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CATCHWORD

Fintech

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1 Drivers and Evolution

1.1 Digitization of the Financial Services Industry

Digitization has a strong impact on the financial services industry. One major reason is that financial products are almost exclusively based on information. Examples are payment transactions or credit contracts which, in contrast to purchasing a car, do in most cases not include any physical components. Another reason is that most processes are almost entirely implemented without any physical interaction such as for example online payment or stock trading – exemptions are some physical forms of interaction such as client advisory. Due to recent developments in information technology (IT), the ongoing process of digitization is not only leading to an increasing automation of processes, but to a fundamental reorganization of the financial services value chain with new business models (e.g., robo-advisors) and new actors entering the market (e.g., Apple). The term "financial technology" or short "fintech" reflects this development of an IT-induced transformation. Among the drivers of this transformation are (Alt and Puschmann 2012, p. 204 f.; Alt and Puschmann 2016, p. 24 ff.):

- *Changing role of IT* Recent developments in information technology (IT) and their convergence, such as social computing, big data, internet of things or cloud computing enable financial services companies to not only automate their existing business processes, but offer the possibility to provide entirely new products, services, processes and business models for the financial services industry. Among the prominent examples are crowdfunding or peer-to-peer insurance platforms which have developed as complementary models to the ones of banks and insurance companies.
- *Changing consumer behavior* The use of electronic interaction channels by customers has grown over the last years and has forced many financial service providers to resize their branch and agent networks and reorganize their channel management towards hybrid client interaction and more customer self services (Nüesch et al. 2015). For example, in Germany banks reduced the number of branches from about 50,000 in 1990 to 34,045 in 2015 (Deutsche Bundesbank 2016) and the number of branch visits sank from 3 to 1 within 15 years (Pickens et al. 2009).
- *Changing ecosystems* Traditional banks and insurance companies have reduced their degree of in-house production (outsourcing) over the last decades which has led to a more focused specialization. This trend towards resizing internal operations started in the companies' back offices and has recently gained momentum in their front offices, too, leading to entirely new ecosystems including incumbents and fintech start-ups but also to the inclusion of companies from outside the financial services industry. A recent example is the cooperation of O2 Telefonica and Fidor Bank.
- *Changing regulation* Although after the financial crisis in 2008, regulation of the financial services industry

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increased in almost all areas, many countries have launched initiatives to lower entry levels for fintech start-ups in recent years. Examples are London, Singapore or Hong Kong which introduced a so called fintech "sandbox" for experimenting with new products and services and business models, foster market development with specialized organization units (e.g., Innovate Finance in the UK), and provide financial support (e.g., Monetary Authority of Singapore).

1.2 Fintech: The Fusion of "Fin"(ancial) and "Tech"(nology)

The term "fintech" is a contraction of "financial technology" and was most probably first mentioned in the early 1990s by Citicorp's chairman John Reed in the context of a newly founded "Smart Card Forum" consortium: "Speaking a language of cooperation between companies and across industries, (…) Citicorp has shed its historical insistence on calling its own technological tune. The harmony emanating from the Smart Card Forum has attracted about 30 dues-payers, including leaders from financial services and high technology. Another 30 have shown an interest in joining. Along with another Citicorp-initiated banking research project called Fintech, it tends to disarm any remaining criticism about Citicorp's being arrogantly out of touch with market preferences" (Kutler 1993).

As an umbrella term, fintech encompasses innovative financial solutions enabled by IT and, in addition, is often used for start-up companies who deliver those solutions, although it also includes the incumbent financial services providers like banks and insurers. This perspective is supported by a recent literature analysis which mentions (1) the application of IT in finance, (2) startups, and (3) services as the three top discussed topics of fintech publications (Zavolokina et al. 2016). Additionally, most of these publications focus on fintech as an enabler of innovations for the financial services industry. Thus, the term is closely related to the term "financial innovation", defined as the "(…) act of creating and then popularizing new financial instruments as well as new financial technologies, institutions and markets" (Tufano 2003, p. 310). Financial innovations distinguish different categories of innovation objects (Tufano 2003, p. 310; Frame and White 2014, p. 4): (1) Products and services, (2) organizational structures (e.g., outsourcing of credit processing) and (3) processes (e.g., online credit application and processing). Because fintech is based on IT as an enabler, these three objects are complemented by (4) systems (Alt and Sachse 2012, e.g., blockchain as a new financial infrastructure) as well as (5) business models (e.g., crowdlending) (Gimpel et al. 2016; Haddad and Hornuf 2016) as additional categories. These five innovation object categories are part of the fintech dimensions (complemented by innovation degree and scope as another two dimensions) which are used in Sect. 3 to differentiate fintech solutions.

