing, insurance, payment, current account, 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 innovative solutions, where customers can lend money via a platform directly from other customers or 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 to 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' interactions 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). Since 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 the literature is not possible at this point. Nonetheless, the expert interviewees follow the suggested itemization, and we classified all cases from the database.

Fintech's Maturity

Research distinguishes four stages of an organizational lifecycle. The *startup* stage, with the development of a business plan and entry into the market place, the *emerging growth* stage, with expansion efforts, the *mature* stage, with a slow growth rate, and the *decline* stage with movement from the mature stage to the transition stage (Jawahar & McLaughlin, 2001). According to the interviewed experts, a fintech's maturity is important, for two reasons. First, such maturity indicates how well the organization and internal processes are established in the market. Second, such maturity relates closely to the bargaining power in a cooperation. Fintechs are startup companies in the early stages of the lifecycle model. Since the decline stage did not occur in the case sample, nor the experts suggested it, we did not include this characteristic in the taxonomy.

Fintech Holding a Full Bank License

While the taxonomy development process revealed that most fintechs don't have a full banking license, a banking license plays a key role in bank-fintech cooperation, since it defines a fintech's abilities 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. Thus, we added this dimension with the characteristics *yes* and *no* to the taxonomy.

5.2 Bank-Fintech Cooperation Patterns

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

Application of the Bank-Fintech Cooperation Taxonomy

In the taxonomy development, we dissected and classified 136 real-world cooperations cases. Our dataset encompasses European and U.S. banks as well as international fintechs. Overall, the most 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 minor roles, while joint ventures are

only represented in 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 lifecycle stages, with 97% of the innovations in pre-maturity stages, and 96% of the fintechs in the startup or growth stages. In more than 66% of the cooperations, the fintech builds a business ecosystem, and banks try to enter this 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 for instance providing account management services or the bank license for the cooperation. However, it is conspicuous that 64% of the classified U.S. banks acted as investors, while only 24% of the European banks provided investment support. In general, the banks primarily seek to get access to the innovative technologies offered by fintechs. There are various categories of fintechs. Most are located in *payment* (28%) and *investing* (22%). The fintech categories *lending* (16%), *cross-product services* (14%), *API and infrastructure* (11%), *current accounts*, (5%) and *insurance* (1%) were not predominantly represented in our dataset. It is also apparent that only three (2%) of 100 fintechs are listed as a regulated financial institution with a banking license.

Prevailing Bank-Fintech Cooperation Patterns

To better understand and identify prevailing bank-fintech cooperation patterns, we conducted a cluster analysis. The results illustrate typical combinations, dominance, and retention of categories in the database. For reasons of clarity and comprehensibility, we restricted the number of clusters to six. We utilized the simple-K-means algorithm (distance function: Manhattan distance; initialization method: Farthest first; number of clusters: 6) in our cluster analysis. We summarized the results of the cluster analysis 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%	B2C process 100%
Maturity of innovation	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%
Innovation holder	Fintech 96%	Bank 100%	Fintech 75%
Bank type	Commercial bank 92%	Commercial bank 87%	Commercial bank 100%
Bank's main distribution channel	Branches 94%	Branches 100%	Online 75%
Bank's role	Investor 61%	Services Provider 62%	Services Provider 75%
Bank's strategic objective	Technology 86%	Technology 75%	Market 50%
Fintech category	Payment 48%	Payment 50%	Lending 75%
Fintech's maturity	Growth 88%	Growth 75%	Growth 75%
Fintech holding a full banking 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%	B2C process 100%	Product 85%
Maturity of innovation	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%
Innovation holder	Fintech 100%	Fintech 100%	Fintech 100%
Bank type	Commercial bank 84%	Commercial bank 69%	Commercial bank 92%
Bank's main distribution channel	Online 84%	Online 61%	Branches 92%
Bank's role	Services Provider 93%	Services Consumer 92%	Investor 64%
Bank's strategic objective	Market 91%	Technology 100%	Technology 64%
Fintech category	Investing 60%	Cross-product services 100%	Lending 28%
Fintech's maturity	Growth 73%	Growth 69%	Introduction 92%
Fintech holding a full banking license	No 97%	No 100%	No 92%

Table 5. The Cluster Analysis Results

Cluster 1: Invest in fintechs to form an alliance and access the fintech's ecosystem

Cluster 1 represents the largest group of the cooperation cases. It encompasses cooperations in which primarily branch-oriented banks invest in fintechs so as 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 in cluster 2 can be illustrated as cooperation between branch-oriented banks seeking CS and IP technologies. The banks in this cluster acquire a fintech, restrict the ecosystem, and integrate the innovation to become its holder. The proportion of fintechs holding 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 in this cluster seek to innovating commercial banks in the lending field's core banking systems, 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 services providers and seek to access 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 in this cluster is 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 ecosystem.

