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The evolution of the financial technology ecosystem : an introduction and agenda for future research on disruptive innovations in ecosystems

Author(s): Palmié, Maximilian; Wincent, Joakim; Parida, Vinit; Caglar, Umur

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Financial technology ecosystem evolution: An introduction and agenda for future research on disruptive innovations in financial services ecosystems

Abstract

At a time where many mature industries are fundamentally shaken up by disruptive innovations, prominent examples such as Apple and Uber demonstrate that, currently, disruptive innovations often originate in the ecosystems or system level rather than ‘standalone’ firms. Unfortunately, the academic literature has so far paid little attention to the role of ecosystems development and evolution in relation to disruptive innovations. To overcome this limitation, our study defines what ‘disruptive innovative ecosystems’ are and shows the impact that the financial technology (FinTech) ecosystem has had in disrupting the financial service industry. We offer an agenda for future research on disruptive innovations and ecosystems, and discuss the evolution of the FinTech ecosystem. Overall, our study indicates that disruptive innovative ecosystems are not only in need of but are deserving of further attention.

Keywords: Disruptive innovation, digitalization, ecosystems, financial technology, FinTech, Artificial Intelligence, entrepreneurship, incumbents

1. Introduction

Our times are characterized by an increasing number of disruptions that fundamentally disturb and re-order the way in which firms and industries operate (Kumaraswamy et al., 2018; Snihur et al., 2018). Not surprisingly, academics and practitioners alike have developed a strong interest in disruptive innovations and seek to better understand how such innovations impact firms and industries (Christensen et al., 2018; Hopp et al., 2018; Ozalp et al., 2018). At the same time, scholars and managers have also developed a deep attraction to dynamic, multi-company systems as a new way of organizing economic activity, i.e. ‘ecosystems’ (Adner, 2017; Jacobides et al., 2018; Scaringella and Radziwon, in press).

These two areas of interest crucially intersect because many disruptive innovations are developed and commercialized in and by ecosystems rather than ‘standalone’ firms (Fuller et al., 2019; Kumaraswamy et al., 2018; Ricciardi et al., 2018; Walrave et al., 2018). Unfortunately, our knowledge of how ecosystems around disruptive innovations emerge and how they disrupt existing industries is still severely limited (Kumaraswamy et al., 2018; Ozalp et al., 2018). Overall, only a few studies thus far have examined the disruptive innovation–ecosystem intersection. These studies have predominantly analyzed how existing ecosystems are affected by disruptive innovations (Ansari et al., 2016; Medialdea et al., 2018; Ozalp et al., 2018; Snihur et al., 2018). In contrast, the emergence of new ecosystems around disruptive innovations and the impact of these disruptive innovative ecosystems on established industries has received less attention. Walrave et al. (2018) theorized how ecosystems around disruptive innovations can increase their socio-technical viability. Sandström (2016) examined how the ecosystem around a possibly disruptive innovation (3D printing) emerged, but concludes that this innovation was non-disruptive in the context under investigation (the hearing aid industry). Several scholars have, therefore, called for

further research to overcome the limitations in our knowledge thus identified (Christensen et al., 2018; Gomes et al., 2018; Hopp et al., 2018).

Our paper responds to these repeated calls and sets forth our knowledge on the emergence and impact of ecosystems around disruptive innovations. To this end, we first develop the concept of disruptive innovative ecosystems by integrating recent insights on disruptive innovation with the literature on ecosystems. We, then, study the emergence of the ecosystem around financial technology ('FinTech') and its impact on the financial services sector to explain how ecosystems around a disruptive innovation emerge and affect established industries. Finally, we propose an agenda for future research on disruptive innovation ecosystems.

By advancing knowledge on the emergence of disruptive innovative ecosystems and their impact on established industries, our study makes an important contribution to the literature. Our carefully selected single case study of the FinTech ecosystem has considerable merit in helping researchers understand the concept of disruptive innovation ecosystems. It also follows in the tradition of this type of research. Clayton Christensen's (1997) analysis of the emergence of disruptive technologies in the area of disk drives and their impact on the disk-drive industry shows that such a study can provide a foundation for a highly influential and flourishing literature stream (Christensen et al., 2018).

2. Theoretical background

2.1. Disruptive innovation

In the foundational work on disruptive innovation (e.g., Christensen, 1997; Christensen and Raynor, 2003), the label 'disruptive' was used to designate an innovation that has no initial appeal to mainstream customers of the established product because it performs worse on a key

performance dimension. Simultaneously, the innovation outperforms the existing offering on some other dimension(s), which makes it attractive to the ‘low-end’ customers of the established product and/or new markets. As ongoing technological progress continuously improves the innovation’s performance on the former dimension, more and more customers of the original product switch to the innovation so that the market share of the old solution progressively erodes (Chen et al, 2018; Kumaraswamy et al., 2018; Schmidt and Druehl, 2008).

Most of the time, however, the term ‘disruptive innovation’ is used in a broader sense, viz. to designate any innovation that shakes up an industry and substantially changes its competitive patterns (Christensen et al., 2015; Kumaraswamy et al., 2018). Following this prevalent practice, we decided to adopt a wider perspective for two reasons: First, a broader view not only dominates academic and managerial discussions in general but also the emerging literature at the intersection of disruptive innovation and ecosystems in particular (e.g., Ansari et al., 2016; Ozalp et al., 2018). Second, relatively inclusive perspectives are commonly applied in the initial exploration of a new field in the social sciences. Subsequent research can then endeavor to refine them.

Specifically, we build on Christensen et al. (2018) and call an innovation ‘disruptive’ when it does not improve performance along the established ‘customer-preference trajectory’ – i.e., along the dimensions that customers historically valued – but introduces a new, hitherto ‘unique constellation of attributes’ (e.g., small, lightweight, rugged; Christensen et al., 2018: 1047).

