Unleashing Collaborative Potential: Exploring the Dynamics between Banks and Fintechs in the Era of PSD2 and Open API Technologies

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I. Table of Contents

II. List of Tables

III. Abbreviations

PSD2 – The Second Payment Services Directive

API - Application Programming Interface

TPP – Third Party Provider

Fintech - Financial Technology

Fintechs - Financial Technology firms

RegTech - Regulatory Technology

SME - Small and Medium Enterprises

IT - Information Technology

Telecom - Telecommunication firms

AISP - Account Information Service Provider

PISP - Payment Initiation Service Provider

1. Executive Summary

The banking industry landscape is experiencing significant changes due to the emergence of fintechs, which offer innovative banking services that challenge traditional banks' market dominance. In response to these industry shifts, both banks and fintechs have embraced open banking. The fear of market loss and control has led traditional banks to adapt to this shift, while the desire to scale has motivated fintechs to participate in open banking collaboration. This study examines the transformation of the relationship between traditional banks and fintechs from rivals to collaborators through open banking; and explores the impact and implications of this collaboration on the banking industry.

Using the Multi-Level Perspective framework, the research examines the technical and social aspects of the transition in the banking sector. At the regime level, traditional banks represent the dominant system, while fintechs constitute the niche level with their emerging innovations. The study adopts a qualitative approach, using semi-structured interviews as primary data, and incorporates secondary data from external sources to provide a comprehensive understanding and validation of the primary findings.

The findings reveal that open banking collaboration is driven by factors including data access, regulatory expertise, and modern technologies that facilitate collaboration between banks and fintechs. Further, the research concluded that open banking collaborations benefit all parties involved. Banks gain access to fintech technologies and enhance operational efficiency and user experience. Fintechs scale their operations and leverage banking infrastructure to reach a broader audience. Moreover, consumers benefit from more cost-efficient and inclusive financial services and better agency over their financial data.

The research highlights the importance of regulations, specifically PSD2, in fostering and securing collaboration between banks and fintechs. These regulations create an environment of trust and encourage the adoption of open APIs for secure data sharing. Open banking also enables advanced data analytics techniques and the integration of modern technologies like machine learning, enhancing banking operations, fraud detection, and customer experiences.

However, challenges and risks need to be addressed. Banks should proactively develop strategies to cope with the evolving landscape without falling behind, and fintechs should balance their growth to maintain collaborative partnerships. Consumer awareness and understanding of open banking are essential to ensure widespread adoption.

2. Introduction

2.1. Background

Since the financial crisis in 2007-2008, the banking sector has faced customer mistrust and low interest. In addition, digital disruption altered the banking industry and allowed new players and platform-based competitors to launch into the market (OECD, 2020). These digital changes not only open opportunities for new technologies but also drive the rise of new business models and the development of new ecosystems (Dhar & Stein, 2017). This evolution process, known as "financial innovation," happens due to the use of technology in designing and adopting new products and platforms for processing financial activities, which is not necessarily performed by traditional financial institutions but rather by non-financial ones, including tech institutions which intervene in the process either in an incremental manner or a disruptive one (Khraisha & Arthur, 2018).

With technology reducing the time and cost of banking services, online banking drew customers' attention creating a new level of competition against traditional incumbent banks (Broby, 2021). According to Lipton et al. (2016), the current wave of innovation in the financial sector focuses on consumers, by leveraging new technologies to meet their needs, especially unbanked, underbanked, and SMEs (Lipton et al., 2016). According to Kassab & Laplante (2022, p. 54), "banking customers include individuals, businesses (small, midsize, and large), trusts, estates, other public and private individuals and investors, and even other banking entities." Traditionally, incumbent banks and traditional financial institutions have been in doubt about the use of technology; however, this digital transformation and the deviation of customers put pressure on the traditional banking system, forcing them to restructure the business model to endure the new entrants and stay in the competition (Broby, 2021; OECD, 2020).

New market players, including but not limited to big tech, fintech, and telecom, surged into the traditional banking industry for their supremacy in understanding customers' needs and in providing convenient, user-friendly, and cost-efficient financial solutions (Wewege et al., 2020). This has made traditional banks less relevant to their customers, creating opportunities for new players to identify market gaps and seek any potential market opportunities (Omarini, 2018). As digital technology advances, the number of fintechs competing with traditional banks increases, capitalizing on modern technologies to meet customers' demands. In contrast, it is a long-winded process for banks to accommodate these digital changes due to outdated infrastructure and regulatory constraints (Basdekis et al., 2022). Fintechs are rapidly evolving due to several factors, including enabling sharing economy where financial services and resources can be exchanged directly without intermediaries; a favorable regulatory landscape with low regulatory barriers and easy requirements for license; and the development of high-quality products with low costs, which contribute to diversifying the financial landscape (Lee & Shin, 2018).

The rapid scaling of fintech firms raises concerns within the banking industry. A global study by PWC on the threats related to the rise of fintechs shows that 70% of participating banks reported a loss of market share as their primary concern (PWC, 2016). To keep their market share and stay relevant, banks are considering either adopting and developing fintech technologies in-house or collaborating with fintechs to leverage their technologies (Berger, 2020). According to a literature review on fintech research by Takeda & Ito (2021), some scholars argue that partnering with fintechs is a good approach for banks to access new technologies. In contrast, others argue that banks should attempt to invest in fintech technologies and develop them in-house proactively. According to the authors, the most efficient will depend on banks' internal resources, as banks with limited internal resources may have no alternative but to seek external resources through partnerships. However, in the long term, it is imperative for banks to embrace and integrate fintech to sustain their competitive advantage (Takeda & Ito, 2021).

A Statista study in 2017, on banks' business strategy concerning the rise of fintech, shows that 91.3% of banks reported that they plan to collaborate with fintechs (Statista, 2022b). Banks-fintech collaboration opens up untapped opportunities for banks that enhance their market position if well exploited. These opportunities arise if banks open their systems to fintechs, allowing data aggregation to include new services and diversifying their offerings in one

platform (Omarini, 2018). More specifically, the rise of open banking and API (Application Programming Interface) technologies paved the way for the upsurge of banking data accessibility to third parties through APIs (Hensen & Kötting, 2022). Open banking is often motivated by regulatory initiatives that promote competition and innovation, like the Revised Payment Service Directive (PSD2) in Europe, which mandates all banks to securely share customer data with third-party providers (Harrison, 2022). Traditional banks realize that the conventional banking model may no longer be sustainable, prompting them to explore open banking and adopt open banking APIs (Axis Corporate & Efma, 2016). They increasingly consider fintechs as potential strategic partners rather than rivals, recognizing the benefits and opportunities this collaboration can bring to remain competitive (Suryono et al., 2020).

2.2. Problem Definition and Objective

The landscape of the banking industry is changing, and banks are to adapt to this change to maximize their competitive advantage. Fintechs succeeded in identifying pain points in the banking industry and offering innovative banking services that are more appealing to the customers, shifting the market dynamics and disrupting the competition in the system (Omarini, 2018). They leverage advanced technologies, including APIs, artificial intelligence, and blockchain, to deliver almost all traditional financial services while promoting financial inclusion by lowering costs, which enables them to disrupt the financial market and attract new customer segments (Utami et al., 2021). Due to fintechs' ability to effectively close the gap between what is being offered and what customers truly need, banks risk losing their market share and experiencing customer churn. Therefore, it is essential for banks to relinquish their closed business models and shift to more open banking ones to stay in the competition. Instead of offering essential individual banking services, banks can expand their offering by partnering with fintechs and leveraging their technologies and expertise to provide customers with a more holistic and integrated experience (Omarini, 2018).

Objective: This study aims to analyze the open banking collaboration between banks and fintechs, examining the transformation of their relationship from rivals to collaborators. A comprehensive understanding of this transition requires considering the drivers, fears and concerns, challenges, risks, and opportunities associated with the collaboration.

Research Questions:

How has open banking collaboration transformed the relationship between banks and fintechs from rivals to collaborators? (RQ)

- What are the key opportunities and risks associated with open banking collaboration? (SQ 1)
- What is the impact of regulations (PSD2) on the collaboration? (SQ 2)
- What are the technological advancements facilitated by open banking? (SQ 3)

2.3. Motivations

Open banking collaboration is a relatively new and evolving area. The limited literature on the topic shows that this area has yet to be extensively researched. According to Hornuf et al. (2021), the literature on financial innovation in general and bank–fintech collaboration in specific is scarce. Consequently, this research aims to contribute to the existing academic literature by providing empirical research with a theoretical understanding of the relationship between banks and fintechs within the context of open banking. Due to their proactive regulatory initiatives toward open banking, Europe is considered the leading market in this domain (Goyal et al., 2023). That is why investigating the open banking collaboration in Europe can provide important insights for other regions still developing their open banking initiatives.

Moreover, examining the regulatory role in facilitating the collaboration can provide insights into the communication dynamics between industry players and policymakers. These insights can inform policymakers and regulators in formulating practical guidelines and frameworks to support open banking initiatives in other markets worldwide. Hence, this research will benefit academics, banks, fintechs, and policymakers.

2.4. Delimitations

The geographical scope of this research is limited to Europe. The research studies the collaboration between banks and fintechs in the context of open banking in Europe concerning

open banking initiatives in the EU area and under EU regulations. The research will primarily focus on the period from introduction of open banking initiatives in Europe to the present. It will not extensively cover historical developments before the emergence of open banking or future projections beyond the current landscape. Despite being a significant addition to the comprehension of this research due to their impact on the situation, no interviews will be conducted with policymakers and regulators, and no consumer surveys will be conducted.

2.5. Structure

This paper is divided into several chapters; the "Background Research" introduces the main concepts used in this research, provides an overview of the context and significance of the topic, and reviews existing research. "Theoretical Framework" includes the theories and frameworks used to understand and formulate interview questions. Providing a comprehensive review of the existing literature and theories guided the work for the rest of the paper. "Methodology" outlines the research design and methods used in the study, including data collection and data analysis techniques. "Findings" presents the research findings from primary data and external sources. "Analysis" connects the findings with the chosen framework. "Discussion" discusses the findings and their implications with other research and discussions available—finally, the "Limitations" and the "Conclusion" of the topic.

3. Background Research

This section will explore relevant research on open banking collaboration, beginning with a literature review that examines various elements and factors involved in such collaborations.

3.1. Fintech

The term "FinTech" was conceived in the early 1990s and stands for "Financial Technology" (Puschmann, 2017) due to the emergence of the internet (Babin & Smith, 2022); however, there was no clear definition for it (Takeda & Ito, 2021). In the literature, fintech is defined in different ways. Omarini (2018) discussed FinTech definitions based on the review of different papers.

According to Arner et al. (2015, as in Omarini, 2018), fintech is the use of technology to deliver financial services, while Blake & Vanham (2016, as in Omarini, 2018) describe it as the use of technology for designing financial services. Leong et al. (2017) define fintech as both designing and delivering financial services through technology. They further define it as the "pervasive digital technologies" disrupting the highly regulated financial sector. The Financial Stability Board (FSI, 2017, as in Omarini, 2018) provides a broader definition, describing fintech as "technologically enabled financial innovation that could result in new business models, applications, processes, or products with a material effect on financial markets and institutions and the provision of financial services (Omarini, 2018, p. 24)."

From an industry perspective, fintech, according to Subaio, a Danish fintech company, refers to software-based financial services such as mobile apps, online banking, and cryptocurrency platforms that alter the way individuals and businesses interact with finance digitally (Hamann, 2021). Further, Plaid, a leading American fintech company, defines fintech as a combination of "financial" and "technology," referring to any technology, software, or application that enables people or businesses to manage, access, gain insights into, or make transactions with their finances digitally, improving the lives of those it serves and aiding those who lack access to traditional financial services (Trificana, 2022). Despite the slight variations between the different definitions, all the definitions highlight the role of technology in delivering financial services.

According to the central bank of Ireland, despite the relatively recent attention gained by fintech, the financial industry has been influenced by technological advancements throughout history. However, with the rise of internet usage and the widespread adoption of devices such as smartphones and tablets, the pace of change has rapidly increased recently (Central Bank of Ireland, n.d.). This rise of fintechs disturbs the financial sector and forms a threat to traditional banks (Babin & Smith, 2022). According to a survey conducted by PWC, 73% of executives in the financial sector believe that FinTech is most likely to disrupt consumer banking and incumbents' business in four areas: market share, margins, information security/privacy, and customer churn (PWC, 2016). According to Trificana (2022), fintech business areas vary from banking, payments, and personal financial management to lending. Babin & Smith (2022) add that fintech products mainly cover personal budgeting apps for individual consumers and payment processing and accounting tools for SMEs. In addition, after conducting market

research on fintechs to check what services they offer, Crypto technologies and services are one rising business area that stands out in fintechs while not usually offered by banks.

According to Puschmann (2017), four main reasons led to the rise and evolution of fintechs. First, the changes happened in Information Technology and the emergence of fields like social computing, big data, the internet of things, and cloud computing which not only aided in automating financial services but also introduced new services and business models. According to the World Fintech Report by Capgemini & Efma (2020), fintechs leverage technologies like big data to serve their customers better as it gives insights that help in personalizing financial products. Second, the change in consumer behavior has played a role in the rise of fintech as consumers' interaction with digital channels has grown in the past years (Puschmann, 2017). According to the Deutsche Bundesbank annual report, banks in Germany have downsized their physical branches from 50,000 in 1990 to 32,045 in 2015 (Deutsche Bundesbank, 2016).

Further, the World Fintech Report in 2020 conducted a survey stating that 50-70% of consumers prefer fintech solutions over banks because they are cheaper, faster, and easier to use (Capgemini & Efma, 2020). Third, banks relying on outsourcing and reducing their in-house production has changed the ecosystem, leading to more focused players like fintechs and even nonfinancial service companies (Puschmann, 2017). Lastly, the change in regulations since the crisis of 2008 created some imbalance. Due to the financial crisis of 2008, the regulations on traditional financial institutions have increased, making it harder for financial institutions to innovate due to their legacy system. While at the same time, many countries have issued initiatives to lower entry levels for fintech and non-traditional financial institutions to promote competition and innovation (Puschmann, 2017).

Fintech has "democratized" access to financial services, making them cheaper and available for the underbanked and unbanked segments (Trificana, 2022). According to Takeda & Ito (2021), financial inclusion stands out to be the most important topic within the realm of fintech research on a social level. Most people in developing countries were unbanked and could only access a few financial services before the rise of mobile devices and fintech technologies. Nevertheless, fintech innovation has bridged this gap by making financial services more accessible for the unbanked and underbanked, contributing to the financial stability of these countries and promoting financial inclusion (Takeda & Ito, 2021). That's why fintech adoption flourished in

many Asian countries due to the absence of a well-established financial infrastructure (Takeda & Ito, 2021). However, most of the fintech research has developed in Europe, where they have a wealth of case studies available for research in the EU due to the varying degrees of financial infrastructure development across member states and major existing financial institutions (Takeda & Ito, 2021). According to Hornuf et al. (2020), fintech emergence in the market increases in areas of strong and well-developed economies and easy access to venture capital which could be evident why there are more case studies in the EU (Hornuf et al., 2021), while Babin & Smith (2022) state that US and China are the leading markets for fintech startups.

The rise of fintech could be analyzed with the technology push market pull approach commonly used in innovation management. According to Dixon (2001), developing products customers want and will buy is a major challenge for industry and academia. The challenge involves balancing what the customer wants with what the producer thinks is a better solution. The two main development approaches are “market pull” and “technology push” (Dixon, 2001). Isoherranen & Kess (2011) explain that a technology-push approach pushes new technology to the market without explicit demand intending to create a winning strategy by being the first or most advanced. This approach creates greater uncertainty for success in the marketplace.

In contrast, the market pull approach means that companies start developing products based on expressed market needs and unsatisfied customers, which creates new demand. Market-driven organizations deeply understand their markets and focus on identifying valuable customers to develop innovative solutions. They offer superior customer value, aim to convert satisfaction into loyalty, and anticipate competitor moves through intimate market understanding (Isoherranen & Kess, 2011).