1.3 Evolution of Fintech

Fintech is of high strategic importance for financial services companies. In banks, for example, IT costs account for 15–20% of all costs and thus are the second largest cost factor after labor costs (Gopalan et al. 2012). Traditionally, banks have the highest IT investments across all industries with 4.7–9.4%, whereas insurers invest 3.3% and airlines 2.6 of their revenues in IT. As the strategic importance of IT in financial services is high, the use of IT has a long history in the financial services industry with banks, insurance companies and other financial intermediaries being early adaptors (Lamberti and Büger 2008). The introduction of the automated teller machine (ATM) in 1959 in Arlington/Ohio (the first ATM in Europe was launched in 1967 by Barclays Bank in London), the transition from physical to electronic trading of NASDAQ in 1971, the introduction of home banking through Citibank and Chase Manhattan in 1981, the launch of the first internet banking facilities in 1994 by Stanford Credit Union as well as the first provision of mobile banking by the Norwegian Fokus Bank in 1999 mark the major milestones of early fintech development in the last century (Arner et al. 2015, pp. 9 ff.). But what are the areas of recent Fintech applications in the financial services industry? Three areas can be differentiated which reflect the development along five phases over the last decades (Arner et al. 2015, pp. 6 ff.; Alt and Puschmann 2016, pp. 36 ff.; see Table 1):[1]

1. *Internal digitization* (*phases* 1–3) The first area of IT use was focused on internal processes, such as payment transactions, or portfolio management. In the first phases of IT development, banks and insurers concentrated on the automation of financial services processes for efficiency gains. Companies offered only a single or later two channels (the branch/advisor or insurance agent and the ATM), and focused on support and later on back-office processes. Examples are electronic claims management or bank accounts. Integration of IT was not or only partially existent and developed in the third phase where first multi-channel approaches were developed.
2. *Provider-oriented digitization* (*phase* 4) In the fourth phase, financial service providers focused on the integration of providers. For this, they had to

[1] These evolution phases apply for developed economies, such as the USA or Western European countries. Other countries like for example China went through different phases of evolution of its fintech industry (see for example Shim and Shin 2016, p.174).

Table 1 Evolution of the digitization of the financial services industry (according to Alt and Puschmann 2016, pp. 36 ff.)

Phases characteristics	Phase 1: until 1960	Phase 2: 1960–1980	Phase 3: 1980–2010	Phase 4: 2010–2020	Phase 5: from 2020
Strategy focus	Single customer channel	Two customer channels	Multi customer channels	Cross customer channels	Hybrid customer channels
Organization focus	Support processes	Back-office processes	Front-office processes	Provider processes	Customer processes
Systems focus	No systems integration	Partial internal systems integration	Internal systems integration	External financial services provider systems integration	External non-financial services provider systems integration

standardize processes and application functions. The outsourcing of business processes started with support areas such as IT and later reached back-office areas like payments, investments and credit processing with the goal to reduce the degree of in-house production. Today this degree, however, is still high in the German speaking region with 73.8% in Germany, 77.5% in Austria and up to 90% in Switzerland. Other countries have a lower degree of in-house production in the banking area, such as for example Luxembourg with 50.7% or Sweden with 53.8% (Alt and Puschmann 2016, p. 31).