Cluster 6: Early-stage cooperation to access technology

In cluster 6, banks cooperate with early-stage fintechs that focus on early-stage innovations. The ecosystem is restricted by the fintech, and the innovation remains with the fintech. The bank seeks to access the innovation technology, while the category of fintech is unclear.

6 Conclusion and Outlook

In this research paper, we discussed the far-reaching implications of digital transformation in the financial sector (Mols, 1998; Tilden, 1996). The global financial sector is undergoing major changes as banks face various internal problems, leading to a lack of innovation capability (Tornjanski et al., 2015), and fintechs are picking up technology-enabled opportunities to push into the market (Dapp, 2015). To overcome these challenges, cross-organizational cooperation has proven its applicability and its positive effects. Thus, cooperation with fintechs is becoming 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 approach and an empirical-to-conceptual one (Nickerson et al., 2013). Thus, we propose a taxonomy to establish an overview of dimensions and design parameters of bank-fintech cooperation that seeks to foster banks' innovation capabilities. For this purpose, we collected data of 136 bank-fintech cooperations, and conducted 12 expert interviews with bank and fintech executives as well as industry experts.

Before concluding with recommendations and emphasizing our contributions to both research and practice, we acknowledge some limitations, highlighting promising starting points for future research. First, the resulting taxonomy is influenced by the applied database and the iterations sequence in the development process, a generally valid drawback. Applying a divergent iterations sequence 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 that builds on the proposed taxonomy is required. Especially research streams in management literature provide promising aspects to capture existing concepts, such as absorptive capacity (e.g. Cohen & Levinthal, 1989, 1990; Lane & Lubatkin, 1998), the relationship between internal and external innovation (e.g. Hillebrand & Biemans, 2003), and proximity in cooperation (e.g. Knoblen & Oerlemans, 2006). Third, this paper focuses on general cooperation patterns on a higher level. Thus, we analyzed a large sample of cooperations and gathered information from public sources. Nonetheless, 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 objectives (e.g. trust, risk perception, or control, c.f. Das & Teng, 2001). Further, especially for policy makers, our taxonomy can serve as a helpful classification of cooperation cases and their specific characteristics. Policy makers may examine and build upon the proposed cooperation patterns for the determination of legal actions. For instance, case-driven research approaches should match and analyze legislation for each of the proposed characteristics (e.g. banking licenses, antitrust legislation, patent law).

The theoretical contributions of the proposed classification artifact address the aforementioned research gap in three ways: First, in this paper, we laid the foundation for further research into fintechs and their integration into the banking sector. For this purpose, this paper can be considered a starting point in various research domains that will eventually analyze fintechs' roles and influences. For instance, finance researchers could be interested in the changes fintechs cause in the financial sector, economics researchers could further look into the consequences for the entire economy, or necessary policy changes. By addressing the development of a descriptive theory, our taxonomy depicts a crucial 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 application as a basis, researchers will be able to focus on particular cooperation patterns and will be able to understand the specific characteristics and dynamics of the entire financial sector. Second, we have suggested the first range of relevant dimensions and characteristics that proven to be valid, useful, and effective. We have also presented prevailing cooperation patterns and identified dominant categories. The taxonomy's multidimensionality lays the foundations for analyzing interdependencies among the dimensions and characteristics – a future research area we find promising. For instance, banks and fintechs mostly form alliances; this can have consequences for banks' security risks, while fintechs indirectly gain access to a banking license, two aspects that are interesting for policy makers. Third, since digital transformation is increasingly accelerating developments in several economies and industries, similar phenomena are likely to similarly shape other industries. Thus, our work can serve as a guideline for other industries, in which similar challenges arise. For instance, in the automotive industry, car manufacturing companies still provide the engineering capabilities to build a car as a platform, but digital transformation enables other companies to provide new value for customers, for instance by providing apps for cars, driving software, and so on. Information systems are generally becoming increasingly important, since these changes are predominantly driven by information-based approaches, occur in organizational information systems, and demand cooperation across organizational borders. Thus, 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 our theoretical contributions, 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. Practitioners who apply our taxonomy can analyze their own endeavors in integrating fintechs and innovation, and can evaluate their value proposition within such cooperation. For this purpose, we delivered the key findings from a real-world database. Thus, managers can gain insights into the shared practices and related outcomes. Second, considering the number of cooperations, it is understood and instituted as an eligible strategy for promoting innovation. We also found

that both parties benefit from the model, and complement each other's strengths and weaknesses. Third, fintechs play a crucial role and don't remain the silent, lesser partner in cooperations. Thus, alliances are the predominant form of cooperation in our empirical database, and acquisitions and incubations only play minor roles. The key role of the fintech is also underlined by the fact that the innovation mostly stays with the fintech. This allows for two contradictory interpretations, which require further verification: On the one hand, fintechs are unwilling to sell their innovation, and banks lack the opportunity to fully integrate a 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 key components to overcome future challenges.