According to the fintech expert Chris Skinner, fintech focuses on improving what banks do poorly, but they do not pay much attention to what banks do not offer (Fintechly, 2022). Hence, they are more of a reaction to market needs. Although market pull is “a safer, less costly, risk-averse approach towards pleasing customers,” it has some drawbacks that are often overlooked. First, customers are usually concerned about having the service they use in a cheaper and easier-to-use way, but they are not often aware of what new products they need. Second, instead of focusing on creating a new market with new products and services, producers tend to compete to offer the same service but at a lower price (Dixon, 2001).

3.2. APIs and Open APIs

API stands for application programming interface, which is a software component that enables "one party to have access to the information or services of another party in exchange for a fee and in compliance with specified data sharing arrangements and agreements," which boosts information sharing between digital systems (Ozili, 2022, p.6). It enables developers to access software features and data (Benmoussa, 2019), and it enables data assembly from different external sources (Goyal et al., 2023). In simple words, APIs allow two computer applications to communicate using a common language (Zachariadis & Ozcan, 2017). The two applications are the client and the server; the client application sends a requisition, also called an API call, to the server application to query some data. Then the server application responds to the client with the queried data (AWS, n.d.). REST API is the most popular API currently used where "the client sends requests to the server as data" through predefined functions like POST, GET, DELETE, PUT, etc., "the server uses this client input to start internal functions and returns output data back to the client" (AWS, n.d.). For example, when making a payment while shopping online, the user clicks the make payment button on the e-commerce site creating an API request from the web page to the server to retrieve payment data. When the API call is validated, the API receives a server response with the requested information. Then the API communicates this data with the requested application, in this case, the e-commerce website (IBM, n.d.). One benefit of utilizing APIs is the ability to leverage the existing infrastructure, build on it, and connect to the core of the software without requiring knowledge of its underlying structure, which makes it faster, easier, and more efficient to integrate systems and deliver services on multiple channels like mobile phone, IoT, applications, etc. (Benmoussa, 2019).

API technology in itself and the idea behind it have been there for many years, mostly internally (Omarini, 2018). However, in the past decade, they have become more popular and advanced in scalability, monetization, and ubiquity (Deloitte, 2021). APIs could be used internally, known as closed APIs, to connect business processes within an organization and exchange data across departments which increases productivity and efficiency, or externally, known as open APIs, to exchange and share "business assets such as information, a service, or a product" with third parties and partners (Zachariadis & Ozcan, 2017, p.5). Open APIs could either be for partners with contractual agreements or public for anyone with some control from the API owners

(Premchand & Choudhry, 2018). Hence, the API owner is the one that decides on the level of openness they want to proceed with (Zachariadis & Ozcan, 2017).

Open APIs have led to the emergence of big business models like the ridesharing business. Companies like Uber and Lyft would not have emerged if Google had not opened their Maps API (Băluţ, 2019). APIs, especially open APIs, were the accelerating factor and "building block" for digital transformation in many industries of all sizes, including the financial industry, as they paved the way to build on digital assets, access new markets, and form a developers ecosystem (Feyen et al., 2021). Further, API technology is a key player in the digital economy, known as the API Economy, as it contributes to business development as it leverages business systems, processes, and data to create value; and revenue generation through referral and usage fees of data access and integration (Deloitte, 2021). According to a survey conducted by the API hub "Rapid," out of 850 developers from over 100 different countries, over three-fourths of developers, mostly from telecommunication and financial services, confirm that taking part in the API economy is a priority for their organization or to be a priority soon (Rapid, 2022).

As a result, APIs became the central player of the fintech revolution (Omarini, 2018), allowing the addition of banking capabilities to platforms without the need for costly code development (Mikalajūnas, 2023). New entrants can deploy APIs to get started with limited banking services, and with the right API strategy, they can expand their services to keep up with the competition. For example, Revolute entered the market with basic banking services like current accounts, foreign exchange, payments, and cards, and now it is moving forward to offer a super app with cryptocurrency wallets, the mortgage sector, and, most recently, expense management (Mikalajūnas, 2023). However, firms desiring to play a significant role in this digital ecosystem must keep in mind that although entering the API market is relatively easy due to low entry barriers, competition is high, and staying in the market can be challenging. (Basole, 2016).

According to Worldline, a French multinational payment, and transactional services company, banks have three approaches they can consider while developing their APIs: the distributor, where banks open up their systems and offer their services and products to third parties; the aggregators, where they enrich and complement their traditional products with third party services; and the orchestrator, where they can deliver their owned service directly to the end customers to maintain customer relationships (Worldline, 2019).

3.3. PSD2

The Payment Services Directive (PSD) was initially introduced by the EU in 2007 to establish a unified payment market within Europe. It aimed to regulate and streamline payment services across EU countries by implementing rules and guidelines (Mansfield-Devine, 2016). However, due to a disappointing response to the original directive, a revised version called PSD2 was proposed in 2013, adopted in 2015, and fully implemented in 2018. The main objective of PSD2 is to foster innovation and promote competition in the European financial market by mandating banks to grant third-party providers (TPPs) access to their customers' data, which will facilitate the emergence of new players and the development of improved services (Zachariadis & Ozcan, 2017). In order to abide by PSD2, banks are to construct "open interfaces" to open up their systems. Banks have the flexibility to determine their level of openness and the value they wish to offer based on their business needs, organizational structure, and financial resources. They also have the option to integrate their services into the business models of other players (Omarini, 2018). Banks are to provide APIs to exchange and make use of information and customers' data so that third parties perform banking operations on behalf of the customers via APIs. In this way, one single bank's API could be accessed by multiple third-party providers when needed to provide innovative financial services to the banks' customers (Mansfield-Devine, 2016).

Further, PSD2 aims to enhance customers' control over their data, granting them the right to provide or withdraw consent for data access by authorized third parties and ensuring secure data transfer in compliance with security measures (EBA, 2018). Customers often interact with multiple financial institutions for various financial needs but face difficulties in moving funds between these institutions due to the complex procedures and lack of transparency (Laplante & Kshetri, 2021). This enablement of secure data sharing provides customers with the flexibility to compare products and choose from a range of financial services that accommodate their needs without having to stick to their banks' limited services, which promotes competition and empowers customers to make informed decisions by giving them control over their data (Premchand & Choudhry, 2018).

As per the European Commission, PSD2 seeks to modernize payment services across Europe for the betterment of both businesses and consumers. Overall, PSD2 was introduced by the EU to ensure that payment regulations keep pace with the current market and technological developments and a step toward a digital single market in the EU. The new regulation equally covers both conventional banks and emerging third payment providers such as fintechs (European Commission, 2019). Hence, payment service providers that offer several advantages to consumers are now regulated under EU rules (European Commission, 2019). According to Finans Danmark, initiatives like PSD2 are desirable and promising in Denmark as it aligns with the market's needs and offers better digital solutions and financial services for both consumers and businesses (Finans Danmark, 2022).

EBA (2019c) adds that PSD2 aims to broaden consumer protections minimizing their accountability for unauthorized payments. It further establishes strict security requirements as it compels all payment service providers, banks, or third parties to apply so-called "strong customer authentication" (SCA) on all electronic payment transactions to authorize the payment and validate the user. SCA is an additional layer of authentication that verifies customer identity based on something the customer knows, for example, PIN code or password; something the customer possesses, for example, a hard device; or something the customer is, for example, fingerprint or face ID. To comply with PSD2, the financial provider should apply two of these three elements of strong customer authentication (EBA, 2019c). Before PSD2, SCAs were used in some EU member states voluntarily, while only very few countries applied it on a compulsory basis, as in the case of Belgium, the Netherlands, and Sweden (European Commission, 2019). Since PSD2 is technology neutral, it is for the provider to choose what technology to use for the implementation. For data sharing, APIs were chosen by the market to be the leading technology for PSD2 projects. Whereas for the SCA, providers tend to use more mobile phone-friendly technologies, which poses challenges for those without access to mobile phones or living in areas with poor mobile and broadband signal coverage (EBF, 2022).

Zachariadis & Ozcan (2017) emphasize that banks should be cautious not to approach the implementation of PSD2 as merely another compliance project. This perspective could be tricky since the regulation's primary objective is to transform the current business model to prioritize the needs and preferences of customers. To succeed in this new environment, banks must rethink

their value proposition and consider the customer's journey as a series of experiences in which the bank plays a critical role. The bank should establish "trusted links" to third parties and offer relevant guidance for every upcoming experience, even before customers' needs arise(Zachariadis & Ozcan, 2017).

According to the European Banking Federation (EBF), although it is too early to assess the impact of PSD2 comprehensively, they can acknowledge that the directive has fulfilled its objective overall in increasing the level of innovation, competition, and security (EBF, 2022). They added that the security measures taken by PSD2, from SCA to fraud monitoring, have proved to decrease fraud rates and led to greater security for consumers. Further, PSD2 not only established an innovative infrastructure by allowing access to third-party providers (TPPs) but also regulated these providers and clarified their role in the ecosystem. It played a role in shifting TPPs from using screen scraping methods to a more secure way to access payment accounts, leading to more robust consumer protection. On the other hand, EBF argues that the implementation process of PSD2 is complex and expensive due to IT and labor costs which lead to compliance issues that are yet to be observed. Moreover, EBF states that there are still players in the banking ecosystem that are not required to comply with PSD2, for example, technical service providers, which should be brought into the scope of PSD2 in future discussions (EBF, 2022).

According to PSD2, for any financial service provider to be authorized to use APIs under the PSD2 directive, they need to hold an account information service provider (AISP) license, a payment initiation service provider (PISP) license, or both. These licenses ensure that registered AISPs and PISPs comply with PSD2 requirements, ensuring they use the end user's data solely for the intended service and refrain from unauthorized use (Wahlbeck, 2022). AISP is a form of read-only access to data where registered AISPs can access, view, and retrieve financial data with user consent, like the example of finance management apps, including personal finance management apps where users can view information from multiple bank accounts into a single dashboard. It could also be used to assess customers' loan eligibility, enhancing the decision-making process. On the other hand, PISP is a form of read-write access to data where registered PISPs are allowed to initiate actions on behalf of the users under their consent, for example, initiating payment transfers like in Mobile Pay and PayPal (Wahlbeck, 2022).

3.4. Open Banking

Open banking is the concept of using a technology-based approach to open up and share banking data via secure digital channels for the benefit of end-users, whether they are individual customers or businesses, with their consent (Babin & Smith, 2022). Open banking establishes an ecosystem based on open access to consumers' financial data among financial institutions through APIs (Laplante & Kshetri, 2021). The introduction of Open APIs has changed the competitive landscape of the financial sector (Zachariadis & Ozcan, 2017), lowering the entry barrier for the financial market, allowing easier interaction and secure movement of information between traditional financial institutions and any player in the ecosystem, and providing consumers with a diverse range of choices (Laplante & Kshetri, 2021). Open banking initiatives could be regulatory-driven or market-driven. A regulatory approach takes place when a country mandates regulatory requirements for open banking to stimulate competition, like in the case of Europe, the UK, Mexico, Australia, and Turkey. The market-driven approach is when innovative and proactive industry players take the initiative toward open banking to satisfy market needs, like in the US, Hong Kong, and Japan (Kassab & Laplante, 2022). However, with the market-driven, there is no contractual agreement between banks and third-party providers (PYMNTS, 2021). Further, there is a guidance approach where regulatory bodies provide guidelines and recommendations to encourage collaboration. However, it does not mandate and allows flexibility in implementation, as in the case of Singapore (Kassab & Laplante, 2022).

To empower the interaction between the ecosystem players, banks need to shift their mindsets to a collaborative approach that maximizes mutual benefits for banks and third-party providers and promotes cooperative business models (EBA, 2018). They should shift their mindset from constantly trying to improve their products and services to designing a digital ecosystem (Zachariadis & Ozcan, 2017), which is a network of digitally connected organizations enabled by modularity and standardization that influence each others' offerings and create a mutual value (Valdez-De-Leon, 2019). The ecosystem should collaborate with all new actors, including third-party payment providers, fintechs, and other technology providers (Zachariadis & Ozcan, 2017).

Open banking not only benefits third-party providers, but it also reshapes banks' positions from solely being financial services providers to data custodians. With the right investments in technical infrastructure and staff, banks can leverage analytics capabilities that turn data banks own into valuable assets that could be shared, providing significant insights for further service developments (EBA, 2018). As a result, open banking has evolved from being a technical tool to a broader direction with business implications, including new business models, competition, customer engagement, and improved and diverse services (Premchand & Choudhry, 2018). For banks to get an advantage from the data they own, they need to educate customers on the benefits they gain from giving consent for data sharing (EBA, 2018).

Premchand & Choudhry (2018) identify four main building blocks for open banking: data; APIs, the medium for data transfer; operation & Governance for API management, security, reliability, and scalability; and finally, security which covers authentication, encryption, and access permission. APIs, the main building block for open banking (Premchand & Choudhry, 2018), are integrated into the banking systems to connect the banking database, where customers data is stored, to authorized third-party providers, forming a network that serves clients, businesses, and financial institutions, leading to cost reduction, services optimization, and increased revenue (Benmoussa, 2019).

While open banking, as a concept, came to light long before PSD regulations, PSD2 accelerated the adoption of this concept, which enabled significant change in Europe's financial service industry (FISPAN, 2022). PSD2 was the driving force for the openness and standardization of APIs in banking, promoting digital partnerships in the banking industry (EBA, 2018). According to Danske Bank, open banking is the most revolutionary transformation in financial services after online banking. It provides customers with a landscape of comprehensive, innovative services and opens up various opportunities for companies across different sectors (Danske Bank Website, n.d.). Further, in 2016, Open Banking Implementation Entity was established in the United Kingdom to deliver open banking with four main elements released in 2018: API specifications, security profiles, customer experience guidelines, and operational guidelines (Laplante & Kshetri, 2021). Therefore, Europe could be considered the birthplace of Open Banking as the introduction of PSD2 and UK's Open Banking Standard served as pioneering initiatives in the field (Deloitte, n.d.).

Building a strong ecosystem with the new stakeholders presents a significant opportunity for incumbents to increase their influence and prevent disruption from digital attackers (Abdulla, 2021). In addition, it can reduce the expenses to develop products or services that could be more practical to be developed with external partners rather than attempting to handle everything internally. This is not only cost-effective but also more strategic to stay competitive in the rapid technological advancement changes the industry is undergoing (Valdez-De-Leon, 2019). To succeed in this new ecosystem, banks need to develop a proper data strategy, architecture, and business model (Abdulla, 2021), as well as easily understood APIs that could be used internally and externally by developer communities (Premchand & Choudhry, 2018). Moreover, well-written API documentation should be provided (Valdez-De-Leon, 2019) along with a testing environment, known as sandbox, allowing developers to experiment with the API before going live (Băluţ, 2019). In addition to offering their own services to third parties and partners in the form of APIs, banks must also consume and incorporate APIs provided by other financial institutions to enhance their service offerings (Premchand & Choudhry, 2018).

3.5. Banks - Fintechs Collaboration

Due to regulatory changes in the financial industry, banks are now demanded to shift from a closed mindset to an open but secure one (Zachariadis & Ozcan, 2017). Embracing open API technologies along with the mandatory compliance to PSD2 has paved the way to an open, innovative, and competitive industry where banks and other emerging players, including fintechs, can strategically collaborate on a diverse range of products and services to leverage the evolving digital ecosystem and align with market trends (Omarini, 2018). On one hand, this move transitions the role of fintechs from being disruptors to collaborators. Many fintechs have already developed strategic frameworks to collaborate with incumbents with robust infrastructure and regulatory expertise and are thriving to scale. On the other hand, forward-thinking banks could also use the opportunity to open for themselves new revenue streams (Omarini, 2018).

Although banks are familiar with APIs as they have been using them internally, they do not have experience working with third-party providers. As a traditional player who used to develop everything in-house independently, opening up is a challenging task for banks that come with a steep learning curve. Banks will need to learn how to collaborate and share customer data and

will demand to set a strategy that not only focuses on their profit but on the long-term goals of having a reliable and scalable API that their partners can benefit from. More importantly, Banks should view open APIs as an opportunity for long-term benefits in enhancing connectivity with customers and the industry (Zachariadis & Ozcan, 2017). However, deploying API strategy in traditional banks is challenging due to their complex IT systems. Nordea, for example, has 40 core systems compared to only one system in most fintechs (Mikalajūnas, 2023). That's why banks should identify their needs first and partner with those who could complement their services and maximize their profit. Banks should learn how to manage their partners and maintain healthy competition among them to ensure continuous advancements (Zachariadis & Ozcan, 2017).