3. *Customer-oriented digitization* (*phase* 5) This area of Fintech application is centered around customers and their processes and redefine today's inside-out, product-centered logic towards new ecosystems. Individual channels may become obsolete with hybrid and overlapping forms of interaction based customer processes and journeys as the center of financial products and services design (Nüesch et al. 2015). First examples are electronic wallets including not only payment, but also the option to collect, store and spend loyalty points and other personal data. These new services include the development of peer-to-peer business models as well as the evolution of non-financial service providers from outside the industry.

2 Term and Approaches

2.1 Existing Approaches

Although the digitization of the financial services industry has a long history, literature on the term fintech has evolved just recently. An in-depth literature analysis identified that the annual number of publications didn't change in numbers until 2009 and remained at a stable level with approximately 3–10 publications per year (Zavolokina et al. 2016). Remarkably, from 2010 to 2015 the number of publications increased to a peak of 285 publications in 2015 (with 487 publications in total over all these years per 31 December 2015). A second important observation is that most of the publications are from newspapers and magazines while only a few scientific papers have touched the topic so far. A closer look at the existing scientific literature delivers some more insights on the focus perspectives:

- *Isolated vs. comprehensive perspective* Some of the existing publications concentrate on developing definitions for the term fintech (e.g., Arner et al. 2015, p. 4 ff.; Kang et al. 2016, p. 72f.). The definitions vary from focusing on certain financial processes, such as, e.g., payments or investments, to covering all areas of financial services (e.g., Chishti and Barberis 2016). In addition, most of the approaches focus on banking (e.g., Haddad and Hornuf 2016) while only a few consider insurance (e.g., Arner et al. 2015 (often termed as "insurtech"); Chuang et al. 2016, p. 3).
- *Alignment vs. enabler perspective* Some approaches see fintech as a possibility to better align business and IT in financial services companies (e.g., Lee and Kim 2015). An example is the application of fintech for the easier and more cost effective adaption of regulatory requirements (so-called "regulatory technology" – "regtech" (Arner et al. 2015, p. 30)). In contrast to this view, other publications focus on fintech as an enabler for new start-up companies or business models (e.g., Haddad and Hornuf 2016).
- *Cost savings potential vs. investments perspective* Some of the approaches analyze cost savings enabled through fintech by applying those solutions within banks and thus optimize intra- and inter-organizational business processes, for example reduced manual interactions (e.g., Lee and Lee 2016). Other approaches are centered around investments of venture capital in fintech solutions and analyze their future market potential (e.g., Skan et al. 2015).

- *Regulation vs. impact perspective* The regulation perspective has a focus on market barriers of fintech solutions and start-ups identifying hurdles and potential solutions such as regulatory sandboxes (e.g., Arner et al. 2015), while the impact perspective focusses on the (global) development of the fintech market in general (e.g., Kang et al. 2016) as well as on its impact and cases demonstrating the potentials (e.g., Lee and Lee 2016; Shim and Shin 2016). An in-depth analysis of the global fintech market in 64 countries shows that the USA are currently the largest fintech market, followed by the UK, Canada, India, and Germany (Haddad and Hornuf 2016, p. 21).

2.2 Examples

Current fintech solutions are delivered by banks and insurance companies as well as by non-banks/non-insurers as providers or financial services. Additionally, the evolution of fintech has shown that the focus has shifted from intra-organizational solutions to customer-oriented business-to-customer (B2C), customer-to-customer (C2C) and provider-oriented business-to-business (B2B) inter-organizational approaches. Thus, fintech solutions differ regarding the providers and the interaction types (Chan 2005) as well as regarding the banking and insurance processes they support (Haddad and Hornuf 2016, p. 4; see Table 2):