Prior research has illuminated several mechanisms that can explain why disruptive innovations frequently pose difficulties for incumbents (see Christensen et al. (2018) for an overview): First, an incumbent’s resource-allocation process may favor adherence to the established customer-preference trajectory. Likewise, some of the popular financial valuation metrics can easily produce a bias against certain types of innovation (e.g., ratio-based metrics may

encourage managers to shrink the denominator by reducing assets instead of increasing the numerator by investing in innovation). Second, some critical resources on which the incumbent depends for survival may reside with its existing customers. Hence, the incumbent may shy away from innovations that do not prioritize these customers. Third, overlap between different market segments can motivate incumbents to retreat to uncontested higher tiers of the existing market as disruptors invade their market from the low end.

The literature has also examined a number of strategies by which incumbents can respond to entrants with disruptive innovations (again, see Christensen et al. (2018) for an overview). Additional investment in current customer-preference trajectories to combat disruption or moving to other market segments are just two of the options. Prominent alternatives are implementing dual structures or other forms of organizational ambidexterity to engage in the different types of innovation simultaneously, and co-opting disruptive entrants (e.g., partnering with entrants, licensing their technology, or acquiring them). Therefore, disruptive innovations do not necessarily cause incumbents to fail.

These response strategies highlighted by previous research suggest that incumbents may face somewhat different opportunities and challenges when disruptive innovations originate from ecosystems rather than individual entrants. On the one hand, an ecosystem as a multi-company system tends to be resource richer than an isolated firm. These higher resource endowments could limit the effectiveness of incumbents' investments in seeking to counter the disruption and diminish their ability to acquire the disruptor or license its technology. On the other hand, its inherently multi-organizational nature could present incumbents with more favorable conditions for joining the ecosystem than does an isolated disruptor.

Such differences across ecosystems and individual disruptors pinpoint the value of studying disruptive innovations in the context of ecosystems in addition to the traditional disruptive innovation research. The editorial of a recent special issue on disruptive innovation corroborates this assessment as it reflects on the state of the literature:

“However, the theory (as originally framed) does not adequately address the dynamics of a number of innovations such as Apple’s iPhone or Uber’s ride hailing platform (also see The Economist, 2015). Many of these innovations are systemic, serve as platforms for others to build on, and disrupt existing relationships among the members of entire industries and ecosystems instead of affecting just specific incumbents (as in the case of standalone products or services offered by individual firms).” (Kumaraswamy et al. 2018: 1027)

2.2. Ecosystems

While the biological term ‘ecosystem’ gained traction since its introduction to the management field in the mid-1990s (Moore 1993, 1996), its use by business scholars and practitioners has witnessed an outright ‘boom’ (Jacobides et al., 2018: 2256) in the last couple of years (Adner, 2017; Fuller et al., 2019; Scaringella and Radziwon, in press). In his pioneering work, Moore defined an ecosystem as:

“[a]n economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world. This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organisms also include suppliers, lead producers, competitors, and other stakeholders. Over time, they

coevolve their capabilities and roles, and tend to align themselves with the direction set by one or more central companies.” (Moore, 1996: 26)

Moore (1993, 1996) “did not establish rigorous correspondence rules between natural and business ecosystems [..., but used the ecosystem terminology to present] an extended (though persuasive) metaphor” (Oh et al., 2016: 4). It is, therefore, not surprising that the popularity of the term has led to some variations in the way in which business scholars and managers have applied it. Several recent efforts provide overviews of these variations (Jacobides et al., 2018; Scaringella and Radziwon, in press; Tsujimoto et al., 2018). According to these reviews, two variations of the definition are particularly common. The first variation highlights a specific innovation or value proposition, i.e. the ecosystem produces a “coherent, customer-facing solution” (Adner, 2006: 98). The second variation emphasizes technological platforms through which platform sponsors and the providers of complements provide value to customers (e.g., Gawer and Cusumano, 2014). These two variations advance a narrower conceptualization of an ecosystem than Moore’s original definition in that an economic community of interacting organizations is likely to offer more than one ‘coherent solution’ to customers – and may feature more than one platform. Applying one of the alternative conceptualizations to these plausible scenarios would split the economic community – i.e. the ecosystem in the sense of Moore (1993, 1996) – into several smaller ecosystems. As in the case of disruptive innovation, we believe that adopting a broad perspective is appropriate in initiating research on disruptive innovative ecosystems. Again, subsequent efforts can work to refine it.

Across variants, scholars widely agree that ecosystems are characterized by complementarities in production and/or consumption and that the members of the ecosystem can coordinate these complementarities without hierarchical governance (Jacobides et al., 2018: 2263).

Given such complementarities, the ecosystem members continue to exhibit significant interdependence, even though they might not be bound by contractual arrangements (Jacobides et al., 2018: 2258). Consequently, the well-being of each individual member largely depends on the fate of the ecosystem as a whole (Iansiti and Levin, 2004).

2.3. *Disruptive innovation ecosystems*

Adner (2017) argues that ecosystem thinking is not always equally important for strategy making and strategy research:

“In mature industries, much of the ecosystem is latent most of the time. The activities, actors, positions, and links are stable; to the extent that there is change, it is at the level of individual actors or dyads (e.g., new products launched through established channels; rivalry among actors in the same positions) rather than affecting the structural alignment of multilateral positions. In such settings, the ecosystem has the taken-for-granted character of routine-as-truce (i.e., Nelson & Winter, 1982). It is when innovation requires a change in the configuration of these elements that the ecosystem becomes apparent and where consideration of ecosystem dynamics becomes critical for crafting and understanding strategy.” (Adner, 2017: 44)

This reasoning corroborates the assessment that the intersection of disruptive innovation and ecosystems is worthy of further investigation since disruptive innovations can normally be expected to possess greater potential to disturb the configuration of an existing ecosystem than non-disruptive (“sustaining”; Christensen et al., 2015) innovations. Combining the above delineations on disruptive innovations and ecosystems, we define an ecosystem that develops a

disruptive innovation and subsequently emerges around this innovation – a ‘disruptive innovative ecosystem’ – as follows:

“A disruptive innovative ecosystem is an economic community of interdependent actors that – without hierarchical governance – coevolve around an innovation which does not exclusively improve performance along the dimensions that customers historically valued, but along at least one hitherto neglected dimension. These actors (organizations and individuals) display complementarities in the production and/or consumption of products and/or services related to this innovation.”