According to a report by Cornerstone Advisors consulting group and the fintech company, Synctera, there are three main partnership types between banks and fintechs. First, operational technologies partnerships are when banks partner with fintechs to improve their internal systems and technical infrastructure for internal uses. Second, in customer-oriented partnerships, banks use fintech technologies and tools to improve their products' customer experience. Finally, front-end fintech partnerships are when fintechs help banks to leverage their own technical infrastructure to offer new financial services (Cornerstone Advisors & Synctera, 2022).

This collaboration will benefit not only fintechs, who will have better access to financial data but also banks who need some technical revamp. Due to their complex legacy systems, banks developed a habit of dismissing and mistrusting new technologies leading to a tardy customer experience, which is indicated by their low Net Promoting Scores and fundamental services that lack innovation. Consequently, welcoming new technology and innovative partnerships is crucial for banks to avoid customer churn and to offer digitally-enabled services that stand out in a competitive market (Axis Corporate & Efma, 2016). Additionally, to accomplish a seamless customer experience, there is a need for a user-friendly front-end, which is the interactive side for customers, and a robust back-end which is behind-the-scenes operations. Although banks put many investments in the front end to enhance their user experience, their core technologies in the back end are not befitting in the modern technologies of the new digital world. As a result, banks are to collaborate with fintechs to create an open platform that supports innovation and seamless operations, which fills the gaps in banks' back-end systems (Capgemini & Efma, 2020).

On the other hand, when banks permit data access through open APIs, they allow fintechs to integrate their solutions with the banks' infrastructure and provide a "central access point" for their customers. This integration grants customers convenient access to different financial services from one platform, which helps fintechs scale their offerings. Further, with their experience in regulatory frameworks, banks can support fintechs to comply with the regulations and guide them through this highly regulated sector to expand their services (Hamann, 2021). It is important to note that banks are not only API providers that allow for data sharing but also consumers who leverage fintechs APIs to improve their offerings (Premchand & Choudhry, 2018). Banks get to access advanced technologies in the form of white-labeled services, allowing them to customize these services and rebrand them as their own without worrying about developing or maintaining them internally. With these cutting the edge services, banks are introduced to new customer segments that strengthen their position in the market (Hamann, 2021). This concept of openness and data sharing creates a network of interconnected financial services which broadens the customer base for banks and fintechs and increases the adoption of these services leading to a positive network externality. Further, by utilizing customers' data and fintech technologies, banks and fintech can analyze the data, track customers' preferences, understand their needs and develop customized solutions that are more likely to be used (Zachariadis & Ozcan, 2017).

On the end-user level, the competition and innovation rising from the bank-fintech collaboration diversify the services offered to users (Premchand & Choudhry, 2018), which results in lower costs for consumers (Mansfield-Devine, 2016). Lower costs and more choices enabled access to new customer segments excluded from the traditional financial system, promoting financial inclusion (Omarini, 2018). In addition, this collaboration encourages customer engagement by allowing customers to manage their finances better. With banks-fintech collaboration, customers can access financial data from different sources and aggregate them in one platform (Premchand & Choudhry, 2018). This collaboration, coupled with advanced technologies like AI and data analytics, helps customers manage their money, optimize their financial situation, and make informed decisions (Omarini, 2018).

Forbes Finance Council (2022) conducted an Expert Panel to gather insights from industry professionals on the changes banks need to undergo to survive advances in fintech and their

opinion on this collaboration. A professional from ARGI financial group and oxygen fintech suggested that banks need to adapt to the changes happening in the financial landscape. However, simple digitalization changes will not be sustainable; instead, a broader change in banking culture, strategic adoption of technologies and web-based services, and an understanding of customers' needs are what banks need to cope with the change. Further, professionals from Digit fintech and NorthOne Business Banking added that customers like to have all their services in one place for better connectivity and engagement, which banks usually do not offer since they operate as "silos." Hence, banks need fintech software integration to help them connect all their different products and services in one cohesive mobile experience. Overall, it is in favor of banks embracing open banking and unlocking customer data to allow collaboration with fintechs. These niche brands are to accelerate innovation in the financial industry and provide banks with technologies and expertise that open to them new markets (Forbes Finance Council, 2022).

On the other hand, some bank executives argue that the decision to collaborate is not always easy to make internally. It might be convenient to convince supervisors of the importance of fintech collaboration when it comes to services and products in which the bank does not offer or have expertise. However, it is very challenging to convince the bank's supervisors to partner with external parties that excel in a specific area and ask them to enhance the bank's existing products or functions. This requires giving external party control over the core functions of the banks, which supervisors will highly resist (Zachariadis & Ozcan, 2017). Nevertheless, suppose both banks and fintech strengthen their bonds and steer their attention toward maximizing the business outcomes of this collaboration. In that case, they will both go beyond the "proof of concept," open innovation where they test new ideas, to "applied innovation," where they implement these ideas on a large industrializing scale which overall improves the financial industry (Capgemini & Efma, 2020).

4. Theoretical Framework

4.1. Multi-Level Perspective Framework

The multi-level perspective (MLP) is a framework initially developed by Arie Rip and René Kemp and further refined by Frank Geels and Johan Schot. It is most notable for its contribution to sustainable transition and development research. As a transition framework, academics used MLP in different approaches (Wang et al., 2022). For example, EL Bilali (2019) used it in the agro-food sustainability transitions to understand and explain transitions towards more sustainable practices in the agro-food domain. Similarly, Jørgensen (2012) deployed it in the energy sector to analyze the transition toward a more sustainable energy system.

Further, Geels (2012) used the framework to analyze the emergence of electric vehicles (EVs) as a low-carbon alternative to conventional ones. Later, concepts like evolutionary economics, sociology of innovation, and Neo-institutional theory were integrated. Further, MLP research papers focusing on themes like Environmental Innovation and Societal Transitions, Sustainability, Technological Forecasting and Social Change, Energy Research & Social Science, and Research Policy were published (Wang et al., 2022).

MLP is used to analyze and explain system innovations and the dynamics of socio-technical transitions, a research that emerged in early 2000 in the field of innovation studies (Geels, 2018). Geels (2006) characterizes system innovations as systems that involve long-term co-evolution of interrelated elements among different actors with changes in both the supply side, like technologies and structures, and the demand side, like changes in user preferences (Geels, 2006). System innovations are not limited to technological changes; conversely, they include policy changes, changes in user practices and behavior, infrastructure, and changes in industry structure (Geels, 2006; Geels, 2002). According to Geels (2011), for a socio-technical transition to be sustainable, technology, policy/power/politics, economics/business/markets, and culture/discourse/public opinion should be involved.

The sociology of technology is one of the building blocks on which Geels bases the MLP framework. It emphasizes that technologies are not passive entities but are actively created and

constantly emerging by human actors and social groups. These technologies first emerge with uncertainties about technical capabilities, functionality, and user and market preferences. Over time, these dimensions start to converge and stabilize, resulting in the emergence of dominant designs and establishing a normal market (Geels, 2006).

Both the evolutionary economics and institutional theory perspectives share a common understanding that socio-technical systems rely on an established set of rules that organize the interaction of actors and social groups, leading to inertia, lock-in, and path dependence. MLP recognizes these sets of stable rules as systems regimes and addresses the transition to a new system by analyzing the interaction of multiple processes and actors (Geels, 2006). It offers a comprehensive analysis of barriers and opportunities, emphasizing the significance of a holistic strategy that considers the interplay among stakeholders across various societal levels (Geels, 2012). The framework recognizes that socio-technical transitions are non-linear (Wang et al., 2022). It emphasizes the interplay between three levels of analysis: the micro-level of individual actors who are working to develop and promote a new technology or innovation, also known as niche; the meso-level of socio-technical systems and their networks also known as regime; and the macro-level of institutional structures and societal contexts also known as landscape (Geel, 2002).

4.1.1. Regime

The integration of current technologies, regulations, user behaviors, infrastructures, and cultural discourses leads to the formation of socio-technical systems known as regimes (Geels, 2004). Regimes are the set of rules and practices embedded in a complex system intertwined with institutions and infrastructures (Geel, 2002). Geels proposed a framework for a regime consisting of seven essential elements: technology, infrastructure, techno-scientific knowledge, markets, user practices, cultural and symbolic significance, sectoral policies, and industry (Nykvist & Whitmarsh, 2008).

In established regimes, innovation tends to be incremental due to the stability of the system and the presence of lock-in, such as shared beliefs that limit actors' ability to see beyond their current scope, consumer behaviors and preferences, regulations that create barriers to market entry, and sunk investments in infrastructure and personnel (Geels, 2012). In addition, the potential for

system innovation, or drastic change, is limited because the regulations, norms, worldviews, and practices that shape the regime are slow to change (Nykvist & Whitmarsh, 2008). Regimes are responsible for maintaining the stability of the system. To understand shifts in regimes, it is essential to consider the interactions between two other levels: technological niches and socio-technical landscape (Geels, 2004).

4.1.2. Niche

According to the MLP framework, niches are where radical innovations emerge as actors work on novel ideas that diverge from the current regimes (Geels, 2012). "Niches are locations where it is possible to deviate from the rules in the existing regime (Geels, 2004, p. 912, as in Jørgensen, 2012, p. 998)." The emergence and development of niches are shaped by the existing regimes and landscapes in which they are embedded (Geel, 2002). They are significant as they offer opportunities for learning processes (Geel, 2002) because rules in the niche are not "clear-cut," so it provides the room to learn more about design rules, user preferences, or infrastructure requirements (Geels, 2006).

As well as they are essential in facilitating transitions since they lay the groundwork for systemic change (Geels, 2012). Furthermore, niches serve as a platform for establishing social networks that foster innovations, including user-producer relationships and supply chains (Geel, 2002). A niche encompasses new technologies, institutions, markets, lifestyles, and cultural elements and comprises networks of actors and organizations (Nykvist & Whitmarsh, 2008). These niche actors aspire to have their innovative ideas adopted by the regime or to replace the regime altogether. However, this is a challenging task as multiple lock-in mechanisms typically stabilize the current regime (Geels, 2012). Despite the promising appearance they may initially look like, there is no assurance of their success (Geel, 2002). Understanding niche development is crucial in comprehending various forms of socio-technological transitions (Nykvist & Whitmarsh, 2008).

4.1.3. Landscape

The hierarchical structure of these levels indicates that landscapes encompass regimes, and within these regimes, there are niches (Geel, 2002). The socio-technical landscape is a critical

factor influencing the dynamics of niches and regimes. This broader landscape context is even more challenging to change than the regime (Geel, 2002; Geels, 2012). Although landscape changes do happen, they occur slower than regime changes. This is because the landscape consists of diverse and heterogeneous elements, such as oil prices, economic growth, wars, emigration, broad political coalitions, cultural and normative values, and environmental issues (Geel, 2002). There are two key roles for the landscape level in MLP: exert pressure on the existing regime to prove some changes; second create opportunities for emerging niches and safeguard them against the dominant regime (El Bilali, 2019).

These changes stress regimes, making it harder for them to adapt, whereas niches tend to evolve more rapidly (Nykvist & Whitmarsh, 2008). At the landscape level, changes such as cultural shifts, demographic trends, and political transformations typically occur gradually. However, these changes can pressure the existing regime significantly (Geel, 2002). The landscape also encompasses various spatial structures, including urban layouts, political ideologies, societal values, beliefs, concerns, media landscapes, and macroeconomic trends (Geels, 2012).

In summary, for the transition to happen, the niche, regime, and landscape levels should be aligned (El Bilali, 2019). The changes in the landscape level, along with the momentum niche creates, put pressure on the existing regime leading to the instability of the regime (Geels, 2012). Due to system innovations' complexity, policymakers should be involved to gradually connect between the niche and regime levels. According to MLP, policymakers can not impose radical changes to stable socio-technical regimes. However, they can put some pressure on the regime and make slight changes to the ongoing process while promoting radical innovation and experimentation at the niche level to foster a connection between the two levels. The pressure intensity on the regime should be gradual until the niche technologies mature; then, policymakers should start pushing for the new technology (Geels, 2006). This destabilization on the regime level, along with the momentum gained by niche, making them attractive to other actors, leads to niche adoption at the regime level (Geels, 2012).

4.2. The Interaction between the three level:

In his paper in 2006, Geels discusses the interaction between the three different levels: macro, meso, and micro level, describing it as the "nested hierarchy" where niches are nested in regimes and regimes nested in the landscape. These three levels dynamically interact over time through four different phases. In the first phase, innovations arise in a niche to address problems and issues in the established regimes. It is a developing phase where users' behavior gets understood, and various technical ideas get developed to meet users' needs and introduce an optimal design. In the second phase, the innovations from the first phase get used in small market niches, which serve as a resource for technical exploration for new functionality. Engineers and technology specialists work together to make improvements to emerging innovations. The new technology starts to gain its own rules and guidelines from engineers and gets incorporated into users' practices, which develops a technological trajectory of its own. As users gain experience and progressively explore its functionalities, a dominant design of the innovation starts to take shape. In the third phase, the new technology diffuses into the existing system, and competition against the current regime arises. Geels suggests that new technologies diffuse in the regime due to niche-external circumstances at the regime and landscape levels. These external circumstances include technical problems in the regime, strict regulations, changes in user behavior and preference, and pressure from landscape changes. Geels argues that the wide adoption of the new technology is an internal driver for its distribution. Due to lower costs and better performance, the emerging technology gains greater benefits as more people adopt it. Lastly, in the fourth phase, the new technology gradually replaces the old way of doing things and introduces new infrastructures, user practices, and policies. In this phase, existing incumbents might resist the new technologies due to the sunk cost they invested in the old ones. They might try to improve the current system to compete against the new ones, put some political pressure, or find a new market to participate in (Geels, 2006).

4.3. Transition Pathways:

The various potential interactions that could take place between niche, regime, and landscape lead to different transition pathways, which were summarized by Geels and Schot in 2007 (Wang

et al., 2022). These pathways are determined by their nature (harmonious or competitive) and timing (El Bilali, 2019), as discussed in the following. The Reproduction process is when a stable regime lacks the landscape pressure. In addition, the transformative pathway where landscape does put gradual pressure on the regime, but the niche is still underdeveloped. Conversely, if the niche is underdeveloped and the landscape puts too much pressure, it will cause destabilization in the regime leading to de-alignment. This unstable regime enables multiple niche innovations to coexist and compete with each other until the most promising niche dominates over the existing regime leading to a re-alignment. Further, technological substitution might happen if a new disruptive technological niche innovation emerges, replacing existing ones due to landscape pressure on the regime. Lastly, technology reconfiguration occurs when a niche innovation gradually gets incorporated into the existing regime leading to changes and adjustments under landscape pressure (El Bilali, 2019).

4.4. MLP compared to other Theories and Frameworks:

In his paper in 2011, Geels compared MLP to other transitions and innovation frameworks and spotted the main differences that make MLP more comprehensive and concrete. Unlike other frameworks, MLP goes beyond focusing on a single technology or one level of interaction. For example, the Technological Innovation Systems (TIS) approach is multidimensional and considers cultural and demand side changes; however, it does not count for the structural changes. Further, theories like disruptive innovation, by Christensen, or technological discontinuity, by Anderson and Tushman, emphasize the technology aspect and tend to marginalize the interaction between new entrants and incumbents. On the other hand, the theory of techno-economic paradigm shifts (TEP) - by Freeman and Perez - is more similar to MLP as it accounts for structural changes and the driving forces that provoke the change. It examines the technologies, production methods, economic framework, institutions, and beliefs that contribute to the system's stability. Despite being very close to MLP in the analysis of system transitions, differences in scope arise between TEP and MLP. TTEP encompasses entire economies, whereas MLP focuses on concrete systems and thoroughly digs into various groups' strategies, resources, beliefs, and interactions (Geels, 2011).