1. *Banks* Although many of the recent fintech solutions were developed from start-up companies from the non-banking sector (World Economic Forum 2015, pp. 13 ff.), banks have started to adopt many of these fintech solutions, too. Depending on the provider type (bank/non-bank) and the interaction type (B2C, C2C), fintech services either focus on the interaction between customers and banks or among customers only. Among the B2C examples are video conferencing (advice), robo-advisory (investments) and online credit application (financing). In contrast to B2C services, where banks are the primary provider, C2C-solutions focus on peer-to-peer-services and platforms. These solutions enable a direct interaction among customers without any provider or where these providers offer platforms for C2C-interactions. Examples are peer-to-peer payment or online customer communities.
2. *Insurers* Fintech solutions for the insurance industry cover insurance-related processes like client advice, life and non-life insurance, claims and risk management as well as cross-processes. Prominent examples are pay-as-you-drive solutions (non-life), where drivers share their vehicle usage data with insurers and in return receive a reduced insurance premium based on an individual risk evaluation, or drone-based claims analysis (claims management), where drones are used for claims inspection instead of humans. Other important areas are the use of big data analysis, for example in the case of the analysis of industrial accident insurances (risk management) to offer more personalized premiums and automated policy management (cross-process). In contrast to banking, most of the solutions in the insurance industry currently focus on B2C, while C2C services are rare.
3. *Non-banks* Non-banks split up into start-up companies and large IT companies such as Apple or Alibaba. In contrast to the incumbents, the non-banks' B2C fintech services focus on disintermediation of banks and very often concentrate on single activities, and a single provider typically does not cover all banking processes (Alt and Puschmann 2012, p. 209). Similarly, C2C interaction models offered from non-banks provide direct interaction among customers. In addition to the B2C and C2C interaction models, non-banks provide B2B fintech services which focus on cooperation among banks and non-banks. Among the examples of these B2B services are digital client advice (advice), personal finance management (payments), digital identity or stock analysis and prediction (investments) where banks source fintech solutions from non-banks.
4. *Non-insures* As in banking, most of the existing fintech solutions stem from non-insurers. They also cover all relevant insurance processes for B2C interaction, but in addition add new business models for C2C and B2B interaction. Examples for B2C business models are solutions for insurance broker management (advice), on-demand insurance products (life insurance), or big data-based catastrophe models (risk management). While the B2C area focuses on disintermediation and in most cases relies on insurance companies as service providers (e.g., the digital insurance broker model requires insurers that cooperate with this broker), the C2C model could provide the industry with more radical changes. A first example of such peer-to-peer insurance models is an online crowd-based life insurance approach, where a policy holder pays a premium only after an incident has happened to a fellow member.

Although all areas are covered by the fintech market, the maturity level of the various fintech solutions differ regarding the process areas covered. For instance, a recent study identified for the banking industry that the most important sector of the emerging fintech market is financing, followed by payment, cross-processes, and investments (Haddad and Hornuf 2016, p. 21).

Table 2 Fintech Examples (complemented from Alt and Puschmann 2016, pp. 101 f. and 224 f.)

Provider type	Banking process					
	Interaction type	Advice	Payments	Investments	Financing	Cross-process
Bank	B2C	Video conferencing (HVB, GER)	Social media payment (Commonwealth Bank of Australia, AUS)	Robo-advisory (UBS, CH)	Online credit application (Targobank, GER)	Online bank account opening (Fidor Bank, GER)
	C2C	Online customer community (Bank of America, US)	Peer-to-peer payment (Paymit, CH)	Community-based interest rate (Fidor Bank, GER)	Crowdlending (Hypothekarbank Lenzburg, CH)	Social network (Fidor Bank, GER)
Non-bank	B2C	Personal finance management (Mint, US)	Cryptocurrency (Bitcoin)	Multi-asset trading (360t.com, GER)	Corporate credits (Finpoint, GER)	Electronic data safe (SecureSafe, CH)
	C2C	Community-based advisory (Wikifolio, AUT)	Mobile Payment (Square, US)	Covesting (Covestor, US)	Crowdlending (Lendico, GER)	Loyalty points marketplace (PointsPay, CH)
	B2B	Digital client advice (FolioDynamix, US)	Personal finance management (Meniga, SE)	Stock analysis and prediction (Stockpulse, GER)	Crowdlending (PostFinance and Lendico, CH)	Digital identity (WebID Solutions, GER)