Established disruptive innovation theory (e.g., Christensen et al., 2015, 2018) emphasizes the potential of disruptive innovations to grow into a position of dominance in the market that they had previously disrupted. When the disruptive innovation is not developed by a ‘standalone’ company but is embedded in an ecosystem, this effect is likely to be strengthened. Complementary innovations developed by other members of the ecosystem can substantially increase the disruptive innovation’s appeal to customers (Adner, 2006). Moreover, a disruptive innovation backed by a multi-company system may be able to grow faster than a disruptive innovation backed by a single firm because the greater number of supporting players can be a source of additional legitimacy. This ‘legitimacy-by-numbers’ effect can increase the innovation’s acceptance among society, policy-makers and regulatory bodies, as well as capital investors who tend to ‘trust’ an innovation more when its fate does not depend on a single economic actor (Carayannis and Campbell, 2009; De Clercq et al., 2006; Hillman and Hitt, 1999).

With these predictions in mind, we go to describe the evolution of the FinTech ecosystem.¹

¹ As we acknowledge in section 2.2, the analytical purpose and the definition of ecosystem used may make it more appropriate to say that the FinTech ecosystem actually consists of various smaller ecosystems. Since we are

3. Research methods

3.1. Study context

Many established industries such as banking and finance, healthcare, insurance, tourism, and transportation face the risk of being disrupted by emerging digital technologies (e.g., Blajer-Gołębiowska et al, 2018; Guttentag, 2015; Lee and Trimi, 2019; Rajapathirana and Hui, 2018). The research context for this study is the emergence of financial technology (FinTech). FinTech has evolved rapidly to reshape banking, payment, commerce, financial investment, and even money. This FinTech ecosystem of incumbent and entrepreneurial actors has benefited from technological advancements in online payments, cryptocurrency and artificial intelligence, and it has created innovation applications that have proved disruptive to incumbents. FinTech is a new realm for banking and finance industries. Its underlying logic is to apply solutions provided by information-technology-based services to increase efficiency in financial markets and banking transactions for consumers, banks, businesses, and all ecosystem members. New trends in the financial industry have led to new financial service products that can change the way financial service firms operate as well as the way consumers transfer, borrow, and manage their wealth and assets. The emergence of FinTech represents an industry system-level change that has led to the

interested in the aggregated effect of the ecosystem(s) on the established industry, we opted for the conceptually more parsimonious solution to talk about one ecosystem. We are not the first authors to talk about the FinTech ecosystem as if it was a single ecosystem (Lee and Shin, 2018). This more inclusive conceptualization is consistent with an argument made by Christensen et al. (2006). Christensen et al. (2006: 101) point out that, in the case of disruptive innovation, “the innovations, not the organizations, are being considered. In the case of MinuteClinic, for example, the innovation is low-cost, walk-in clinics in high-traffic areas such as drug stores and shopping malls and not the MinuteClinic brand itself. It is easy to confuse the two, but a [...] consideration of disruptive innovations] needs to focus on the solution first and then look at how it is, or could be, implemented.” Applying their argument from the single-firm to the ecosystem context, a consideration of the emerging ecosystem(s) around a disruptive innovation as a whole should be the first step and a consideration of how the ecosystem(s) can be differentiated into smaller ecosystems should come later. However, we do not deny that using another conceptualization of an ecosystem can equally lead to interesting insights. In fact, we propose the use of alternative conceptualizations as an avenue for future research.

emergence of new actors and the convergence of competencies. FinTech thus provides a relevant research context for the study of disruptive innovation ecosystems.

The FinTech ecosystem with its stakeholders has grown appreciably in recent years because of substantial investment (Lee and Shin, 2018). Total investment in FinTech as of March 2016 reached nearly USD 33 billion, whereas the figure for 2014 was only USD 3.4 billion (Strategy&, 2015). A few years ago, most FinTech investments were located in the US. However, the rise of China as the dominant force in FinTech transaction value since 2016 has signaled its ongoing expansion in other parts of the world. European countries, especially the UK and Germany, have, in similar vein, experienced significant innovation in recent years.

The technology offerings and market penetration of FinTech companies, which numbered 248 in 2014, have continued to grow. The number of FinTech companies reached 1,379 in 2016 (Venture Scanner, 2016). FinTech companies operate in various areas, causing disruption and introducing innovation to traditional financial products and services. While Bitcoin and other cryptocurrencies continue to attract considerable attention from investors and the media, other areas of FinTech such as robo-advisors, InsurTech, and retail banking have garnered greater recognition in recent years.

3.2. *Data and analysis*

This study uses explorative qualitative and secondary data since the current knowledge about the topic of FinTech is limited. More specifically, we conducted 78 expert interviews with senior-level executives from a range of organizations (e.g., banks and private investors) and institutions (e.g., governments and international regulatory agencies) to gather insights into how FinTech disrupts the banking system and, more importantly, how the emergence of new

technologies shape the ecosystem. These respondents were selected on the basis of their hands-on knowledge and ability to provide varying perspectives on the evolution of the FinTech industry. The interviews were conducted over a period of three to four years and averaged 50 minutes per respondent.

The respondents held different company positions: investment analyst, fund manager, compliance officer, financial expert, regulator, trader, and so on. The following questions were asked during the interviews: How has the journey for your organization been in terms of adapting to financial technology transformation? How would you categorize the FinTech applications in your industry? What are the common challenges and opportunities related to FinTech? How are other ecosystem actors adapting to FinTech? How has the emergence of FinTech transformed your industry dynamics and the position of actors? The interviews were executed by the third author, who has an industry background as a consultant.

We also analyzed white papers, reports, and blogs to understand this disruptive ecosystem, which has had one of the largest impacts in the last decade. In order to develop an empirically grounded framework for disruptive innovation ecosystems in the FinTech industry and various insights thereof, we followed the steps recommended when using constant comparison techniques (Strauss and Corbin, 1990; Nag et al., 2007). This technique enables researchers to identify empirical patterns in a large and complex dataset. The method calls for a series of iterations to discover different themes and uncover various dimensions in order to develop theoretically and empirically grounded frameworks, such as a disruptive innovation ecosystem roadmap. The focus in the initial step is placed on open coding the interview data and documentation to retrieve common terms or labels the respondents provided. In the next step, we began to identify patterns and links within the categories in order to develop empirically driven

but theoretically valid themes, such as different technology applications in financial services. The final step involved generating an illustrative framework that connects data and codes at a higher level of abstraction, such as the proposed framework. To ensure rigor and increase confidence in the analysis, multiple members of the research group developed the coding scheme independent of each other, in the first instance. Where a lack of agreement existed, the coding scheme was discussed and modified until consensus was reached. This provided an independent perspective on the trustworthiness of the coding schemes (Lincoln and Guba, 1985).