4.5. Strengths, Weaknesses, and Criticism:

Geels (2012) states that the MLP framework does not rely on straightforward cause-and-effect relationships or simplistic drivers. A single factor, such as technological change or prices, cannot explain transitions. Instead, they involve complex interactions between multiple dimensions, including technology, industry, markets, consumer behavior, policy, infrastructure, spatial arrangements, and cultural meaning. The co-evolutionary and systemic approach of MLP acknowledges that the development of each dimension is interconnected and affects the others, resulting in a complex web of interactions between actors at different levels of society. Further, MLP recognizes the system's stability on one end in the form of the regime level and the radical changes on the other end in the form of the niche level (Geels, 2012).

Geels (2006) summarized the strengths and weaknesses of MLP in three main categories: scope, empirical validity, and simplicity. Geels claims that a strength of MLP is its broad scope combining input from sociological, economic, and socio-technical theories (Geels, 2006). Another strength Geels (2006) adds is the empirical validity as MLP was applied in many historical case studies like "the transition from propeller-piston engine aircraft to turbojets (1926-1975), the transition from sailing ships to steamships (1780- 1914), and the transition in urban land transportation from horse-and-carriage to automobiles (1860-1930) (Geels, 2006, p. 177)".

Despite the strengths, Geels (2006) proposes some gaps that MLP does not fill that require further research. Exploring the interaction between multiple niches is one of the gaps that MLP does not address. Currently, MLP analyzes the system innovation with only one niche; however, a system will have multiple niches that compete with each other, reinforce each other, or in some cases, co-exist is not yet supported by MLP. An additional recommendation is to have a broader empirical foundation by including more case studies from various sectors and domains. This allows researchers to analyze and test different variables like the public versus private sector, with or without infrastructure, sectors with small firms vs. large firms, etc (Geels, 2006).

While MLP has advantages in analyzing transitioning systems across various levels, there are some critical concerns regarding its use. Jørgensen (2012), on the one hand, criticizes MLP for its lack of guidance. Although MLP could be good at analyzing the situation and the interactions

between different actors, it does not offer guidance and support to these actors involved in a transition process, including policymakers, business leaders, civil society groups, and others who are working to bring about a transition to a more sustainable or equitable system (Jørgensen, 2012). On the other hand, MLP was criticized for its simplicity as it draws clear lines between the three levels, regime, niche, and landscape, where it is not always that simple when the levels are interrelated (El Bilali, 2019). It does not account for the fact that the boundaries between these levels may be fluid and contested and that actors engaged in transition processes often work across multiple levels (Jørgensen, 2012).

In addition, MLP was criticized for not considering the spatial factor and the geographical characteristics, which hold significance in shaping the distribution of resources, infrastructure, and actors within socio-technical systems. Many researchers have tried to contribute to the framework and integrate the spatial factors, but a comprehensive framework that includes these factors has not yet been developed (Wang et al., 2022). Further, El Bilali (2019) adds that although MLP is more convenient for analyzing technical innovation based-transitions, it is constrained when analyzing social innovations.

MLP was also criticized for being biased toward the bottom-up approach, where changes happen gradually due to the development of smaller units (niches) that influence large systems (regimes). In contrast, it is suggested that policy-induced change, as in the top-down approach, also has a significant role in the transition process (El Bilali, 2019). However, MLP is accused of limited attention to power and policy as it does not observe the role of policy in the transition and does not recognize the political barriers between niche and regime actors (Wang et al., 2022). This accusation is negated by Geel (2002, 2006, & 2011) as he emphasizes that policy and political changes are important for sustainable socio-technical change and acknowledges policymakers' importance in putting pressure on the regime.

Another limitation of MLP, according to Geels (2006), is the use of metaphors like "landscape," as it does not align with the academic context where researchers prefer more concrete concepts. However, it is not only the concept of landscape that is vague but also the role assigned to it is also vague. Many studies marginalize the landscape-level analysis and focus on other aspects treating landscape as the assorted category that accommodates elements that do not fit into the niche or regime categories (El Bilali, 2019).

4.6. MLP in this Research:

In this research, the Multi-Level Perspective framework will be deployed to analyze the socio-technical transition in the banking sector from a closed system, where traditional banks and emerging fintechs work independently, to a more collaborative open banking system. It will study the collaboration process between fintechs and traditional banks in the light of open banking. The research will apply MLP for socio-technical change to examine both the technical and social aspects of the transition in the banking sector. On the technical side, the focus will be on open APIs, technology advancements resulting from collaboration, and their implications for the banking industry. On the social side, the study will consider the impact of collaboration on both individual and business consumers.

At the regime level, traditional financial institutions represent the dominant system of practices, rules, and structures intertwined with institutions and infrastructures. This level will investigate the stability of traditional banks, their lock-in effects, and their resistance to change, which can hinder the adoption and diffusion of fintech technologies into the banking sector. On the other hand, fintech innovations and other emerging technologies represent the niche level, which consists of new and innovative ideas that deviate from the existing regime. At this level, the MLP will be used to identify the strengths and limitations of the niche and analyze the niche market and users' needs.

Finally, at the landscape level, factors influencing the system transition and the dynamics between the niche and the regime will be identified, and their impact will be investigated. These factors include consumers and their behavior, policies and regulations, digital transformation altering the financial sector, and how these changes exerted pressure on traditional banks, opened opportunities to fintechs, and facilitated the system transition. The digital transformation of the financial sector, for example, did impact the development of fintech technologies, creating opportunities for emerging niches. Further, the Payment Service Directive 2 (PSD2) has influenced the collaboration between traditional banks and fintechs, exerting pressure on existing regimes.

MLP will be utilized to investigate the status quo pre-open banking, including the stability of traditional banks and their lock-in effects. It will examine how niches rise to address problems in

established regimes and the internal momentum they build up due to users gaining experience and progressively exploring the functionalities of the innovations, making them more visible and relevant to the regime level. Then it will look into the collaboration process considering the drivers on the regime and niche levels that encourage banks and fintechs to collaborate. It will also look into how banks and fintechs perceive the collaboration process and their fears and concerns that might hinder it. The study will also examine the impact of landscape changes, such as how PSD2 has created a regulatory framework that encourages traditional financial institutions to collaborate with fintechs and embrace open banking. While transitioning to the new open banking system, challenges and conflicts between traditional banks and fintechs during the collaboration will be investigated, and the possible ways of handling them. Also, perceived opportunities and risks will be examined to study the implication of the collaboration process.

By using the MLP framework, this research aims to provide a comprehensive understanding of the complex socio-technical transition in the banking sector and shed light on the collaboration dynamics between traditional banks and fintechs as they navigate the changing landscape of open banking, resulting in a mutually beneficial outcome that transforms the old system into a more open and collaborative one.

5. Methodology

This research analyzes the collaboration process between traditional banks and fintechs in open banking. It investigates the role of Open API technology and the PSD2 regulations in promoting innovation and competition that facilitates this collaboration process. It looks into drivers and inhibitors, the opportunities and risks, fears and concerns, and the potential advancements of this collaboration. The research adopts a qualitative approach; it uses semi-structured interviews and secondary sources for data collection. Further, it employs the Multi-Level Perspective framework to analyze the primary and secondary data and draw a conclusion accordingly.

5.1. Literature Search

The literature review is divided into two stages: background research and theories and frameworks research. The background research aims to explore the topic from different angles, understand the concepts, examine the elements tested in other relevant studies, and identify research gaps. The background research was developed in rounds where each led to the other. In the first round, the following keyword examples were used to find relevant literature: *fintech innovation, financial technology, digital transformation of the banking industry, banking sector disruptions, digital banking trends, and collaboration between banks and fintech*. This round served as an explorative round for the fintech industry and how it is a factor in digitally transforming the banking sector.

Further, it proposed the following keyword examples for the second round: *open API, open banking, payment service directive 2, and banking data sharing*. This round introduced the factors and elements that play a role in the collaboration process between traditional financial institutions and fintechs. Lastly, background research was conducted to examine the challenges and opportunities arising from this collaboration with the following keyword examples: *data security, open banking opportunities and risks, legacy systems, and user experience*. This process developed a solid background of the topic, a better understanding of the concepts, and ideas for elements and factors that could be tested throughout the research.

The background research was not limited to academic papers but encountered various data sources to develop a comprehensive analysis that explores diverse viewpoints. Since this research has industry relevance, news articles, banks and fintechs blogs, and white papers were considered. The fintech-banking collaboration is a new evolving topic; hence, news articles and industry blogs are great sources for up-to-date information that covers the latest trends and insights. They view the industry perspective and provide practical insights as they are written by professionals with direct experience and industry knowledge. In addition, consultancy reports by firms like KPMG, McKinsey & Company, and Capgemini were also considered. These reports hold accessible market research data and survey findings that are usually not publicly accessible. They offer a deeper market understanding through case studies, best practices, and strategies. Finally, publications from regulatory agencies like the European Banking Federation (EBF),

European Banking Authority (EBA), and European Commission were reviewed to understand the regulatory landscape and its impact better.

The second stage of the literature review, in parallel with the background research, is finding a fitting theory for the research. At first, different innovation theories were reviewed, including the Diffusion of Innovation theory by E.M. Rogers, which illustrates how innovation diffuses over time in a system and what are the characteristics of the adopters (LaMorte, 2022; Khraisha & Arthur, 2018). It acknowledges that innovation diffusion in the system is a progressive process; however, it focuses most of the attention on the different adopting segments, their rate of adoption, and their characteristics (Surry, 1997; LaMorte, 2022) without giving enough information about the interaction between these segments. Moreover, the Open Innovation theory by Chesbrough was considered, which investigates the strategies of openness that promote cooperation and collective creativity where knowledge and technology are accessible to all stakeholders and contributors (Chesbrough & Appleyard, 2007). However, this theory mainly focuses on the technological aspect of innovation without considering the societal aspect. Also, it does not analyze how the innovation will diffuse in the existing system.

Later, the background research showed that an industry change theory is needed to assess not only the innovation but also the changes happening in the existing system. The concept of Industry Convergence was first considered. It does not have one single founder, but rather it is an evolving concept that researchers and academics have contributed to, making it hard to rely on as it does not propose a defined framework. Further, banks and fintechs are not two different industries converging like in the case of the telecom and banking industries; instead, they are implications of the digital evolution of one single industry, the financial industry. Consequently, the concept of industry convergence does not apply to this research. Finally, the Multi-level Perspective (MLP) framework was the most fitting for this research as it analyzes socio-technical changes which account for both the technological aspect and the societal landscape of the change. Further, it analyzes not only the emerging innovation but also the changes happening in the current system and the interaction between the two. Section 3 in this report is a dedicated section for MLP and its application in this research for further information.

5.2. Data Collection

5.2.1. Primary Data

For primary data collection, semi-structured interviews were conducted. To have a high-quality data set that is diverse and unbiased, interview subjects that were contacted were divided into four main groups: banks, fintech, academic professors, and consultancy firms. For fintechs, platforms like Copenhagen Fintech and Digital Hub Denmark were used to find fintechs that could be contacted for interviews. A list of 15 fintechs were contacted. For academic professors, webpages of major universities of Denmark, including CBS, AAU, SDU, KU, and IT University Copenhagen, were browsed to find researchers with focus areas in fintech, open banking, and financial innovation research. A total of 8 professors were contacted. Banks and consulting firms were directly contacted based on prior knowledge of the bank or the consulting firm. Some banks were contacted when they were found as partners on fintech webpages. A list of 14 banks was directly contacted, including major banks like Danke Banks, Nordea, and Deutsche Bank, and smaller banks like Sydbank and SparNord. In addition, three major consulting companies, KPMG, Accenture, and BCG, were contacted. Finally, the LinkedIn platform was utilized to directly connect with experts and employees in the industry, where 15 employees and industry experts were directly contacted.

A total of four positive responses successfully contributed with their input and participated in online interviews ranging from 45 minutes to an hour. Two interviewees are fintech employees and two academic professors. The very few industry responses received show the limited willingness of banks and fintechs to engage due to some concerns and reservations on participation. Most of the responses received were as follows: “We do not participate in these kinds of research”; “We do not have the time or resources for this.” This lack of positive responses might indicate that the banking industry is still of a conservative culture as they deal with sensitive financial and customer data, so they may be cautious about participating in research studies for compliance concerns, especially banks, as they operate in a highly regulated environment.

It could also be a prioritization indicator as some respondents clearly stated that they have new projects in their workflow within the coming period, so they do not have the time to participate in the research. This lack of interest suggests that the industry may not prioritize research initiatives. They may rely more on internal research and established industry reports to avoid the risk of sharing data with external researchers.

The MLP was used as a guide to draft the interview questions. First, the questions were divided into three main categories: questions analyzing the niche, regime, and landscape levels. Then, within each level, the questions were developed based on the different elements that MLP suggests, including drivers, challenges, market needs, user behavior, resistance, problems in the regime, policies and landscape pressure, and infrastructure which assisted in drafting the main themes. It is worth mentioning that, as MLP addresses the socio-technical change, the questions did not only address the technical side but also the societal side. It covers aspects like the impact of the collaboration process on society, what segments benefited the most, what fears users have, if any, and what customers' needs were met. In the table below, there is a sample of the structure of the interview questions and how the framework was used to outline the main themes and frame the questions, measuring diverse relevant aspects. The full table with all the interview questions could be found in appendix 12.1.

Theme	Level	Questions
Status Quo	Regime	What are the areas where banks are excelling over fintech?
	Niche	What issues did fintech try to solve that banks usually overlook? Which customer segment did fintech want to serve? Which customer needs they wanted to meet?
	Landscape	On a general level, how do you think the open API technology has affected the rise and evolution of fintech and how did this impact the regime system of traditional financial institutions?
Drivers Fears & Concerns Challenges & Conflicts	Regime	What were the drivers for banks that made them collaborate? What concerns and fears did banks have about this collaboration?
	Niche	What challenges do fintech face during this collaboration?
		Are there any conflicts or do you foresee potential conflicts between banks and fintech due to this collaboration?

	Landscape	How did open banking APIs and PSD2 impact the relation between banks and fintechs?
		What concerns and fears did consumers have about this collaboration?
Opportunities and Risks	Regime	What opportunities do banks gain from this collaboration?
	Niche	What opportunities do fintech gain from this collaboration?
	Landscape	What opportunities do consumers gain from this collaboration?
		What are the digital trends that emerged from the use of open API between banks and fintech?
		What risk did this collaboration bring or what risk do you foresee rising?

Table 5.1 Simplified Table of Interview Questions

5.2.2. External Data

A systematic review of external sources was conducted to add to the primary data collected. Integrating empirical evidence with external data added a deeper level of analysis and an extra layer of interpretation of the primary findings. It serves as a validation which adds credibility to the primary data. It provides a comprehensive understanding of all possible perspectives, themes, and trends, which could be compared and contrasted with the empirical evidence to give a more critical analysis and holistic conclusion.

The external data this research relied on are mostly pre-conducted interviews available on the Internet. All interviews included the name, the title, the position, and the firm/bank the interviewee is affiliated with, which establishes the interviewee's identity and professional background, adding credibility to the data provided and the reliability of the interviews. The interviews were sourced from diverse platforms, including record interviews on YouTube, interviews conducted by reputable consulting groups such as McKinsey & Company, interviews on established banks' websites, and interviews from reputable fintech magazines like Finextra and the Payments Association.

The utilization of external data sources provides valuable insights that offer a distinct advantage, mainly due to the inclusion of interviews conducted with individuals occupying influential positions within hierarchical structures, which may have been challenging to access independently.

Overall, the selection of these pre-conducted interviews and other external sources was guided by their credibility, relevance to the research topic, and alignment with established knowledge in the field, which enabled the research to engage with existing perspectives and contribute to ongoing debates in the field.

5.3. Data Analysis

After collecting the data, i.e., recording interviews, transcribing it, and cleaning it, each transcript was reviewed independently, insightful parts were highlighted, and relevant tags were added. Then the transcripts were cross-read, the tags were compared and contrasted, and the patterns were spotted. Based on the patterns found, the main themes suggested by MLP were confirmed, and some sub-themes were drafted. With the main themes in mind, external sources were systematically reviewed and cross-checked with the primary data to add a deeper layer of analysis. After conducting a thematic analysis of the primary and external data, six main themes and their respective sub-themes were chosen. A complete overview of the themes, subthemes, and descriptions can be found in a codebook in appendix 12.2.