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I. Appendix I: Bank-Fintech Cooperations

ID	Bank	Fintech
1	Fidor Bank AG	smava GmbH
2	Fidor Bank AG	bankless24 GmbH
3	FinTech Group Bank AG	ZINSPILLOT (Deposit Solutions GmbH)
4	Sparda-Bank	zencap (Funding Circle Deutschland GmbH)
5	Comdirect Bank AG	moneymeets GmbH
6	MHB-Bank AG	WeltSparen (Raisin GmbH)
7	Deutsche Bank AG	Gini Pay (Gini GmbH)
8	DAB BNP Paribas	GINMON (Ginmon Vermögensverwaltung GmbH)
9	HypoVereinsbank (Unicredit Bank AG)	Gini Pay (Gini GmbH)
10	DAB BNP Paribas	easyfolio GmbH
11	Volksbanken	Startnext Crowdfunding GmbH
12	Hauck & Aufhäuser Privatbankiers AG	easyfolio GmbH
13	ING-DiBa AG	Gini Pay (Gini GmbH)
14	Wirecard AG	HOLVI (Holvi Payment Services Oy)
15	Wirecard AG	zencap (Funding Circle Deutschland GmbH)
16	net-m privatbank 1891 AG	Vexcash AG
17	Deutsche Kreditbank AG	FinReach GmbH
18	Deutsche Kreditbank AG	WebID Solutions GmbH
19	Consorsbank	Seedmatch crowdfunding GmbH
20	Augsburger Aktienbank AG	moneymeets GmbH
21	Fidor Bank AG	Bitcoin Deutschland AG
22	Santander Consumer Bank AG	payever GmbH
23	FinTech Group Bank AG	auxmoney GmbH
24	Sparkasse Berlin	SumUp Payments Limited
25	Comdirect Bank AG	Gini Pay (Gini GmbH)
26	Wirecard AG	orderbird AG
27	Deutsche Kreditbank AG	easyfolio GmbH
28	Fidor Bank AG	FUNDSTER AG
29	FIL Fondsbank GmbH	Vaamo (Sciuridae Vermögensverwaltungs GmbH)
30	1822 direkt	easyfolio GmbH
31	Berliner Volksbank	simplesurance GmbH
32	DZ Bank AG	iZettle
33	DAB BNP Paribas	moneymeets GmbH
34	FinTech Group Bank AG	Savedo GmbH
35	Comdirect Bank AG	TopTrade
36	Commerzbank AG	IDnow
37	UBS Group AG	EASYSYS
38	HypoVereinsbank (Unicredit Bank AG)	SumUp Payments Limited
39	FinTech Group Bank AG	IDnow GmbH
40	UBS Group AG	Figo GmbH
41	Deutsche Kreditbank AG	Cringle GmbH
42	VOBA Hellweg	Lendstar GmbH
43	Berliner Volksbank	Bergfürst AG
44	Commerzbank AG	Gini Pay (Gini GmbH)
45	Comdirect Bank AG	easyfolio GmbH
46	Consorsbank	easyfolio GmbH

47	FinTech Group Bank AG	Qnips GmbH
48	Commerzbank AG	Traxpay AG
49	ING-DiBa AG	WebID Solutions GmbH
50	FinTech Group Bank AG	talent-invest.de
51	Süd-West-Kreditbank Finanzierung GmbH	auxmoney GmbH
52	ebase	easyfolio GmbH
53	Sutor Bank	fairr.de GmbH
54	Sutor Bank	ZINSPILLOT (Deposit Solutions GmbH)
55	Augsburger Aktienbank AG	CASHBOARD
56	Wirecard AG	RatePAY GmbH
57	SWK Bank	WebID Solutions GmbH
58	FIL Fondsbank GmbH	moneymeets GmbH
59	Onvista media GmbH	easyfolio GmbH
60	ING-DiBa AG	easyfolio GmbH
61	FinTech Group Bank AG	easyfolio GmbH
62	Wirecard AG	Lendico Deutschland GmbH
63	Comdirect Bank AG	wikifolio Financial Technologies AG
64	Commerzbank AG	CRX Markets GmbH
65	Wüstenrot Bausparkasse AG	easyfolio GmbH
66	Sutor Bank	FinReach GmbH
67	Wirecard AG	SumUp Payments Limited
68	Sparkassen-Finanzgruppe	Payone GmbH
69	Commerzbank AG	Bilendo GmbH
70	Commerzbank AG	ByeBuy Global Operations GmbH
71	Commerzbank AG	OptioPay GmbH
72	UBS Group AG	SumUp Payments Limited
73	SEB AG	Tink GmbH
74	SEB AG	Amelia
75	SEB AG	Ripple
76	SEB AG	Coinify
77	SEB AG	Leasify
78	Swedbank AB	Sprinklebit
79	Danske Bank A/S	MobilePay
80	Hongkong & Shanghai Banking Corporation Holdings PLC	Tradeshift
81	Santander Consumer Bank AG	iZettle
82	Santander Consumer Bank AG	Kabbage Inc.
83	Santander Consumer Bank AG	myCheck LLC.
84	Santander Consumer Bank AG	Ripple
85	Santander Consumer Bank AG	Socure
86	Santander Consumer Bank AG	Monitise
87	Santander Consumer Bank AG	Elliptic
88	Santander Consumer Bank AG	SIGFIG
89	Lloyds Banking Group plc	Worapay
90	BNP Paribas	Hello bank!
91	Banco Bilbao Vizcaya Argentaria	ATOM
92	Banco Bilbao Vizcaya Argentaria	Holvi
93	Banco Bilbao Vizcaya Argentaria	SpringStudio
94	Banco Bilbao Vizcaya Argentaria	MADIVA
95	Barclays PLC	analoganalytics