4. Findings

This section has three sub-sections. In the first, we discuss the technological disruptions that have driven change in the ecosystem. In the second, we discuss the key financial technological applications that have been introduced. In the final sub-section, we present a FinTech disruptive innovation ecosystem roadmap based on a longitudinal perspective.

4.1. Emergence of financial technologies (three waves of technological changes)

4.1.1. Wave 1: Electronic payments

The development of the Internet and smartphones has increased the popularity of electronic fund transfers through online banking and mobile payment. The transition from traditional cash to digital money has blurred the line between money and data. Transactions such as paying for taxi fares and restaurant bills can now be made using software applications (apps). Consumers are now offered more payment methods than ever before.

Emerging technologies in money transfer on the Internet offer new opportunities for businesses as well as governments. New low-cost, open-source technologies such as ‘Blockchain’

allow businesses to reach a larger number of customers, including those in neglected market segments. Businesses can also focus on the deficiencies of financial services in providing services that are not available under the existing infrastructure. These include digital payment, money transfers, and loans. New technologies also offer more convenient methods for international digital commerce and create a new and constantly expanding mobile workforce.

The formation of a FinTech ecosystem is an important factor prompting the type of technological innovation that facilitates the creation of more efficient financial markets and systems (Strategy&, 2015). A developed FinTech ecosystem can also attract greater talent and generate more business ideas, leading to the growth of opportunities in a variety of sectors including wealth management, electronic payments, trading platforms, insurance, and regulations.

4.1.2. Wave 2: Blockchain and cryptocurrency

The blockchain and cryptocurrency category comprises companies that provide products and services relating to blockchain technology and cryptocurrencies. Blockchain is a shared database, best known as the technology that supports Bitcoin and other cryptocurrencies. Cryptocurrency is a kind of digital asset that uses cryptography to enable secure transactions and verify the transfer of assets. Bitcoin is the first and the most well-known cryptocurrency (Telegraph Reporters, 2018). Blockchain companies develop and implement blockchain technology, whereas cryptocurrency companies provide products and services such as trading and storing of cryptocurrencies.

Companies in this category provide a wide range of services. Cryptocurrency mining companies focus on developing hardware, software, and other services for mining cryptocurrencies. A large group of companies in this category focus on currency trading by

providing trading platforms for cryptocurrencies. These platforms normally allow their users to exchange cryptocurrencies for fiat money. In addition, some companies operate in wallet services; they provide software wallets for cryptocurrency storing and transfer services for cryptocurrencies or money. Another group in this category comprises companies that provide peer-to-peer (P2P) market platforms or lending platforms.

Example of companies in this area include LocalBitcoins, Prasos, and Coinia Wallet. Swiss blockchain and cryptocurrency companies, which are the most significant in terms of innovation, include Ethereum, Xapo, Monetas, iProtus, Metaco, Bitcoin Suisse AG, Bitfinitum, Bity, SwissMine, and CryptoCash.

Blockchain is probably the first term that comes to mind with reference to FinTech currency. The reason is that Blockchain is a shared database that has attracted considerable attention from the public in recent years. It is best known as the technology that supports Bitcoin and other cryptocurrencies. Thanks to the popularity of Bitcoin, Blockchain has gained a competitive advantage and momentum.

Bitcoin transactions and blockchain business models still have a limited number of uses, and FinTech transaction volumes are still quite modest compared to the entire financial services market. Their impact has been notable, as reflected in increasing investment in Blockchain as well as Bitcoin and other cryptocurrencies.

Blockchain technology and its potential applications have received the approval of many technology employees in the financial industry and Bitcoin dissidents because of their benefits and applicability to finance. Although some investment bank leaders have been skeptical about the technology, which could introduce high risks through security breaches and fraud during financial transactions, they have also praised the technology behind Bitcoin as a “good” and “useful”

technology that facilitates a range of outcomes (Glazer, 2016). For example, blockchain technology allows stock traders, including buyers and sellers, to interact directly without a third party. All transactions can be recorded almost immediately. Thus, the financial industry has taken a keen interest in the development of blockchain because of its potential applications in streamlining financial transactions and extending services to customers. Several major investment banks in the US including JP Morgan Chase and Goldman Sachs, as well as their counterparts in Europe, have conducted research into blockchain and have begun to develop projects for internal use.

4.1.3. Wave 3: Artificial intelligence

During this stage, the ecosystem is transformed by Artificial Intelligence. Artificial intelligence captures the intelligence that can be exhibited by machines. The concept of Artificial Intelligence in the financial sector centers on devices that can interpret and understand tasks, and take action to complete those financial tasks. For example, the devices can be robo-advice, digital brokers, and assorted devices used in trading, tax management and trade decision-making. With artificial intelligence, there is a high degree of automation and efficiency improvements, which are most readily apparent in investment platforms and portfolio management. Many previously unique and high-value-adding banking services and products disappear. With increasing customer maturity and adaptation to artificial intelligence, new kinds of customer needs emerge. Several of the known incumbents experience significant challenges in adapting, and new entrants take over and become important players. While this occurs in many areas in the finance system, Artificial Intelligence can be found at the core of many product and technology areas today. Among them are RegTech (regulatory technology), which refers to FinTech companies that help customers with the

compliance process, and Wealth management, which captures an area of FinTech that includes companies offering alternative wealth management services and technology-enabled solutions.