6. Findings

This section presents the key findings from qualitative interviews conducted with the 4 participants presented in Table 6.1, backed up by findings from a systematic review of external sources. The findings are categorized into six main themes with sub-themes, as summarized in Table 6.2. A summary of the findings is provided at the end of this chapter in Table 6.3.

Interviewee	**Role**	**Organization**	**Areas of Expertise**
1	Academic Professor	Copenhagen based University	Fintech | Technology Economics | Financial Services | Machine Learning | Data Analytics | Digital Platforms
2	Academic Professor	Copenhagen based University	Cryptography | Blockchain | Software technology | Distributed ledger technology
3	Analyst	Danish based fintech that has	Customers & Technical support

		2.900 connected banks across Europe	
4	Consultant	Multinational financial services corporation	Partnerships | Product Strategy | Business Development | Payments

Table 6.1 Overview of interviewees

Note: Interviewee 1 will not be directly quoted because they prefer not to be.

#	Main Themes	Sub-Theme
1	Status Quo before Collaboration	-
2	Drivers for Collaboration	- Access to Data - Access to Regulatory Expertise - Access to Modern Technologies - Convenience, Time & Cost Efficiency - Retain Customers and Competition - Changes in Landscape - Responses to the Collaboration
3	Fears and Concerns	- Security - Liability - Consumers' Concerns
4	Challenges and Conflicts	- API Development, Integration & Communication - Shifting Mindsets - Complexity of Banking Systems & Compliance
5	Opportunities	- Developing Ecosystem - Automation & Connectivity - Technical Opportunities - Consumers Benefits
6	Risks	-

Table 6.2 Themes and Sub-Themes Simplified Table

6.1. Status Quo before Collaboration

To understand the importance of the collaboration between banks and fintechs and to be able to investigate the changes open APIs and PSD2 altered in the industry, the status quo was explored to have a better background on how the landscape was, what were the points of strengths of banks and fintechs, and what were the pain points each faced.

Regime

According to the primary data, interviewee 4 explains that banks were burdened by outdated infrastructure. Further, their scale, risk aversion, and large customer base were strengths but also contributed to their traditional and slow-moving nature.

> *"How did banks position themselves and how were they structured beforePSD2 is that banks did everything [...] they really managed everything end to end including their own infrastructure which already had like a lot of technical debt. So in some cases it was built in the 80s or in the 70s and it just kept on and build on top of that. So that made them also pretty slow. And because they were still having old tech, they were not really able to meet at the demands of consumers."* (Interviewee 4)

> *"Uh, well, I think banks, it's scale, it's money, it's a knowledge of legislation. Yeah, that's also slows them down, of course, because we can see at this moment is that it really slows them down. It is really risk averse. So I think it's and it's also installed base so obvious and the banks have a large customer base."* (Interviewee 4)

Interviewee 3 highlighted that the traditional nature of banks had motivated fintechs to revolutionize the banking sector by introducing innovative technology and disrupting established practices.

> *"Banks are very traditional and so they're very sort of set in their ways. So I think what Fintechs come is they come and they again revolutionize the way that technology is used in this very traditional sector, which is banking."* (Interviewee 3)

External sources added that due to their longstanding presence, banks possess deep industry knowledge, consumer trust, and expertise in industry regulatory frameworks.

> *"But as a bank, our strengths are our understanding of our industry, our ability to comply with different regulations and our global network, which has been established over a number of decades."* (Gil Perez, the Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

> *"What you see is that banks are still very trusted by consumers when it comes to their finances and beyond. Various studies show that the preferred guardian of data is a bank, instead of for example social media players. Privacy and trust are a key need of customers that banks can provide."* (Koen Adolfs, Product Owner & API Evangelist at ABN AMRO Bank as mentioned in an interview by Coeckelbergs, 2019)

The sources confirm the primary data that the long last presence of banks led to a rigid system that slowed them down and challenged the transformation of their operations.

> *"Banks have been around a lot longer and have complexity in their technology and areas where transformation has to take place. It's too risky and costly to throw it all out and start again."* he goes on referring to fintechs *"[...] they don't need to deal with a legacy environment. They begin with an infrastructure that is modern and easy to update."* (Gil Perez, the Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

Niche

Interviewee 1 states that fintechs prioritize cost-efficiency and leveraging existing technologies, similar to telecoms. They focus on adapting to industry changes and using technology innovatively to stay up-to-date. Fintech companies recognize the significance of tech innovation and collaborate with major industry players to explore new ways of handling data and capitalize on emerging opportunities.

The primary data shows that fintechs exploited the gap between banks and customers and made their way to the market accordingly. Interviewee 4 explains that fintechs, with their new technology stack, agile organizational approach, and young talents, have been able to meet customer demands more effectively by providing faster, more efficient, and customer-centric solutions.

> *"I think that Fintechs, who entered the space, let's say in starting 2011, 2012 and they build everything on a new tech stack, which was more fast, more efficient, more agile in in terms of of building it. And because of that it abled to meet customer demands in a better way."* (Interviewee 4)

> *But then if you look at fintechs, it's really about access to the latest or having, yeah, the latest technology or know how to develop it. More agile organizations, new ways of working. Maybe better talents or younger talent and or aligned with OK what's the customer needs or the consumer needs? [...] The larger banks also had really yeah knowledgeable people, but I think that fintech had brought in like younger people just coming from maybe from university, knowing what they wanted to build, and with that not being hindered by any wait, sort of say.* (Interviewee 4)

Interviewee 3 emphasizes that Fintechs aim to enhance financial health and transparency for individual consumers and companies by offering tools for a better financial overview, understanding of transactions, budgeting, and savings.

> *"I think it's always the question whether IT shapes people or whether people shape IT. But I definitely think that in this case, people do shape the IT. There was a very clear gap in the market for this, and I think that reflected in customers banking behavior."* (Interviewee 3)

> *"Definitely financial health and financial transparency, I think Fintech strives to make it easier for the individual consumer or like either individual like end user or individual company to have a better overview of their finances, to better understand what money comes in and what money comes out and and like. Yeah, finding patterns in their transactions, budgeting savings, all that sort of stuff."* (Interviewee 3)

Fintechs focused on targeting new, underserved customer segments. According to interviewee 4, unlike banks that offered a wide range of products, fintechs were focused on catering to specific segments and providing specific services. Interviewee 3 further emphasizes that fintechs paid particular attention to serving Small and Medium Enterprises (SMEs).

> *"[...] banks did everything and they had like really broad portfolio of products and solutions. [...]most fintechs, they're really focused on specific segments or specific jobs to be done."* (Interviewee 4)

> *"So banks used to do everything and they would typically work with their traditional partners and fenderson their partner for years while and and that's really slowed them down and they had the fintechs who really focus on specific use case or niche or target audience and really focus and deliver the product to meet those needs."* (Interviewee 4)

> *"We want to foster collaboration between small, medium businesses especially. Mobile pay for example has completely revolutionized the way that people do bank transactions. The purpose of Aiia is to sort of do the same but for businesses. So businesses are able to better like handle their accounting, handle the finances."* (Interviewee 3)

In line with primary data, external sources argue that fitechs primarily focused on establishing a niche that focuses on the consumers' needs and filling the gap between these needs and what banks offer.

> *"Snoop aims to make everyone better off by helping people make the most of their financial data. We want to transform traditional services like retail banking, money management and price comparison into more intelligent and personalised services. [...] Snoop believes that there is a new way of delivering personalised insights, recommendations and actions tailored to the consumer's actions and behaviours."* (John Natalizia, CEO & Co-Founder of Snoop as mentioned in an interview by the Payments Association, 2021b)

> *"Ping Identity focuses on the intersection of frictionless user experiences and security and many customers leverage our technology to enable their digital transformation initiatives."* (Andre Durand, Ping Identity CEO as in McKinsey & Company Interview by Brodsky et al., 2018)

Confirming the implications made by interviewee 4, Ulster Bank acknowledges the fact that fintechs are more focused and target specific segments.

> *"Fintechs are not looking at least yet to set up full service banks, they are looking to come and observe the segments of the market, parts of the values chain that they want really to disrupt and become really good at in a deep capable way"* (Ciarán Coyle, Chief Administrative Officer, Ulster Bank as in a youtube interview by Finextra, 2018c)

Further, the sources agree that fintechs target the business segment, especially SMEs, due to their flexible approaches that are convenient and time efficient for all sizes of businesses.

> *"Initially, I believe we see that much of what we have delivered to the private customer segment, possibly can be copied straight of and be delivered to the business segment as well. [...] It is not a complete secret that our utmost ambition actually is to start doing this quite soon. That is: do more or less what we do right now, but also start doing it aimed towards the business segment as well."* (Tink CTO as in Sturen & Thoresson, 2020)

> *"OK, so if you're an SME, you are the entity collecting payments. You sign up and register with Ordo. That takes about 3 minutes - we've timed it. And we only collect the amount of data we absolutely need to provide the service."*
> *[...]*
> *"We're an Open Banking platform so, whatever size company you are, whatever solution is right for you, we've got a pick and mix capability that you could integrate into your platform; or not integrate and use our 'off the shelf' solutions. There are different levels of integration you can do with our solutions. So, it's about giving a greater opportunity to businesses and SMEs for being able to collect and receive payments easily."* (Fliss Berridge, Director & Co-Founder of Ordo as mentioned in an interview by the Payments Association, 2021a)

Landscape

Based on the primary data, before collaboration, there was a power imbalance that favored banks, granting them control over customers' finances and the ability to make decisions such as loan eligibility based on their own criteria.

> *"More open collaboration between banks means that things are more transparent and also it takes away some of the power that the financial institutions have held for many, many, many years so far. [...] All the power was on the bank side, right? So it was the banks that had the power over your finances basically and could sort of say ohh well we think that based on your financial history, you're not eligible for a loan or whatever something in that down that Road."* (Interviewee 3)

Further, Interviewee 3, referring to the impact of digital transformation on the industry, says:

> *"It definitely encourages evolvement and competition and innovation. It would gives the opportunity for companies in the industry to personalize their products and make them more customer centric. So they can provide some services that like fill a gap in the market that isn't there right now."* (Interviewee 3)

External sources add that before the rise of open APIs and PSD2 took effect, the industry needed more innovation on the landscape level due to bank monopolization and customer lock-in, which also led to a lack of competition, confirming the power imbalance stated in the primary data. Further, it also highlights the role of digital transformation in changing the industry landscape.

> *"The industry was fairly limited in terms of innovation, and banks very much worked towards locking their customers in with them, rather than building and offering them good services. [..] Banks also had monopoly power on money transferring. Customers had to go to them and ask them to send their money. All of this had led to a rather magical position for the banks, where it was very hard to even try to compete with them on the financial market."* (Tink CTO & Co-founder as in Sturen & Thoresson, 2020)

> *"Indeed, the major change is now coming from digital disruption of the sector. [...] Customers have new service expectations in terms of user-friendliness of the interface and transparency. [...] Digital technology may have a large impact in terms of increasing competition and contestability of banking markets"* (OECD, 2020)

6.2. Drivers for Collaboration

Banks perceived fintechs differently; some perceived them as an opportunity, and some as a threat. However, both banks and fintechs acknowledged the power of each other and the valuable assets each held, becoming aware of the importance of collaboration to deliver high-quality products and stay in the market. Hence, the drivers for collaboration were explored to understand the motivation behind the collaboration from banks and fintechs perspectives.

Before exploring the drivers, the following findings highlight banks' initial perceptions of fintechs, how some banks recognize the collaboration potential, and how fintechs are willing to open up the market and engage in collaboration without aiming to dominate the entire market.

Banks:

> *"Some cases they really saw Fintech as competitors like entering in their market, coming with like a newer, more agile, faster, newer products, yeah, which were really able to meet the demands of the consumers and actually the customers of the larger banks. So that annoyed them a bit and they all said, yeah, they're a bit small, so don't worry too much." [...] Yeah, you will have banks that say, well we build everything ourselves. We're not looking to the outside, so it's a little bit… OK, let's, let's call it arrogant"* (Interviewee 4)

> *"But you also had some other banks that were like, ohh, hang on, this is pretty cool. This is what we want. We cannot do it by ourselves at this moment, so let's see if we can collaborate. So it was like a really mixed bag in terms of how banks and fintechs looked at each other and also how they collaborated."* (Interviewee 4)

> *"I believe fintechs and many other innovative start-ups have a positive impact on the financial industry, and that banks should view them as potential partners, rather than competitors."* (Gil Perez, the Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

Fintechs:

> *"So I think banks were very sort of set in their ways and I think fintech is a tool to open up the banking world much more and to make banking more like both easier and more accessible for the consumers"* (Interviewee 3)

> *"From our perspective it does not really matter who wins in the market. What we are hoping for is that what we are doing is a part of what unlocks the market."* (Tink CTO as in Sturen & Thoresson, 2020)

6.2.1. Access to Data

One of the significant assets banks have that fintechs need help with is data. Data is the main driving force on the niche level, encouraging fintechs to collaborate with incumbent banks to access users' data. Despite this valuable commodity, banks are limited in delivering innovative services with it, creating a promising opportunity for fintechs to step in and fill the void.

> *"You can't do anything without the banks or sort of, you're very you're very stumbled without the bank. [...] financial data is not with the Fintech. It is with the banks. [...]*
> *We would not be able to offer the same quality product that we offer now because we would not have any of the banking data.* (Interviewee 3)

> *"Most fintechs can't deliver their services without access to consumer account data."* (Plaid article by Kopple, 2022)

> *"Data is the new currency in today's financial landscape, and the fintech industry is at the forefront of leveraging technology to solve problems and create better financial solutions." [...] There is now an incredible opportunity for the financial services to utilise the data that is at their fingertips by leaning on the solutions the fintech industry is providing. This will help them navigate the new landscape, enhancing data access leading to more efficient and customer-centric services, meaning banks can remain competitive in an increasingly digital world."* (Fraser Stewart, Co-Founder and Chief Commercial Officer at Lyfeguard as in the FinTech Magazine, 2023)

Plaid fintech, about the partnership with the bank JP Morgan Chase, emphasizes that the collaboration builds secure and reliable data access and transfer within the ecosystem, which is essential to protect consumers and developers.

> *"This partnership underscores the need for secure and reliable data in the fintech ecosystem." "We firmly believe that collaboration with financial institutions is the best way to deliver on the promise to protect consumers and developers. We're proud of the steps we are taking with Chase towards this reality."* (Plaid as in Fintech Futures News, 2018)

6.2.2. Access to Regulatory Expertise

Unlike banks, fintechs do not face the challenge of regulatory compliance, which gives them room to innovate. However, to survive the highly regulated landscape they compete in, fintechs need the regulatory expertise banks possess. Further, with partnering with banks, fintechs may overlook specific regulations and rely on bank partners to offer them the needed regulated services.

Interviewee 4 highlights that knowledge of legislation is one of the key strengths of banks.

> *"Uh, well, I think banks, it's scale, it's money, it's a knowledge of legislation"* (Interviewee 4)

External sources confirm that banks' regulatory expertise drives fintech to partner with them.

> *"New partnerships can be a win-win. Whereas smaller fintechs bring innovation and change to the banking sector, major banks can be helpful with resources and compliance expertise."* (Jon Schäffer, Danske Bank's Head of Strategic Partnerships as in an interview by the Mastercard Fintech, Aiia, by Basse, 2019)

> *"[...] fintechs are not regulated and they either ignore the regulation or rely on banks to provide the regulated services or coverage for them – hence there is a partnership opportunity for both sides."* (Gil Perez, the Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

6.2.3. Access to Modern Technologies

Interviewee 4 highlights that having outdated technical infrastructure makes it difficult for banks to adapt and build on. This statement reinforces what interviewee 1 and interviewee 3 emphasized about banks needing fintech to access modern technologies and enhance their IT infrastructure.