Provider type	Insurance process						
	Interaction type	Advice	Non-life insurance	Life insurance	Claims management	Risk management	Cross-process
Insurer	B2C	Personalized marketing (Manulife, CA)	Pay-as-you-drive (Progressive, US)	Online contracting (Haven Life, US)	Drone-based claims analysis (Erie Insurance, US)	Big data analysis of industrial accident insurances (CA, US)	Automated policy management (EZLynx, US)
	C2C	–	Crowd-based liability insurance (Lloyd's of London, UK)	–	–	–	–
Non-insurer	B2C	Digital insurance broker (Knip, CH)	Pay-how-you-drive (Metromile, US)	Life style-dependent premium (Sureify, US)	Mobile claims management (Snapsheet, US)	Risk data management (QuanTemplate, US)	Online reinsurance calculation (EazyRe, GER)
	C2C	Online rating (Comparis, CH)	Sharing economy insurance (Geario, US)	Crowd-life insurance (Shacom, TW)	No-claims bonus (Friendsurance, GER)	Crowd underwriting (Guild, AU)	Donations from insurance premiums (Givesurance, US)
	B2B	Insurance broker management (Zywave, US)	Sensor-monitored householders' insurance (Allianz and Panasonic)	On-demand insurance products (Slice Labs, US)	Buy, compare and manage insurance policies and claims (Embroker, US)	Big data-based catastrophe models (Praedicat, US)	Compliance and reporting (Tango, US)

3 Dimensions of Fintech

Because fintech solutions are closely connected with financial innovations regarding products and services, organizations, processes, systems, and business models, they generally differ regarding these objects. A more comprehensive view is given when complemented by the dimensions innovation degree and innovation scope (Tufano 2003, p. 310; Frame and White 2014, p. 4; Alt and Sachse 2012; Gimpel et al. 2016; Haddad and Hornuf 2016):

- *Innovation object* According to the five different categories of financial innovations, business models, products and services, organizations, processes and systems can be distinguished as the primary fintech innovation objects. An example for the first category are crowd-lending platforms such as Lending Club, which make banks redundant for credits. Video advice is a prominent example for the products and services area. Here, client advisors interact with their clients through video chats without physical contact. A third category are organizational innovations like the outsourcing of credit processing from a bank to a service provider. Other objects are certain processes as for instance online credit application and processing for mortgages which until now very often were paper-based processes. Finally, systems innovations, for example the blockchain as a new financial infrastructure (Mori 2016), focus on new types of applications.
- *Innovation degree* Technology in general and fintech especially can have different performance effects that can either be incremental or disruptive (Foster 1986). While incremental fintech solutions lead to an optimization of the status quo with regard to quality, time and/or cost, disruptive technologies often feature inferior performance in the early stages of their evolution, but in their later development lead to fundamental changes of the entire value chain (Bower and Christensen 1995). An example for the first category are remote deposit capturing apps for mobile phones which allow users to optimize their payment processes by simply photographing a payment slip instead of typing the data into their online banking system. In contrast to this, an example for a disruptive innovation would be a blockchain-based peer-to-peer payment system like Bitcoin which completely changes the entire existing payments value chain and allows users to conduct payment transactions without banks.
- *Innovation scope* Fintech innovations differ regarding their intra- or inter-organizational scope. While intra-organizational innovations focus on internal, micro-economic changes of innovation objects in one of the five categories, the latter focuses on macro-economic structures with changes of the value chain. An example for the first category are electronic B2B marketplaces like DNAppstore which allow banks to source and integrate different applications from different providers based on a homogeneous semantic platform. An example for the other category is a new payment value chain for electronic wallets through co-operations of banks, credit card processors and non-banks such as ApplePay, which makes banks superfluous for mobile payments. Another example are cryptocurrencies as an entirely new inter-organizational solution for the organization of payments in a society.

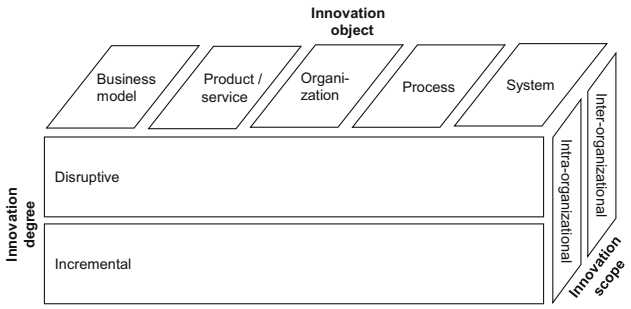

Fig. 1 Dimensions of fintech

Summarizing these three dimensions, this paper defines the term fintech as incremental or disruptive innovations in or in the context of the financial services industry induced by IT developments resulting in new intra- or inter-organizational business models, products and services, organizations, processes and systems (Fig. 1).