4.2. *Development of financial technological applications*

4.2.1. *Banking*

Banking FinTech companies provide alternative banking solutions for retail banking. Their services include digital lending, personal finance, online and mobile banking, P2P lending and investment management. P2P lending companies allow their clients to access funds on a P2P lending basis, with clients borrowing directly from lenders. Some companies provide digital lending services in which they directly lend funds to borrowers. This category includes companies that offer personal finance and investment management services. These companies provide tools and advice for clients to manage their accounts as well as providing various financial planning and investment services. Finnish companies in this category include Holvi and Euroloan. Swiss FinTech banking companies include Contovista, Flynt, MoneyPark, Numbrs, and Qontis.

Online banking has become popular as the smartphone market has grown (Hussain et al., 2019). An estimated 46% of consumers use only digital channels such as mobile phones, PCs, and tablets for banking services, which represents a huge increase from 27% in 2012. Young consumers are reported to be the main users of mobile banking, with 82% of smartphone owners between the ages of 18 to 24 years using mobile banking (PwC, 2017).

The development of new technologies and smartphones has created openings for new digital-only banks that provide exclusively online services via several digital applications. The new generation of FinTech banks can operate without offices or facilities, which significantly reduces brick-and-mortar costs. Free from the cost of physical locations and benefiting from new

technologies, FinTech digital-only banks can introduce lower rates and fees to clients along with innovative services. By using the benefits of FinTech and its technologies, banking platforms can offer more user-centric services to meet the needs of individual clients. Digital-only banks offer clients around-the-clock accessibility without the need to visit a branch during office hours to access banking services. In the US, a survey found that four out of 10 Americans had not visited a bank branch in the previous six months (LaPonsie, 2016).

While digital consumers have shifted their preferences to online and mobile banking, they also have higher expectations regarding online services. They demand easy-to-use digital services with seamless approval and flawless processes. Digital-only banks have the advantage of allocating all their resources to the supporting technology in order to enhance clients' digital experience and meet this emerging need.

Digital-only banks possess great potential to flourish in the years ahead. However, they still face the challenge of building a customer base from scratch. Most customers are still reluctant to transfer their money from well-known established banks to new start-up banks. Surveys have shown that 62% of respondents still believe in the importance of local bank branches, and 25% of respondents refuse to open an account with a bank that has no local branches (PwC, 2017). This challenge has placed digital-only banks at a clear disadvantage with respect to traditional banks. However, if and when these digital-only banks gain the trust and favor of the public, their position may change for the better, and their influence on the way financial services are provided may become considerable.

4.2.2. Payments

FinTech payments are one of the largest components of FinTech. FinTech payment companies provide electronic payment services; these services vary from consumer needs to trading in markets and mobile or Internet commerce. Companies in this category offer point-of-sale (POS) payment services such as digital storefronts. Digital storefronts, or cyber storefronts, refer to websites that sell products and services. Other payment services offered by FinTech companies in this category include personal payment services and mobile or online payments. To meet the needs of the emerging trend of cryptocurrencies, some payment companies offer Bitcoin payment services, allowing customers to use digital currency for fast and secure payment. Some companies in this category also offer fast and affordable digital solutions for money transfers.

Notable Finnish FinTech payment companies include Mistral Mobile, Seitatech, Payment Highway, Tapp, PayiQ, Enface, Giftom, MobiWallet, and Wone Payment. FinTech payment companies based in Switzerland include Avance Pay, Cash Sentinel, e24, Monito, Paymit, Kickshops, and Twint.

4.2.3. Crowdfunding

Companies in this category provide digital platforms to raise funding for projects and start-ups, so-called 'seed-stage/start-up funds' in the roadmap of angel or venture capital investors. Crowdfunding is a way for individuals, businesses, and organizations to raise funds in the form of donations or investment over the Internet. There are four types of crowdfunding: reward-based, donation-based, equity, and debt crowdfunding (World Bank, 2013). Companies in this category differ in the types of investment projects for crowdfunding.

Finnish crowdfunding platforms include Fundu, Invesdor, Vauraus, Joukon Voima, and Mesenaatti.me. In Switzerland, notable crowdfunding companies include Crowdhouse, Investiere, Spendit, Cashare, RaiseNow, ProjektStarter, and Veolis.

4.2.4. *InsurTech*

InsurTech companies are FinTech companies that provide insurance services based on technological innovation. These companies differ in the types of insurance and services they offer, which include life/annuity, healthcare, and rent and housing insurance. InsurTech companies use disruptive models such as peer-to-peer insurance, which connects a group of customers and pools their premiums to insure them against risk. Some InsurTech companies allow clients to customize their insurance policies with the assistance of artificial intelligence. These companies have made insurance more user friendly and affordable for consumers. Some companies offer mobile purchasing and monitoring of insurance policies.

Notable Finnish InsurTech companies include Vakuutuskettu, Pretus, and Wellmo. InsurTech companies in Switzerland include FinanceFox, Knip, MyLibery, Bfox, Esurance, Anivo, and Animalia.

The insurance industry is actively exploiting the technological advantages and benefits derived from FinTech applications to enable new innovations called InsurTech (insurance technology). InsurTech has flourished in response to the relatively slow development of traditional insurance services compared to that of other financial services. According to InsurTech reports, 86% of insurers think that they must innovate to retain a competitive edge, whereas 96% of insurers think that digital ecosystems influence the insurance industry (Accenture, 2017).

The leaders of online investment advisor and digital wealth management companies in Europe refer to the insurance sector as “ripe for the picking” because of its lag in adapting to changing consumer habits and preferences and in addressing their sector’s need to embrace digital technologies. Although insurance is a huge sector for FinTech firms to enter, it is difficult to access because of increasingly complex regulations and massive capital requirements.

However, venture-capital-backed funding for InsurTech companies has increased in recent years. InsurTech is becoming one of the most active segments of the FinTech ecosystem as it seizes the opportunity to simplify and improve the efficiency of traditional insurance. Global InsurTech investment was estimated to reach USD 1.7 billion in 2016, which nearly doubled the figure for 2014 (Accenture, 2017). Although the US leads the InsurTech trend with more than 50% of total deals, countries such as the UK, Germany, France, China, and India are following the trend with strong growth in investment (LaPonsie, 2016).