> *"Banks did everything [...] including and typically their own infrastructure which already had like a lot of technical debt. So in some cases it was built in the 80s or in the 70s and it just kept on and build on top of that. So that made them also pretty slow. And because they were still having old tech, they were not really able to meet at the demands of consumers."* (Interviewee 4)

> *"So we have financial institutions which just use Aiia to enhance their IT infrastructure and sort of take digital solutions under their own name, their own branding."* (Interviewee 3)

> Further, Interviewee 1 emphasizes that banks require assistance with micro-innovation, leveraging technologies to address new problems in simplified ways. Given the complexity of system integration and changes due to their vast customer base and large-scale operations, banks often seek the expertise of smaller fintechs or large technology providers specializing in niche areas and technologies like machine learning and AI. Due to their large scale, banks need to decomplexify their operations by, for example, outsourcing critical functions to fintechs instead of developing them in-house. (Interviewee 1)

The external sources support the primary data that partnering with fintech brings modern technologies as a benefit for banks, and they further highlight that modern technologies are driving enablers for new opportunities in the banking sector.

> *"If you find the right fintech in a good partnership with a bank, they bring a freshness and a newness both in technology, the platforms capabilities, the thinking that banks don't have the luxury of because of the legacy technologies and architecture that we have*

> *to manage"* (Ciarán Coyle, Chief Administrative Officer, Ulster Bank as in a Youtube interview by Finextra, 2018b)

> *"In addition, fintechs and emerging start-ups help prime the market with new technologies and thus enable new opportunities for banks and market participants. [...] Our Corporate Bank division is developing a new innovative financial solution focusing on the intersection of IoT (Internet of Things), 'Pay per use' and new financial services business models. Thus, we have another opportunity to collaborate with multiple fintechs and IoT companies to offer our clients new financial tools for them to grow and adjust to market demands."* (Gil Perez, the Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

6.2.4. Convenience, Time & Cost Efficiency

> Interviewee 1 argues that there are some changes that banks are not capable of doing not because of the lack of knowledge, but either because they can't afford it, or they can afford but it is more convenient to do it collaboratively with other firms. (Interviewee 1)

Due to their complex systems, it is sometimes faster, cheaper, and even more efficient for banks if they rely on fintechs to develop solutions instead of in-house development.

> *"We're not going to be the ones who develop all of our services in-house. We'll much rather be cherry picking powerful business solutions and create our own ecosystem of functionalities," [...] "If a fintech with an attractive solution can integrate it in a cheaper, faster, and better way than we're able to do it ourselves, we can offer compelling solutions and stay ahead of the emerging competition".* (Peter Schleidt, Jyske Bank Managing Director as in an interview by the Mastercard Fintech, Aiia, by Iversen, 2019)

Referring to their partnership with Axeptia fintech, Danske Bank adds:

> *"What drives us is the desire to develop tools and solutions that can benefit our customers, and we have realised we can achieve our goals faster by working with partners like Axeptia,"* (Claus Harder, Global Head of Markets and Transaction Banking at Danske bank as in Danske Bank, 2023)

Nordea further argues that partnering with fintechs shortens the time to diffuse into the niche market.

> *"We see an opportunity for boosting the innovation, creating new kind of services maybe for niche markets And also shortening the time to market compared to purely internal innovation"* (Arkko Turunen, Head of CM Application Management at Nordea as in a Youtube interview by Finextra, 2019)

6.2.5. Retain Customers and Competition

Fintech solutions are more convenient for customers as they address their needs. Therefore prioritizing customers' convenience due to the fear of customer churn was a key driver for banks to partner with fintechs.

> Interviewee 1 adds that partnering with fintechs keeps banks relevant in the market during these demanding changes. (Interviewee 1)

> *"I think just convenience for the customers and also good reputation. I think there's a risk of getting a bad reputation if your bank is not one of the ones that collaborate there, then maybe people are like ohh, but I really need to be able to add my bank to Aiia had to do my finances and I can't, so I'm just going to change to another bank. So I think it's also a competition thing definitely."* (Interviewee 3)

> *"I think they want to be the bank where their users say ohh like I was able to add my bank through this external solution where I do my bookkeeping. Like they wanna be, wanna say a "good bank". They wanna customers to find it easy to do banking with them because they don't wanna risk the people change banks."* (Interviewee 3)

In agreement with the primary data, external sources emphasize that both customer satisfaction and maintaining relevance in the market are crucial drivers for partnering with fintechs.

> *"First and foremost, absolutely the client's satisfaction. We see a number of opportunities in partnering up with third parties, fintechs and other kind of third parties to create better services for our customers"* (Arkko Turunen, Head of CM Application Management at Nordea as in a Youtube interview by Finextra, 2019)

> *"Why do we look at partnerships, and I think that's all driven by customers, our customers needs. Customers may vary from consumers to large or small companies. Since it is super strategic to satisfy and make sure we provide what the customers are asking from us and that we remain relevant, then if partners can help us with that, of course partners will be super strategic for us as well"* (Sofia Ericsson Holm, Head of Strategic Partnerships at Nordea as in a Youtube interview by Finextra, 2018d)

> *Fintechs especially are eager to find new ways of providing people with personalised and convenient banking solutions. [...] That's why relevance has become more important than ever. If we can offer our customers a relevant banking experience that suits their way of living, they are more likely to stay with us. If not, they will go somewhere else. This is a race towards remaining relevant. A race that we simply can't lose".* (Peter Schleidt, Jyske Bank Managing Director as in an interview by the Mastercard Fintech, Aiia, by Iversen, 2019)

> *"With third parties we can really look for new use cases that can solve very concrete real-live customer problems. We are very motivated by this. That is our motivation to share our knowledge about it to the outside world."* (Koen Adolfs, product owner and API Evangelist ABN AMRO as in Coeckelbergs, 2019)

JP Morgan adds that it is not only about retaining existing customers but partnering with third parties also allows banks to access new customer bases.

> *"For us, open banking is about how we take more of our experiences to our customers and how we partner with the market to create better experiences. Historically, companies and banks have tried to create active experiences and make customers come to them. We are looking at how we can also take our banking products to our customers, even if they are not on our website.* (Sairam Rangachari, Head of Open Banking, Treasury Services at J.P. Morgan as in J.P. Morgan, n.d.)

In addition, banks need fintechs partnerships to differentiate themselves from other banks and other players in the market to stay in the competition and take the lead.

"An important part of Jyske Bank's DNA is to differentiate us from other banks by teaming up with fintechs in order to offer digital banking solutions in a quick and intelligent way." (Peter Schleidt, Jyske Bank Managing Director as in an interview by the Mastercard Fintech, Aiia, by Iversen, 2019)

"Here as well we noticed that the integration with a Fintech, and working on aggregation helped us to take a lead position in the domain of Open Banking: we were able to adapt and optimize the integration process before most other banks started thinking about it, so to say." (Koen Adolfs, product owner and API Evangelis at ABN AMRO as in Coeckelbergs, 2019)

6.2.6. Changes in Landscape

According to interviewee 1, industries and sectors are dynamically changing because of regulations, government pressure, and changes in people's demands.

This subsection will discuss two main changes in the banking industry landscape that were key drivers for the collaboration between banks and fintechs: the implementation of PSD2 regulation and the emergence of API technologies and API-based solutions.

PSD2

According to interviewee 2, PSD2 aims to open up the conservative banking sector and force banks to be responsive. Interviewee 3 adds that PSD2 did help in solving the problem of data access fintech had with banks and introduced a more regulated environment for collaboration.

" PSD2 is actually interesting because it's cracking the doors open to a very, very conservative sector, which is technologically conservative, which is also conservative as an industry, the banking sector, it's cracking it open to make sure that we can have, you know, integration of transfers, driven by uh, you know, there's an API to them" (Interviewee 2)

"PSD2 is put into place, apparently to counteract the tardiness of the commercial, and maybe also the sovereign which, you know, central bank sector. So that's put into place to

kind of force them to be a little bit more responsive to requirements. [...] So PSD2 is kind of trying to force banks to open up their banking systems." (Interviewee 2)

"Everything was up to the banks in regards to what they wanted to share and what kind of accounts you could access or add. [...] Now PSD2 has come in and that means that there are some financial data that the banks have to supply because that's the EU regulatory requirements. [...] Because PSD2 came in, that means that Aiia yes has much more leverage. [...] Before PSD2, banks could just say we don't wanna do that or oh, we'll put it in our backlog and then it could be years before they did it. But now they have to do it and there will be consequences that they don't because then we do report them to the FSA."* (Interviewee 3)

**FSA: The Danish Financial Supervisory Authority is the financial regulatory authority of the Danish government responsible for the regulation of financial markets in Denmark*

"I think there's always gonna be loopholes, if you could say that. So I think there's always gonna be a risk of whatever, like the privacy of the data privacy being compromised [...] that is why PSD2 is such a good initiative, because that means that regulatory, there are some other, some other yeah legislation that like protects the the data, the bank data." (Interviewee 3)

When asked about the promotion and acceleration of the collaboration process by PSD2, Interviewees 3 and 4 responded:

"I think so, yes, definitely, because once again this provides like a legal framework. So I think it provides some sort of a security for the users. [...] Having PSD2 and having an EU regulative, that sort of backs you I think means that users trust the product much more and I think that is that is super key in this sort of open fintech world" (Interviewee 3)

"I think the PSD2 really, uh, accelerated it. As soon as it becomes a legislation banks are like ohh I have to do this. So it's forced them, but at the same time, uh banks of course are also aware of the customer needs. Yeah. And that they need to collaborate here.

So I think there would still look for collaboration. But I do think that PSD2 actually accelerated it." (Interviewee 4)

External sources add that PSD2 has fostered trust between banks and fintech companies by securely regulating data sharing.

> *"We realized that there was a possibility to use our technology, and apply it to unlock all of the data, and unlock the possibility of making payments outside the banks. All of this was started and launched before Open Banking even was a concept, and before PSD2 had been thought of. [...] The idea was that, in the long-run, by using this technology and unlock everything the market could become more effective. Early on, we came to the realization that banks were not ready for this, because it was highly unregulated and our approach was a bit controversial with how we did all of this before regulations such as PSD2."* (Tink CTO as in Sturen & Thoresson, 2020)

> *"The impact of data-sharing regulations on the way we interact with our money can't be overstated. Consumers' right to access and use their financial data is clear, but regulation has yet to define how exactly it will be enforced."* (Zach Perret, Plaid CEO as in McKinsey & Company Interview by Brodsky et al., 2018)

> *"We started out with doing our own thing by offering the consumer services that we launched. But with PSD2 in place, and the banks having become more comfortable with sharing data, we changed our business model into selling the exact same technology that we had built for ourselves, to instead sell it to the banks."* (Tink CTO as in Sturen & Thoresson, 2020)

> *"While the concept of open banking is not new, it is gaining momentum following the introduction of new regulation including the PSD2. New rules mean banks are now collaborating closer with regulated third-party providers, creating more choice and a better user experience."* (J.P. Morgan, n.d.)

In line with the statement of interviewee 4, who stated that banks recognize the importance of collaboration to meet customers' needs even without PSD2, while PSD2 still accelerated the process, Tink also highlights that the primary driving force behind collaboration is addressing customer needs, with PSD2 playing a crucial enabling role.

> *"From our perspective, consumer need is the driving force but regulatory problems have gotten in the way of customer will. I think we have to accept that many of these entities are very big and extremely regulated; they don't dare take short-term bets on small innovative parts of their business. They needed PSD2 to pave the way, to remove an obstacle to a five-year roadmap. As I see it, PSD2 is the backseat enabler, not the driving force."* (Daniel Kjellen, Tink CEO as in McKinsey & Company Interview by Brodsky et al., 2018)

APIs

APIs are essential for banks-fintechs collaboration as they facilitate their interaction and automate the data-sharing process.

> *"Well, yeah, it has been essential. you have to collaborate and that's something you have to do based on open standards [...] And you know the open APIs facilitated it, right. They enabled the collaboration. So if you now look for instance at OK like larger banks and their partnerships with Fintechs it's all API based."* (Interviewee 4)

> *"It definitely enhances the concept of financial services definitely. [...] It opens the ability for like the IT to evolve because as I said before like banking is a very traditional industry and it is still very manual I think within the banks and so fintechs coming in and being able to like revolutionize the way people do banking is a big driver of open API technology."* (Interviewee 3)

Interview 2 explains PSD2 and open API as the following:

> *"Think about it as just a little database that contains, you know, how much money you have in each account. And you know, in your records, the transactions in a log, right. So it's a log of it. and the access to the database they wanted to make sure you know that there's a little bit of competition. So that the banks don't just, you know, just enclose their whole database such that you can only access with their own programs, right?"* (Interviewee 2)

" PSD2 then says like, OK we have an API so other people can write programs and companies and run these programs against this API and they just know like use the banking system through the API." (Interviewee 2)

Further, interviewee 3&4 elaborate on the dynamics of API interaction between banks and fintechs and how the data sharing happens:

"So basically what the banks do is that they have their API and on that API they put everything that they have to or under PSD 2 regulation. They make it available for whoever has a contract with them. Aiia has a contract with them, so they make all the data available at the same time as they get it and then we fetch it. So it's not like pushed out to us, but it's like Aiia has an API that fetches data from their API. And then when we make it available onto the customers. So it is like a three-step part because that is the most stable way to make sure that the data is like transferred properly." (Interviewee 3)

"What I see is that banks, they connect with Fintech or their vendors through an API, pulling on all the data they need to onboard new customers. [...] They all pull in their data through API's and then in the past it was just sitting on a server somewhere probably and it was not not a real connection to the outside. So I think it's essential to collaborate, but also to collaborate in the most efficient way. (Interviewee 4)

Although adopting open API in the financial sector is always connected to introducing PSD2, interviewee 1 argues that PSD2 is technology neutral; it did not force any particular technologies, including open APIs. Regulators can force guidelines and standards, but as per the interviewee, they cannot force certain technologies that might lead banks to run out of business.

Although PSD2 did not mandate API technology, as stated by interviewee 1, external sources argue that PSD2 has stimulated the adoption of APIs and highlighted their potential regarding reliable data sharing and leveraging existing banking infrastructure.

"The regulation PSD2 really stimulated us to reflect on what the future of banking could be and what API technology could bring in that sense. [...] Having PSD2 is one thing, being explicit about the opportunities of APIs and partnering up with third parties is were

the real added value can be found." (Koen Adolfs, product owner and API Evangelist at ABN AMRO as in Coeckelbergs, 2019)

"Not surprisingly, as a result of changes associated with PSD2 and other similar open banking regimes, banks are the most interested in APIs, with 60 percent noting it as a top area of interest." (International global fintech survey by KPMG, 2017)

"Without API-driven connectivity, fintechs have less reliable access to financial institutions, which can lead to service disruptions. An app can't create a budget without access to a user's spending data. [...] This streamlines data management and ensures seamless, reliable connectivity for consumers. Without efficient API-connectivity, customers and fintechs face service delays and miss opportunities." (Plaid article by Kopple, 2022)

"Ultimately, open banking APIs should make it easier for new fintech services to focus on providing a great user experience – as they can rely on the stable, core banking infrastructure already created by financial institutions." (Tink, 2020)

6.2.7. Responses to the Collaboration

After discussing the drivers for collaboration, the following will present the different responses of banks and fintechs to the collaboration process. These responses can range from resistance and hesitation to responsiveness and adaptability.

When asked about their opinion, interviewee 1 stated that industries have to be responsive to change to survive; they have to define their needs and set their strategies. They think that using API is something banks have been waiting for, but they have to take it step by step and prioritize their budget to avoid running out of business.

Interviewee 3 expresses the view that banks may feel threatened and uncertain about fintechs displaying their data which could be a reason for their reluctance to embrace the collaboration. The traditional nature of banking and its significance in handling finance makes any change perceived as a threat.