4 Further Research

Scientific literature on fintech is still rare. As this paper has shown, the already existing fintech solutions as well as the potential areas of innovation enabled through fintech are steadily increasing. The three identified fintech dimensions for innovation may serve as a guide for future research:

First, innovations affect different kinds of fintech objects. Examples are new services like chat bots, artificial intelligence-based advice services, or mobile bank accounts. But, since many of these fintech solutions are still in their early phases of development, it remains unclear how consumers will adopt them. Further research could focus on questions like: What are innovations patterns in fintech with regard to single objects (products and services, processes, etc.) and the interrelations among them (e.g., what are the interrelations of new systems and new business models etc.)? An example are system-based innovations through blockchain technology enabling entirely new

products and services (e.g., smart contracts instead of traditional contracts), processes (e.g., C2C instead of B2C), organizational forms (e.g., decentralized instead of centralized organization), and business models (e.g., customer-driven data models instead of company-driven data models). Another example is a new digital identity service enabling new processes and products such as online authentication and multi-vendor financial service bundling. Additionally, an important question will be how clients will adopt fintech solutions that are offered by non-banks/non-insurers.

Second, regarding the innovation degree many fintech innovations have concentrated on incremental improvements such as mobile payment solutions based on "mature technologies" (e.g., mobile phone camera) that are used to optimize existing business processes. A next step are so-called disruptive innovations which are often induced by a new so-called "pacemaker technology" or by the convergence of two or more of them (Hacklin et al. 2004, p. 32). An example are smartphones which in combination with apps have revolutionized communication. One intensively discussed pacemaker technology in the context of financial services is the blockchain (Mori 2016). Potential questions in the context of fintech are: What are the strategic implications of this convergence process for financial services with regard to innovation objects, namely business models, products and services, organizations, processes and systems? Which technology-induced innovations have a disruptive effect and what is their impact on the industry's value chain? How can lessons learned from other industries be used as analogies to deduce the impact on financial services?

Third, the innovation scope encompasses both, intra-organizational, micro-economic issues and inter-organizational macro-economic impacts. The micro-economic perspective could lead to a transformation of banks and insurers towards more decentralized, networked entities, each of them focusing on single tasks, a development recently termed as hyperspecialization or crowdsourcing (Malone et al. 2011). In such a scenario, electronic service marketplaces for C2C, B2C and B2B interactions play an important role to match demand and supply in highly specialized value chains. For this, business and technology platforms enable multi-lateral relationships among all relevant stakeholders (Kauffman and Ma 2015, p. 261). On the other hand, from the macro-economic perspective the line between established industry sectors are becoming blurred, which may lead to a re-definition of the well established Standards Industrial Classification System (SIC) that defines industries such as, e.g., "Retail Trade" or "Finance, Insurance and Real Estate". Examples for financial services are on-demand insurances or payment services for cross-mobility services. Another important development are new hybrid market forms such as the sharing economy where financial services also play an important role (Puschmann and Alt 2016). Among the questions are: What are future organizational forms from a micro- and macro-economic point of view which support this new order? Which standards are needed to provide a higher degree of specialization in the financial services industry? What are the components of a distributed financial infrastructure that support these evolving innovations along all innovation objects and among all involved market actors (e.g., regulation, logistics, price comparison, etc.)?

In summary, the described developments enabled through fintech have already had a strong impact and will in the future have an even stronger one on the financial services industry, leading to a fundamental reorganization of the whole industry. Although many examples of this evolution can already be observed, many more of them are likely to appear in the future. The information systems domain may contribute with its strong interdisciplinary approach by providing research from various perspectives and by linking engineering, computer science, business, marketing, and other disciplines.

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