The question now is whether the rise of InsurTech can threaten the incumbents in the insurance market. Although mainstream insurance companies face competition from these disruptive InsurTech start-ups, many customers place greater trust in their traditional insurance companies because of concerns over account security and fraud protection. However, there is scope for InsurTech start-ups that cooperate with insurance companies to improve efficiency and optimize the operation of mainstream businesses. Incumbents may be slow to embrace new technologies, but they are partnering with InsurTech start-ups to enable digital transformation of their services. In China, the numbers of investments in InsurTech start-ups rose by 40% in 2016 with nearly two-thirds of deals funded by insurers (Even, 2017). Such investments will enable InsurTech companies to modernize the insurance industry and introduce new distribution channels for ecosystem companies in the industry.

4.2.5. *RegTech*

RegTech (regulatory technology) refers to FinTech companies that help customers with the compliance process. These companies provide tools for implementing and monitoring compliance with regulations or reforms using innovative technology. These firms help customers address and mitigate risks relating to laws, regulations and compliance. RegTech companies focus on government and legislation. They offer tools to identify legislation or platforms for legislative and regulatory analysis. Some RegTech companies focus on tools to help customers prevent the risk of anti-money laundering (AML) or to assist them in the know-your-customer (KYC) process.

Cybersecurity RegTech companies provide tools for customers to detect policy violations and to comply with information security protocols. Other notable areas of RegTech include tax management and trade monitoring. Reports show that the US is the leading country in RegTech, with 74% of the total global deal share since 2013, followed by the UK, which has 10% of the global deal share (CB Insights, 2017). While the UK is the RegTech leader in Europe, Germany, Ireland, the Netherlands, and Switzerland are also increasing their market shares.

A notable example of a Finnish RegTech company is MORS Software. Notable RegTech companies in Switzerland include NetGuardian, Qumram, Apiax, Finform, SwissMetrics, KYC Exchange Net AG, Dydon, and Squirro (Fintechnews Switzerland, 2017).

The technological disruption caused by FinTech, the rapid development of the digital economy, and the virtualization of money have caught the attention of regulators and governments in several countries. New regulations such as the Markets in Financial Instruments Directive (MiFID II) and the International Financial Reporting Standard (IFRS 9) have been introduced, forcing institutions and companies to adapt and implement compliance rules within a short time

frame. Some have proved unprepared for rapid technological change. Therefore, RegTech has grown rapidly to meet this need to address regulatory challenges.

The Northern Trust's annual regulation conference poll showed that, in 2014, 50% of attendees expected to spend more time on regulatory compliance in the coming year. The figures were even higher for 2015 (75%) and 2016 (68%; Risk.net, 2017). These data show that many firms still need to invest time and resources to comply with new regulations such as MiFID II. While the new regulatory environment can become a burden for firms because of the necessity to dedicate time and resources to regulatory compliance, RegTech start-ups tend rather to sense a real opportunity to innovate and create solutions for established companies.

4.2.6. Wealth management

Wealth management FinTech includes companies that offer alternative wealth management services and technology-enabled solutions. These include robo-advisors, investment platforms, and portfolio management. The most notable sub-category in wealth management is robo-advisors. Robo-advisors refer to companies that offer automated investment platforms. This service now targets both business and retail customers and competes with traditional wealth management services in terms of cost, flexibility, and around-the-clock online accessibility. Robo-advisor platforms help clients customize their investment portfolios based on analysis of their risk profiles and investment goals. Robo-retirement focuses mostly on retirement savings accounts.

Wealth management FinTech refers to companies that focus on developing exchange and/or trading platforms for financial assets such as stocks, bonds, foreign exchange, and other asset classes. Digital brokerage refers to online brokerage platforms for investors to trade assets such as stocks and bonds. Some companies in this category provide advisory platforms for advisors

to create investment portfolios to sell to clients. Others provide social investment networks for investors to interact, track peers' investment strategies, and follow each other. Hedge Fund Tech refers to companies that offer software solutions or platforms for hedge funds.

Notable wealth management FinTech companies in Finland include Evervest, Helsinki Capital Partners, Benemint, Selma, Haumi, FA Solutions, Shareville, and Taviq. Wealth management FinTech companies in Switzerland include InvestGlass, MoneyPark, Advanon, Lykke, Amnis, TrueWealth, and FundBase.

Robo-advisors are rapidly becoming the biggest disruptive technology in investment and online stock trading. This new technology has been one of the most frequently mentioned FinTech segments. The automation of advisory services can benefit firms and customers in various ways, especially in meeting the needs of an increasing number of clients by customizing individual clients' services. The demand from a large number of customers makes it difficult for financial advisory firms to process information from market research and analyze the data to provide advice. Therefore, new robo-advisor start-ups have entered the advisory market with new strategies to solve the complexity of data management with the help of robo-advisors.

While traditional wealth management firms are limited by online technology capabilities and tools, robo-advisor start-ups have addressed these weaknesses and have identified opportunities to access this market by exploiting the rise of mobile and cloud technologies. A FinTech survey conducted in North America showed that 79% of respondents would use robo-advisors for personal investment, and 69% would use robo-advisors for assistance in retirement planning (Finextra, 2016). However, flaws in financial advice algorithms and data protection issues associated with this new trend testifies to the need for cautious consideration.

4.3. *FinTech disruptive innovation ecosystem evolution*

The FinTech ecosystem consists of numerous technology companies and global institutions. It is, therefore, difficult to list all parties using the primal segmentation often used in the banking and financial industries. However, it is possible to constitute the global FinTech ecosystem of banking and finance industries by adding the technological orientation of existing parties and the new segmentations that have evolved from the new entrant technology suppliers. The development of FinTech through the emergence of thousands of start-ups in this sector has brought significant changes to various industries. In addition to mapping technological innovations in financial technology and banking applications, we find evidence that a FinTech ecosystem, as it emerges, has a systematic and hard-hitting impact on incumbents (see Figure 1).

We identify three stages of ecosystem evolution. The first stage is prominent industry maturity, which opens up a path for the introduction of technology innovations (in our case, related to electronic payments) in initial cooperation with incumbents. Here, incumbent firms dominate and seek support from new ventures to enhance their ability to exploit emerging technological innovations. One example is online payments, where established banks have cooperated with technological companies to offer new incremental functions such as online payment or mobile banking. These applications have proved helpful and have allowed incumbent firms to use existing complementary capabilities such as their sales force and brand value. In these situations, there are few new ventures, and financial support from venture capitalists tends to be limited.