96	Barclays PLC	thelogicgroup
97	Barclays PLC	accesspay
98	Royal Bank of Scotland	Oakam
99	Royal Bank of Scotland	Funding Circle GmbH
100	Royal Bank of Scotland	Assetz Capital
101	Goldman Sachs Inc.	Square
102	Goldman Sachs Inc.	Digital Asset
103	Goldman Sachs Inc.	Funding Circle GmbH
104	Goldman Sachs Inc.	CompareAsiaGroup
105	Goldman Sachs Inc.	Nubank
106	Goldman Sachs Inc.	Plaid
107	Goldman Sachs Inc.	Bluefin Payment Systems
108	Goldman Sachs Inc.	FreedomPay
109	Goldman Sachs Inc.	UNX Inc.
110	Goldman Sachs Inc.	Momo
111	Goldman Sachs Inc.	Investshare
112	JP Morgan Chase & Co.	Square
113	JP Morgan Chase & Co.	Avant
114	JP Morgan Chase & Co.	OpenFin
115	Bank of Amerika Corp.	Yodlee
116	Wells Fargo & Company	EyeVerify
117	Citigroup Inc.	Digital Asset
118	Citigroup Inc.	Selerity
119	Morgan Stanley	Square
120	Morgan Stanley	SoFi
121	Morgan Stanley	Affirm
122	Morgan Stanley	Betabrand
123	Morgan Stanley	Moneytree
124	Santander Consumer Bank AG	Tradeshift
125	Santander Consumer Bank AG	Digital Asset Holdings LLC.
126	Santander Consumer Bank AG	PayKey
127	UBS Group AG	Fantex Inc.
128	UBS Group AG	UNX Inc.
129	Banco Bilbao Vizcaya Argentaria	Coinbase.com
130	Banco Bilbao Vizcaya Argentaria	Prosper Funding LLC.
131	Banco Bilbao Vizcaya Argentaria	Personal Capital Co.
132	Banco Bilbao Vizcaya Argentaria	Taulia GmbH
133	Banco Bilbao Vizcaya Argentaria	Kasisto Inc.
134	Barclays PLC	Square Inc.
135	Deutsche Bank AG	Inxight Inc.
136	Deutsche Bank AG	G2 Microsystems Inc.

II. Appendix II: Taxonomy Development Iterations

Iteration	Name of dimension	Approach (C2E, E2C)	Included characteristics of the dimension
1	Cooperation type	C2E	Acquisition, alliance, incubation
2	Innovation holder	E2C	Bank, fintech
3	Maturity of the innovation	C2E	Introduction / uncoordinated, growth / segmental, maturity / systemic
4	Entire taxonomy	E2C	No new characteristics, but additional input to better analyze the banking system and new objects
5	Bank type / Value chain location	C2E	Commercial bank, cooperative bank, savings bank / Customer common interface, channel solutions and interaction platforms, customer-oriented financial market infrastructure, core banking systems, financial market infrastructure
6	Fintech's maturity	E2C	Startup, 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 inputs to better analyze the literature on innovation types and new objects
10	Innovation type	C2E	Product, process
11	Innovation type	E2C	Bank-to-customer process, customer-to-customer process
12	Fintech holding a full banking 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	Bank's role	E2C	Services consumer, services provider
16	Fintech category / Bank's role	E2C	Cross-product services / Investor
17	Entire taxonomy	E2C	-