> *"I think that's because they maybe feel a little bit threatened. We are our own entity and the banks don't know for sure how we display their data. I think that's the thing. I think it's the uncertainty from the bank side"* (Interviewee 3)

> *"I think mostly because banking again is a sector that is so very traditional that I think any change is a bit scary, I think, for that sense. Also because it's so big and obviously it sits on all the money and money is just a big driving factor of society and a country and everything. So anything that like changes the way your one is used to doing things in such a sort of heavy segment I think is is can be perceived as a threat."* (Interviewee 3)

> *"If banks choose to do their own solution, it seems to me like that could be because they feel a bit threatened and they feel a bit insecure about how their the financial data that they provide is gonna be distributed. Yeah."* (Interviewee 3)

In agreement with interviewee 3, Ping Identity adds:

> *"Many will be threatened by terms like open banking, open health, or open government, but usually it's the incumbents that have something to protect—including business models that have been well fortified over many decades."* (Andre Durand, Ping Identity CEO as in McKinsey & Company interview by Brodsky et al., 2018)

While interviewee 3 highlighted the sense of threat perceived by banks towards collaboration, external sources shed light on additional responses and perspectives in this regard.

Deutsche Bank recognized the importance of collaboration and took responsive steps toward the change.

> *"You need to stay close to the fintech and start-up communities across the globe. That's where our global presence of Deutsche Bank Innovation Network offices come in. Based in Berlin, London, New York, Palo Alto, as well as Singapore – covering the Asia Pacific region. Our Innovation Network members continuously scout, identify and evaluate the solutions provided by start-ups and technology companies and marry them with the requirements of the bank's divisions."* (Gil Perez, Head of Strategy & Innovation Networks at Deutsche Bank as mentioned in an interview by Deutsche Bank, n.d.)

Nordea adds that collaboration success depends on each bank's specific needs and challenges.

> *"On a general note, I believe that there is a large need for collaboration. However, this will really depend on the particular needs and challenges facing the bank and whether they can be met by the fintech."* (Sarah Häger, Head of Open Banking Community at Nordea as in an Interview in MoneyLive Nordic Banking Conference by MoneyLive, 2019).

Others believe that the response of banks had changed from hesitant due to lack of legislation and regulation to more responsive when they realized the opportunities it could bring:

> *"In the beginning we were somewhat hesitant to the initiative. Then, we quickly started to look at it more from an opportunity point of view. [...] Having PSD2 is one thing, being explicit about the opportunities of APIs and partnering up with third parties is were the real added value can be found."* (Koen Adolfs, product owner and API Evangelist at ABN AMRO as in Coeckelbergs, 2019)

> *"I think it's changed dramatically in the six years since we founded Tink. In the first two years there were plenty of barriers—a lack of legislation, less well-formed customer behavior. Now everyone sees where the future is headed, it's a matter of how fast we get there. I'd say at this point we've seen 10 to 15 percent of banks having placed their bets. Sixty percent realize something is going to happen; they may not yet want to push it but want to stay close, take a multi bet strategy. And probably 20 percent don't have a clue yet and don't believe they have to change that much."* (Daniel Kjellen, Tink CEO as in McKinsey & Company interview by Brodsky et al., 2018)

Fintechs view increased collaboration as exciting because it enables them to develop innovative financial services more efficiently.

> *The concept of banks allowing increased access to developers is incredibly exciting. When we started Plaid, there was no concept of "fintech." The infrastructure available to startups was sparse. [...] In working on this project, we found that connecting with consumer bank accounts was incredibly difficult and—importantly—that there were thousands of developers like us who were struggling to launch financial products. [...]*

Seeing large financial institutions embrace fintech and build products to enable the market is incredibly exciting. The move towards open banking is a testament to the way that banks are increasingly embracing technology that allows their consumers to better control and take agency over their financial lives. (Zach Perret, Plaid CEO as in McKinsey & Company interview by Brodsky et al., 2018)

6.3. Fears and Concerns

6.3.1. Security

Since banks and fintech typically collaborate on open banking APIs, there is a growing concern about security due to the potential for data breaches.

> *"Yeah, I think it it does raise concerns regarding like the data privacy and security in general. [...] I think it's hard to identify and prevent fraud activities in open banking* (Interviewee 3)

According to interviewee 2, layers of security could be implemented to ensure integrity and secure data transfer through APIs. They suggest using cryptographic techniques and digital signatures for the security & authentication of third-party providers (TPP). When transmitting a message/request between banks and TPPs via API, the TPP uses a private key to create a digital signature that includes the request. Then the bank uses the corresponding public key to verify the signature and validate that the TPP is authorized. Once verification is done, TPP can access the data requested. The whole communication process between the bank and the TPP is encrypted with cryptographic techniques to protect the data from unauthorized parties. The interviewee further highlights that the goal is not only to reach a high level of security but also to do it in real time.

> *"Everything is encrypted, everything is hashed. It truly is. It also makes it really hard to troubleshoot sometimes because none of the like even the amounts of a transaction are hashed, so we can't see what the actual amount is"* (Interviewee 3)

> *"I think there's only about 10 of us that can have access to proper financial data and then the banks have to give us that access but we can't see anything within the systems the the*

data that that the banks provide are encrypted, it is hashed, it's whatever and it is hashed when it comes to Aiia." (Interviewee 3)

However, interviewee 2 adds that digital signatures might not protect a financial institution from identity theft. That's why multi-factor authentication is necessary for more robust security.

"And the other part is identity theft. So if it's just a single digital signature involved, then the way you can do identity theft is just by stealing the private key. [...] But you have to protect making it difficult against you know stealing somebody's digital identity. And actually worldwide now is this multi factor authorization required to minimize actually the sort of like, uh, theft potential, it's still there. So these are security concerns that are universal." (Interviewee 2)

In agreement with interviewee 2, interviewee 3 stated that they use MitID as a form of multi-factor authentication to authorize users for secure data access.

"It won't be unlocked before the end user logs in with MitID and authenticates the connection. So definitely MitID before MitID was NemID is one of the biggest drivers in this because we like nothing is available before the user performs this SCA, the strong customer authentication. [...] Everything is hashed. So like you can't see it unless you are the customer or the user of the bank in the other end logging in with MitID." (Interviewee 3)

"So how it works is that, for example, a fintech has a user that wants to use Aiia for example. So let's say that's me. I signed up for some sort of accounting system. I want to access my bank data through this accounting system. I have to create an account with Aiia that I then have to authenticate with MitID that then Aiia can access the bank data. So then Aiia users we get a token from the MitID that we then give to the bank and then when the bank receives this token from the MitID where they can see OK, the user has approved. Then we can fetch the the data" (Interviewee 3)

Another layer of authentication that Interviewee 3 discussed is that users who authorize a TPP to access their data on their behalf are required to renew this authentication every 90 days.

> *"It's also important that we can only fetch data 90 days at a time. So every 90 days users have to go in and reauthenticate. So this is also a security measure to ensure that we just can't fetch the data forever because like maybe the user stops using Aiia, but then we still have the token to … that would be that would be critical, so we can only we can only fetch the data at 90 days at a time and then the user has to go in and perform this whole setup again."* (Interviewee 3)

Mennes from OneSpan summarizes the security measures discussed in the primary data into two layers: TPP authentication and user authentication.

> *"The first risk is related to authorized access by TPPs to open banking interfaces of financial institutions. This risk is addressed by requiring TPPs to digitally sign all the requests that send to open banking interfaces. This means that TPPs would have a public private key pair with a corresponding certificate issued by a trustworthy certificate authority to authenticate themselves when they communicate with the open banking interfaces"*
>
> *The second risk is the authentication of the users of the TPP application, based on the PSD2 financial institution will have to authenticate the users of TPP application when such a user wants to access his bank accounts. PSD2 pays a lot of attention to the way this authentication has to be performed, it mandates two factor authentication, it mandates transaction authentication based on dynamic linking. It also requires transaction risk analysis to be performed in order to spot fraudulent access attempts and fraudulent transactions.* (Frederik Mennes, Director of Product Security at OneSpan as in a Youtube interview by Finextra, 2020)

Due to all these security measures, Plaid CEO pointed out that the term "Open API" is in itself misleading as APIs are surrounded by privacy and security concerns that are being adequately handled.

> *"Before we dive in, it's worth noting that "open banking" is actually a bit of a misnomer: there are no truly open APIs in financial services. Due to security, regulatory, and privacy concerns, it's essential to properly vet each developer and use case."* (Zach Perret, Plaid CEO as in McKinsey & Company Interview by Brodsky et al., 2018)

6.3.2. Liability

When partnering with third-party providers, there is a potential for issues to arise without clear accountability.

> *"The involvement of different parties in the flow of data or in the initiation of transactions raises the issue of how to assign liabilities between the banks and the third parties, and how to resolve potential disputes between them."* (Institute of International Finance, 2018)

> *"And it addresses things like shared liability, which is a big thing for everyone, when it comes to consumers consenting to sharing their data, who is liable if there's a breach is top of mind."* (Jamie Leach, Australian regional director at FData Global, a not-for-profit open banking industry body, as in the Financial Review, 2021)

PWC argues that banks' liability concerns are one of the obstacles to why there is a lack of awareness of open banking.

> *"Low awareness of Open Banking and PSD2 has been driven by a number of factors, including a lack of marketing by banks. Given the continuing uncertainty around elements of the regulation, banks have concerns about promoting data sharing and where liability lies."* (PWC, 2020)

To avoid incidents that might raise liability concerns, Mennes from OneSpan states that PSD2 imposes some security measures on TPPs to ensure secure collaboration.

> *"The third risk is about incidents happening at TPPs like data breaches that could also impact financial institutions. PSD2 pays a lot of attention to the security of the infrastructure of TPPs. These requirements are about creating security policies, proper network security controls, performing penetration tests to proactively detect vulnerabilities, etc.* (Frederik Mennes, Director of Product Security at OneSpan as in a Youtube interview by Finextra, 2020)

Further, interviewee 2 argues liability concerns should be doable as contractual solutions could solve them.

"Liability should be doable. [...] So if you're intermediating, I should have a contract with you that holds, makes sure that you're liable for the actions that you do not execute correctly. [...] you might have a contract with a bank that says that the bank has said they provide a certain API and a certain service API and they say that this is what we do. If they make a mistake, then they have breached their contract." (Interviewee 2)

The interviewee adds that the contracts should be clear and deficiencies should be outspoken:

"It's very important to make sure that the contracts are not too complicated and have no traps for customers also for companies involved. [...] you should basically say like this is what we do for you and this is what we guarantee we will not do and guarantee what we're not doing based on security, right. So it says like this is all and nothing else is possible, right? And nothing else is possible is really just another way of saying it's a secure system, right. But it should be clear what you will do and you know you specified and and then you know basically have to implement it correctly." (Interviewee 2)

6.3.3 Consumers' Concerns

Another concern raised by Interviewee 1 is the issue of "dim awareness," in which banks notify users about third-party data access, but this does not guarantee that users are truly aware. Notifications often contain lengthy and small-print information that not all customers fully comprehend. Banks have the responsibility to provide reminders and updates when changes occur. While companies like Google and Facebook have been known to profit from harvesting and selling data, banks are prohibited from engaging in such practices. However, it is essential for customers not to be naive and assume that nothing can go wrong. Like any other, the banking industry is not immune to issues such as money laundering or fraudulent activities, although such incidents may not always be publicly disclosed. (Interviewee 1)

Referring to consumers, Interviewee 3 adds:

"I think fintechs are really good at saying you need to authenticate every 90 days. So I think they understand that they need to do it. I'm not sure they understand why. I think they do see ohh OK, I only fetch 90 days. I have to do it again. OK, fair enough. So they do it. But I don't think they understand that it's actually a security measure put in by us

and by MitID and by everyone to make sure that the financial data is not like…Yeah, fetched forever." (Interviewee 3)

External sources further highlight consumers' concerns and skepticism regarding open banking.

An international survey by the multinational Dutch bank, ING, shows that consumers are still suspicious about open banking. However, a "balancing of risk vs. reward, and likely a preference for convenience" makes consumers adopt these technologies despite their concerns. Further, the "network effect" accelerates the adoption process as it demonstrates social acceptance.

" Our survey found that only 30% of respondents on average across Europe were comfortable for companies to share their data if they gave consent. [...] 75% of people would like to have access to data on how they spend their money, but only 40% said they were comfortable providing the information that could lead to that." (ING, 2020)

Consumers might be willing to share their data with banks but not with TPP.

"If we look at the market today and we listen to what consumers feel about sharing data, we see there is no big concern to share data between banks. However, we see that many consumers are having doubts when it comes to sharing payment data with non-banks." (Koen Adolfs, Product Owner & API Evangelist at ABN AMRO Bank as mentioned in an interview by Coeckelbergs, 2019)

"Sharing our finances with organisations other than our most trusted provider sounds scary" (Survey Response from ING, 2020)

Thomas from EY consulting firm adds that this skepticism indicates a need for greater education in this area.

"Another dimension I would talk to would be awareness and education. So some f the researches that we have done shows that the majority of consumers really don't know what open banking is, what does it mean, what potentials does it bring; what are the benefits that they can have; and also how the risks around that is being managed" (Hamish Thomas, Partner, EMEIA* Payments Leader at EY as in a Youtube interview by Finextra, 2018a)

**Acronym of Europe, the Middle East, India and and Africa*

However, Adolfs from ABN AMRO argues that this skepticism is not a major concern for SMEs, as they are already accustomed to working with multiple interfaces within their own financial infrastructure.

> *"I do think there is a difference between consumers and SMEs. SMEs and corporates are more used to accountancy software, and CRM for instance. These systems already interact with other applications. They already work with multiple interfaces which interact with their finance infrastructure. So, to that extent, I believe the change is a lot bigger for consumers compared to business customers."* (Koen Adolfs, product owner and API Evangelist at ABN AMRO as in Coeckelbergs, 2019)

6.4. Challenges and Conflicts

Challenges and conflicts may arise when the collaboration process starts; as interviewee 4 states, *"That is always part of the entire process."*

6.4.1. API Development, Integration & Communication

Regime

According to interviewee 1, by default, the legacy systems for banks are resistant to anything that is Open API-like. Banks have so many different functions that are all connected, and that might be linked to common data centers, which makes it very challenging to make changes in one function without altering the whole system. Therefore, it is demanding to know how to do it step by step and how to do it economically to avoid bankruptcy.

Due to this demanding change in banking IT infrastructure, some banks tend to develop joint solutions with partners.

> *"The PSD2 regulative came in and that changed a lot of the landscape for us because that meant that suddenly banks had to comply, but also the whole internal IT structure for us, but also for the banks were changed. And that also meant that the banks had to outsource a lot of their, like what they, their API structure to other companies that could offer, like maybe more like a joint solution to these API structures."* (Interviewee 3)

Interviewee 3 further highlighted that the size of a bank does matter, as smaller banks with limited resources find it even more challenging to develop and maintain their own IT infrastructure for implementing PSD2 APIs.

> *"Now it's too big of a job for many of the smaller banks. For example, we have Spark just to give an example, it's not as big as a bank like Danske Bank that has their own IT infrastructure. So some of the smaller banks like the Spark have been grouped together into what we call an adapter. Basically they handle the IT infrastructure for a group of banks in Denmark or a group of banks in the Netherlands or whatever. So that also means that apart from Nordea and Danske Bank, all the other banks in Denmark actually don't operate their own PSD2 API. It's been sort of outsourced to another company that handles all the IT infrastructure of the bank."* (Interviewee 3)

Aside from infrastructure challenges, being the first mover in adopting new technology poses a challenge, as indicated by interviewee 1. Banks often adopt new technologies, such as open APIs, once they observe the benefits of other incumbents' adoption. In technology, being the first adopter does not guarantee greater profitability. (Interviewee 1)

In agreement with the primary data, external sources also indicate that Developing and integrating APIs requires a change in the whole banking infrastructure, which is time, cost, and resources consuming. That's why pre-built API are sometime a go-to solution for businesses, as it saves time and resources:

> *"Before full-scale consumption in the corporate space, both clients and banks need to get off the existing systems – this requires time, focus and investment on both ends"* (Kerstin Montiegel, Global Head Client Connectivity at Deutsche Bank, as in Deutsche Bank, 2023)

> *"Forward-thinking treasury software providers and banks have started to build partnerships to provide their joint corporate clients with pre-built API connectivity. This enables corporates to reduce the time required for implementing API connectivity from months to weeks. And perhaps even more important to many corporates is the fact that pre-built integrations eliminate the need to allocate scarce IT resources."* (Deutsche Banks, 2023)

Niche

Interviewee 3 raised a challenge that fintech might face when partnering with banks, which is data quality.