The second stage is the symbiosis stage, which introduces a more radical technology such as cryptocurrency and blockchain. These technologies are largely driven by adaptation and exploitation of the new banking and transactional practices of new ventures. The increasing volume of digital transactions has led to a new trend whereby money in the form of data slowly

replaces physical money or traditional cash. FinTech reports have noted that the concept of physical money is fast becoming redundant in this new digital-only world (EY, 2017). The industry landscape in this particular stage tends to be highly disrupted and uncertain. Existing incumbent firms attempt to co-exist with new ventures that begin to gain market share because they have no previous lock-in investments. Thus, they start to profit from technological innovations due to their ability to quickly respond to the changing ecosystem. There is also a larger inflow of venture capital to support these new ventures as the industry expands, with new actors and certain larger actors unable to cope with disruptive innovation.

The third stage is industry resilience and the very prominent role of new entrants that take over and re-shape the industry where incumbents face the risk of being replaced. During this stage, the industry is transformed with incumbent firms confronted with diminishing influence and new ventures exerting increasing influence. With artificial intelligence, there is a high degree of atomization and efficiency improvements. Many previously unique and high-value-adding banking services and products disappear, and new kinds of customer needs emerge. With increasing customer maturity and adaptation to artificial intelligence, customers start to seek new kinds of services such as highly customized wealth management plans. Few incumbents are able to cope with the need to innovate and adapt their business models. Thus, most incumbents struggle to survive. However, with a large injection of venture capital, many new ventures are able to grow and dominate. They begin to offer financial technological applications such as InsurTech and RegTech.

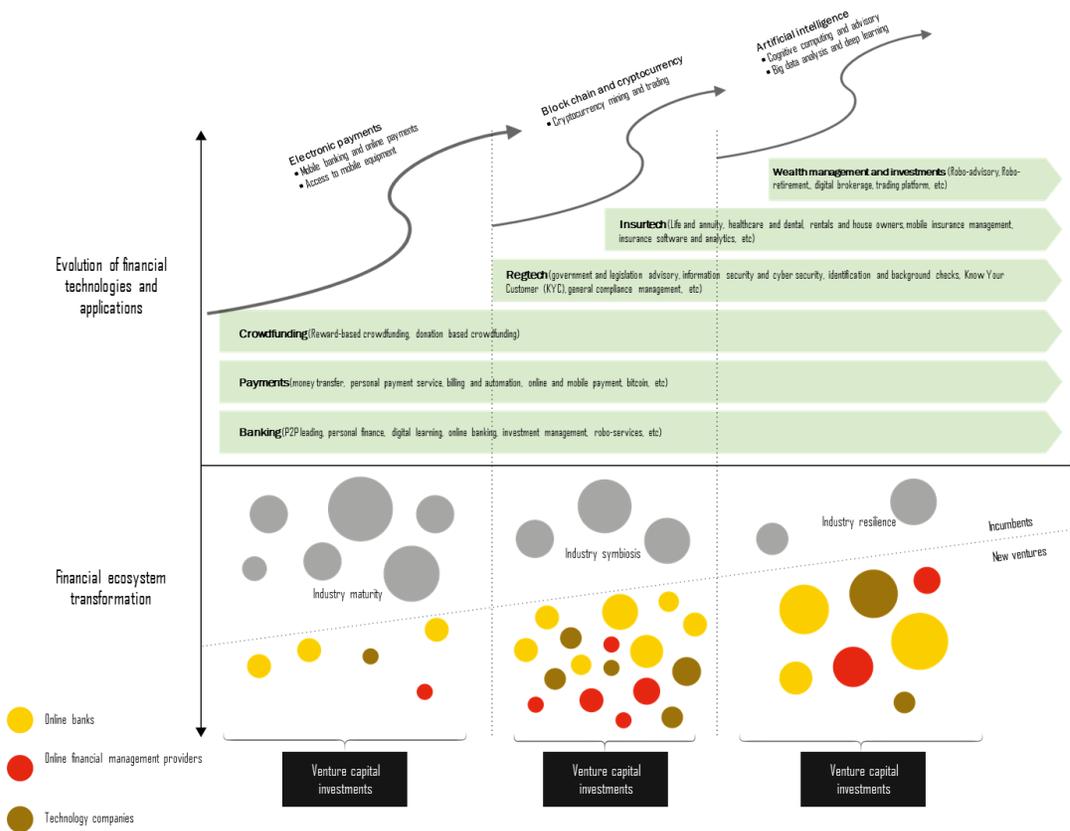


Figure 1: FinTech disruptive innovation ecosystem roadmap

5. Discussion and agenda for future research

The academic literature on innovation and the revolution in product offerings and business models devotes considerable attention to the market mechanisms and effects through which disruptive innovations supplant existing technologies and product offerings (Bower & Christensen, 1995; Christensen, Raynor, & McDonald, 2015). Most research in this area has studied how entrepreneurial companies influence existing incumbents through disruptive technologies, products, and business models in the process of discovering and implementing a fundamentally different solution in existing businesses (for a review, see Christensen, McDonald, Altman, & Palmer, 2018). Although this research has advanced our knowledge of how individual disruptive

companies influence existing businesses and industries of entry, it has not addressed the underlying motives and strengths of collective forces combining through joint formation or the way in which various entrepreneurial companies group together (Christensen et al., 2018; McDowall, 2018). This omission is the focus of this research paper. Such a view provides a larger picture of systemic impact. Previous research has neglected disruptive innovation ecosystems and the broader context of entrepreneurial companies that create disruptive innovation in industry or product domains. An understanding of the underlying ecosystem where disruptive innovation occurs could help the research community to interpret and analyze the larger framework that promotes a different value proposition in a larger system of incumbent companies (Tsujimoto, Kajikawa, Tomita, & Matsumoto, 2018). This would provide insights into the broader picture of underlying disruptive technology innovation of entrepreneurial companies and how incumbents' technology and business models face new competition. In turn, this would impact the next generation of innovation, where ecosystem actors influence each other through emerging technologies and business models.

Against this background, we argue that, while research suggests that disruptive innovation has far-reaching implications, studies have overstated the impact of individual disruptive innovation companies compared to the impact of disruptive ecosystems. Our research addresses this oversight by exploring the concept of disruptive innovation ecosystems. We argue that an understanding of this concept is important for the study of disruptive innovation. We define the concept and outline how it occurs through an empirical study of the global FinTech ecosystem that has transformed and outcompeted an entire sector of incumbents. Ultimately, the goal of this paper is to discuss how disruptive innovation ecosystems contribute to disruptive innovation theory and the growing stream of ecosystem research.

We believe our conclusions from studying the evolution of the Financial Technology services sector provides a clear message. At a time when the fast-changing business environment is driven by disruptive innovation from new entrants, the study of disruptive innovation should not neglect the power emanating from the forces that build and transform ecosystems. The disruptive power of FinTech is derived from the development of the ecosystem of actors. The importance of ecosystems is evident when emerging technologies develop in the FinTech sector and interdependent companies influence the direct development of technology, competencies, and opportunities for new business models in financial services. Invariably, this will undermine the power of incumbents. Initially, the power of the FinTech ecosystem was limited, but it will ultimately prove to be increasingly groundbreaking.

Our research has explored the concept of disruptive innovation ecosystems and the evolution of the disruptive FinTech ecosystem. Consistent with our definition of disruptive innovation ecosystems, we have shown how communities of actors with complex yet related relationships develop a broad trajectory along a technology path; here, members of the ecosystem co-evolve and forge interdependencies that combine and integrate a spectrum of knowledge, with the aspiration of increasing value through faster, smarter, and more creative value propositions. We have supported our thesis that firms on the same broad technology and competence path benefit the whole system by developing and entering new niches. We have shown the importance of investors remaining interested in the ecosystem. We have also revealed how technological advancement means more entrants in related technological categories, which is important for value creation in disruptive innovation systems.

This paper's analysis of the FinTech ecosystem supports the growing number of scholars who argue that many disruptive innovations today are developed and commercialized in and by

ecosystems rather than ‘standalone’ firms (Fuller et al., 2019; Kumaraswamy et al., 2018; Walrave et al., 2018). As the significance of ecosystems for disruptive innovation burgeons, the knowledge gaps that persist become increasingly detrimental and inhibiting. Much academic endeavor is needed to augment the very limited amount of research thus far conducted on the disruptive innovation–ecosystem intersection. We, therefore, highlight some potential avenues for future research.

- Ecosystems display cooperative and competitive elements simultaneously (Moore, 1993). How does the intra-ecosystem competition affect the market prospects of a disruptive innovation, i.e. the extent to which the innovation actually disrupts its target industry? What other features (e.g., the strength of the ties between ecosystem members; fluctuation among ecosystem members) make an ecosystem more or less receptive to producing a disruptive innovation?

- Are there conditions under which a disruptive innovation is better developed and commercialized by a standalone company than an entire ecosystem?

- A disruptive innovation first needs to be developed, before it can make inroads into a market. Overall, disruption can be a relatively lengthy process (Snihur et al., 2018). At which points along the process does an ecosystem offer greater advantages over a standalone approach?

- In developing our definition of disruptive innovative ecosystems, we drew attention to variations in the way the literature describes ecosystems. While some studies conceive of an ecosystem as a community of actors that affect each other, others refer to actors contributing to a specific value proposition, and still others refer to actors grouping around a particular technological platform (Jacobides et al., 2018). Similarly, the term ‘disruptive innovation’ may be used in a narrower or broader sense (Christensen et al., 2015; Kumaraswamy et al., 2015). Under which conditions do the different variants of ecosystems and disruptive innovations, respectively, make

a difference to our knowledge on the development and commercialization of disruptive innovations in and by ecosystems? For instance: Are some ecosystems better able to generate disruptive innovations that make inroads into a market from the low end than other kinds of innovation that shake up the industry, and if so, why?

- The distinction between disruptive and non-disruptive (sustaining) innovations is not the only powerful way to characterize an innovation. Other insightful classifications are ‘competence-enhancing vs. competence-destroying innovations’, ‘architectural vs. generational innovations’, and ‘radical vs. incremental innovations’ (Gatignon et al., 2002). How do these types of innovation relate to ecosystems?

This list is, of course, not meant to be exhaustive. Scholars may identify many more promising research opportunities at the intersection of disruptive innovation and ecosystems, and we welcome such efforts. In their search for promising research opportunities in this area, scholars may wish not only to refer to the above agenda but also to the research agendas on disruptive innovation in general (e.g., Christensen et al., 2018; Hopp et al., 2018); they will want to consider whether these research recommendations have interesting implications in the context of ecosystems.

Overall, it is important to state and acknowledge that research on disruptive innovation at the organizational level has largely examined the issue through the lens of the individual firm. This approach only marginally considers the context and ecosystem of the focal firm. In this study, we approach the issue from a different angle in order to offer a broader explanation than the traditional explanation of the link between the individual entrepreneurial entry of disruptive innovation and the incumbent exit. Adopting a closer look at the evolution of the FinTech ecosystem, we present a compelling case that disruptive innovation system research is very much needed. The results of

the study offer preliminary but encouraging support for the standpoint that disruptive innovation systems should command further attention. We focused on the concept of disruptive innovation systems and the need for a broader perspective. However, we performed little analysis of the mechanisms behind the progress of the ecosystem. Therefore, we encourage scholars to test and develop the mechanisms behind the concept of disruptive innovation systems.

6. Concluding remarks

At a time that is simultaneously characterized by the emergence of influential ecosystems and by a growing number of disruptions, the literature has so far paid scant regard to the role of ecosystems in the development and commercialization of disruptive innovations. To overcome the consequent limitation in our knowledge, this current study has developed a definition of disruptive innovative ecosystems and has illustrated this concept using the example of the disruptive FinTech ecosystem. We further indicate some avenues for future research on disruptive innovations and ecosystems. Overall, our study offers preliminary but encouraging support for the idea that disruptive innovative ecosystems demand and deserve further attention. We hope that our insights motivate scholars to engage in more conceptual and empirical work at the intersection of disruptive innovation and ecosystems.

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