> *"One we have now that is quite common if we have conflicts, it's mostly because of the quality of the data. So the bank supply the bare minimum that they have to for regulatory requirements, but they don't provide like a single digit like apart from that. And that means that also the data that we provide will be like very, very sparse, and so that means that our users will be like, I don't understand why I can't see this, this and this"* (Interviewee 3)

> *"that's a challenge that we have right now because then we have to, like, raise it with the banks and be like you're not giving us enough data and they're like, yes, we are. We're giving you exactly what we can with PSD2."* (Interviewee 3)

Further, the technological limitations of banks are another challenge fintechs face when partnering with banks.

> *"Technological resources from the bank side. That's what makes the most difficult for us because they don't necessarily have the same technological resources or the same technological drivers as we have like being a bank, it's not as important to be like techie as it is for fintech."* (Interviewee 3)

6.4.2. Shifting Mindsets

Interviewee 4 highlighted the challenges that can arise from cultural differences and ways of working between banks and fintechs during the integration process.

> *It's not only in terms of legislation, but also things like culture. So how would that fit?*
> *So I spent some time in the US and I work for also like a financial institution and we acquired a smaller fintech I was part of that, that integration and what we mean was that there was like a disconnect in terms of culture, but also in that that also went into OK the way of working. Yeah. So that the Fintech was really agile while that financial institution*

that was that I had joined was more like waterfall and a little bit outdated way of working but also outdated infrastructure so that that costs friction. (Interviewee 4)

The shift in mindset that banks need to embrace is crucial, considering that they did not initiate the implementation of PSD2 and other regulatory changes but rather imposed upon them, as stated by interviewee 3.

"So I guess banks were not really, not gonna say ready, but I think PSD2 was a change that banks did not initiate, if that makes sense. So they did it because they had to, but they didn't do it because they wanted to. So I think that is always a challenge when collaborating when one party wants something more than the other party. And I think PSD2 is definitely more valuable for the fintechs than it is for the banks, because now the banks have a set of regulations to comply with and the Fintech suddenly have like an open field of data to play with. So that's definitely like this, sort of I wanna say the power imbalance of those two is definitely something to consider. And I think also like educating, especially smaller banks, on the benefits of of like using open API in the in their product." (Interviewee 3)

External sources also argue that the main challenge in the transition towards collaboration between banks and fintechs is not just technology itself but rather the shift in mindset and prioritization within organizations.

"The challenge is not the technology, but the shift in mindset and enterprise prioritisation that is required" (Helen Sanders, a consultant to the financial services sector as in Deutsche Bank, 2023)

"Yes, I don't think is it a "either/or". All the perspectives that you heard are extremely Relevant. [...] I do believe that the only way to make this transition successfully is when people want to change [...] Changing a mindset requires people to also believe in this change, to understand what is going on. They need to feel supported in what they are doing in the process to realise the chance. It is my conviction that by just accepting new technology, one will not realise the full potential. [...] Only then, you can figure out together what is required and what technology can help to enable people to build this

vison." (Koen Adolfs product owner and API Evangelist at ABN AMRO as in Coeckelbergs, 2019)

"I think generally, both fintechs and banks are on a learning curve when it comes to that because fintech are lean, agile, new technology but banks have millions of customers and very high quality data and if you bring those things together, it can be quite an interesting merge. [...] Fintechs bring a new way of thinking, thinking about the customer propositions in different ways that banks want to expose themselves to and collaborate on." (Ciarán Coyle, Chief Administrative Officer, Ulster Bank as in a Youtube interview by Finextra, 2018c)

In addition, shifting from the traditional model of working within the bank to a collaborative approach with external partners is particularly an obstacle in the banking industry.

"The main issue is the way of working. So far banking has been working in an integrated model where the products have been built within the bank. But that's the major change now that we will work more and more with partners going forward and in an ecosystem. So the first thing is to shift our mindsets to be able to work with partners." (Jarkko Turunen, Head of CM Application Management at Noredea as in a Youtube interview by Finextra, 2018b)

"In order for collaboration and innovation to happen, both parties need to have a desire to move away from their established positions of supplier-buyer, towards a partner like structure. [...] One of the catalysts has been a kind of cultural maturity which has enabled a mindset shift towards working with partners in an ecosystem as an accepted norm. This has slowly replaced the traditional way of working that all solutions should be produced in-house, with the idea that using partners to supply the customer base with solutions can access a larger pool of potential innovation [...] Naturally the mindset of the bank and its genuine willingness to collaborate as well as the processes that are in place to enable efficiency are critical differentiators." (Sarah Häger, Head of Open Banking Community at Nordea as in an Interview in MoneyLive Nordic Banking Conference by MoneyLive, 2019)

In order to transition from a mindset of control to one of collaboration, it is essential to understand the process of selecting the appropriate partner. Moreover, to find the right partner, there are some factors that banks need to consider:

> *"The right fintech partnership for a bank can help overtime to transform the innovation culture in the bank by exposing employees, leadership teams with fintechs, bringing them together, making them work together I think over time that might have the greatest transformational impact of all actually "* (Ciarán Coyle, Chief Administrative Officer, Ulster Bank as in a Youtube interview by Finextra, 2018c)

> *"I think there are three things. First of all, the bank and the partner need to have common objectives and the willingness to work together to make something good happen for the customers. [...] The second thing is about scaling. We are looking into ideas that we can scale across the client base [...]. The last bit is again on the way of working, startups are more nimble and agile and we as banks need to respect that but on the other hand sometime it take a bit of time for banks to also change and undo things and sort of there needs to be a mutual understanding on the differences and ways of overcoming that"* (Jarkko Turunen, Head of CM Application Management at Nordea, as in a Youtube interview by Finextra, 2018b)

> *"[...] but also from the very beginning know why you are partnering, from a bank perspective to know what are we looking for, what is the problem that we are trying to solve and then identify different kinds of solutions, potential partners, or if you build yourself or co-create or other solutions. [...] Also to be as honest and open as you can about the challenges and opportunities because sometimes it takes much longer than both of us want. Be honest about where we going, what time it will take, what fund it will take, and what's the end game."* (Sofia Ericsson Holm, Head of Strategic Partnerships at Nordea as in a Youtube Interview by Finextra, 2018d)

6.4.3 Complexity of Banking Systems & Compliance

The challenge lies in ensuring compliance and meeting standards when partnering or acquiring smaller fintech companies, as their risk and compliance standards may differ from those of larger Banks.

> *"Is everything compliant and do they meet our standards that is also there's always a bit like OK it's a smaller company… a small fintech, will that fit be there and will bring on additional risk by fintech partnering or even acquiring this smaller company. So the financial institution that I was working for was of course heavily regulated and had all sorts of standards in terms of risk compliance and stuff like that, and secure and then you try to onboard another, smaller fintech that they knew what they were doing but obviously their standards were different because they were much smaller."* (Interviewee 4)

In agreement with interviewee 4, non-compliance with regulations and frameworks is also a challenge highlighted by external resources.

> *"Another factor is the non-compliance. There are still a number of regulations and rules and frameworks we need to fit in the bank and in banking industry in general. Making sure we have an efficient way of collaborating with fintechs while ensuring that we are still compliant and following the frameworks. That's one of the key thing to address"* (Jarkko Turunen, Head of CM Application Management at Nordea, as in a Youtube interview by Finextra, 2018b)

> *"Like what you see on many developer portals, building the PSD2 APIs have taken a lot of resources to become compliant."* (Koen Adolfs, product owner and API Evangelist at ABN AMRO as in Coeckelbergs, 2019)

Collaborating with banks can be challenging for emerging fintech companies due to complex processes and risk assessments. Further, there is a learning curve for third parties in partnering with banks through APIs.

> *"It is true, banks are complex and for an emerging start-up company it is often hard for them to navigate processes such as risk assessments. But the solutions aren't viable without passing these checks – and all our peers will say the same. That's why our Innovation Network team members are involved and facilitate the entire process from initial contact through to the adoption by the respective division. This is important, especially when things develop in an unexpected way. We are always trying to improve the process, while also hosting teach-ins for start-ups so they understand what's expected of them. These go down really well."*

(Gil Perez, Head of Strategy & Innovation Networks at Deutsche Bank as mentioned in an interview by Deutsche Bank, n.d.)

"What I also experience is that very often third parties are not very familiar in partnering with banks through APIs. [...] Collaborating with a bank in a similar way is new for many parties. The challenge now is to build apps that are beneficial for the customer, the third party and the bank. This requires a completely different strategic thinking, and everyone needs to learn how that works." (Koen Adolfs, product owner and API Evangelist at ABN AMRO as in Coeckelbergs, 2019)

6.5. Opportunities

The open banking collaboration creates opportunities on three levels: banks, fintechs, and consumers levels.

If you look at the banks enabled, yes, shorter time to market. For the fintechs is all about, yeah, scalability. Just growth in general. It also uh grows competition, of course consumers are again, huh, healthed by that. I think consumers benefit from it. SMEs benefit from it. Corporates do. [...] Well, I think in the end a better product. (Interviewee 4)

Further, Holm from Nordea argues that the collaboration between banks and fintechs opened opportunities on both the backend regarding infrastructure and data protocols and the frontend regarding products and services offered.

"I think the opportunity is there both from the backend and infrastructure solutions but also from a frontend. The lowest hanging fruit would be add-on products that are not purely bank products to start with. [...] In a corporate world it could be an add on within expense management…travel expense management [...] or in the consumer world it can be a PFM solution. But that's an add on to what we already offer. But it can also be a more commodity…a more bank kind of product. For example you can have an aggregator that doesn't have to be built by the bank and be built by someone else, applied on our*

open banking platform and then offered." (Sofia Ericsson Holm, Head of Strategic Partnerships at Nordea, as in a Youtube interview by Finextra, 2018d)

**PFM - Personal Finance Management*

6.5.1. Developing Ecosystem

The variation in capabilities, resources, strengths, and limitations have contributed to the development of an ecosystem.

> Interviewee 1 discusses that the faster technology adoption by big banks and the struggle of smaller ones to keep up have led to the collaboration between multiple actors, including banks, vendors, and small firms, to address technological gaps. Further, this collaborative approach among market actors encouraged consulting firms to participate in the ecosystem. Banks use them to provide guidelines and ideas on how to do things and insights on market trends and benchmarking. They also develop solutions tailored to one specific firm that then generalize for a wider availability to their other clients. This emergence of vendors and consulting firms and the interconnection among small and big banks strengthen the ecosystem and make technologies scalable and accessible for a broader range of participants. (Interviewee 1)

> It is even a smart move for firms developing technology infrastructure aligned with PSD2 requirements to make their solutions compatible with an "open application environment" that seamlessly interacts and integrates with other actors in the ecosystem. This promotes business growth through the potential of multiple sales with a single technology infrastructure setup. (interviewee 1)

Interviewee 4 added that collaboration opens opportunities for new players to join the ecosystem by adjusting their business models.

> *"In general I do think that the collaboration has really strengthened the ecosystem. [...] I do think that there were companies that suddenly said, OK, hey, hang on, we might have a new line of business or we need to change our business model or we can monetize the data we are having."* (Interviewee 4)

The collaboration in the banking ecosystem involves various stakeholders, and it benefits all actors and all segments of the ecosystem, including B2B (Business to Business) and B2C (Business to Consumer) segments, connecting large corporates, small and medium-sized businesses, and consumers, creating a comprehensive ecosystem of mutual benefit.

When asked about the actors of the ecosystem interviewee 3 responded,

> *"Well, basically everyone who has a bank, right? The customers of the banks which are like the main sort of stakeholders in this because like if they don't wanna use like the open API technology then there will not be any like traffic there. Accounting systems, consultancies, whoever somehow needs to to access finances or help finances. And then we are like the mediator and then we have the banks, but we also have like the FSA for example, which is the financial authorization of like the set of all the legal components for banking in Denmark and in Europe as well. It's the financial regulatory authority of the Danish Government. And then there is, obviously, because Denmark is an EU country and we operate in Denmark, we also have the EU legislation. So we also have like the sort of legal stakeholder, there's regulatory requirements that we need to obviously follow and consider like when developing products and and also like sometimes maybe they can help us in some ways like not directly, but if they like impose some sort of regulation that helps our business."* (Interviewee 3)

Further, when interviewee 4 was asked about what segment benefits the most, they responded,

> *" Obviously, it actually it's across the entire ecosystem. You see so active in the B2B segments or in the B2C segments also for instance large credit card schemes who build uh, who use APIs to connect to credit card issuers for instance, they would…It would then again connect to to large corporates or small and medium size businesses or consumers. So it's it's I think it's the entire ecosystem that benefit from the corporation."* (Interviewee 4)

External sources further emphasize that the collaboration between banks and fintech on open APIs has led to the developing of an ecosystem of multiple actors.

> *"By fostering innovation, these APIs are creating entirely new ecosystems around the banks. Ecosystems these banks can leverage to broaden their offering and attract new customers."* (Tink, 2020)

> *"We realised that the API technology allows us to easily connect to third parties, like Big Tech and Fintech, competitors, e-commerce, and all that in multiple angles. That is where we see the biggest opportunities. [...] That experience helped us to better interact with developers, to build a community around that and to provide solutions that third parties have built. [...] I also think that a pure focus on banking when it comes to APIs and Open Banking is not the right approach if you really want to learn from it as a banker. It should be much more about digital ecosystems."* (Koen Adolfs, product owner and API Evangelist at ABN AMRO as in Coeckelbergs, 2019)

Establishing relationships with regulators as part of the ecosystem has been fostered and supported in open banking. This collaborative approach created effective communication channels that were helpful during challenging times like the pandemic.

> *"Close collaboration with regulators – establish an ongoing relationship with regulators to help them understand, support and approve new and innovative digital platforms and solutions. For example, before the COVID-19 pandemic only signed paper copies were allowed as proof for certain tasks. Through the pandemic, we saw flexibility in allowing digital signatures, and this was a direct consequence of a close working relationship between banks and regulators. Let's build on that."* (Gil Perez, Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

6.5.2. Automation & Connectivity

When questioned about the state of the collaboration process prior to open banking, interviewee 3 emphasized the significance of open banking in automating the collaboration process.

> *"It was harder to manage. We had to manage contracts with every single bank. [...] So it was much more, I wanna say manual. That's probably not the right word to use, but it*

was a bit more manual back then and it also obviously wasn't as regulated." (Interviewee 3)

"Users would have to upload, they would have to go into the bank and then take out a file like a CSV file or whatever and then they would have to go into their accounting system and then upload the file and then do the bank reconciliation manually" (Interviewee 3)

"As fintechs having these connections with the banks means that you can automate things and that and that is definitely one of the big drivers." (Interviewee 3)

Interviewee 2 adds that open banking also automates user account management as it automates the data transfer process.

"You can obviously access different bank accounts across the same platform. Let's say you have four banks, then before PSD2 and open banking and Fintech came and like revolutionized the whole thing, you could just access like bank account one and bank account two and so on. Whereas now this open banking idea and fintech coming in and like adding value to this industry enables customers and bank users to access and manage all of their accounts across like banks or financial institutions, but within the same platform. So it's definitely also simplifies like accounting and tracking your finances and everything within that scope." (Interviewee 2)

External sources add that incorporating fintech technologies can also help automate internal processes for banks.

"Let me give you one example – in Santa Ana, California, our Document Custody Service team verifies loan documents for clients such as real estate, auto or solar loan documents, before they can be funded, securitized or sold. To accelerate the mainly manual process with several truckloads of documents being handled each day, we applied an artificial intelligence solution from a New York based start-up working with high-speed scanners. Today over 20,000 loans are being processed each day, which involves the scanning and analysis of around half a million pages a day." (Gil Perez,

Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

"Open banking and APIs are speeding up innovation and helping address some of the traditional pain points associated with cash management and treasury services. Manual and repetitive tasks can now be automated in a secure way thanks to APIs. Systems can be more easily integrated with one another and data can be shared in real time." (J.P. Morgan, n.d.)

"We recently partnered with a start-up which helps streamline the invoicing process. They receive both paper and electronic invoices, placing them in a single, user-friendly online portal. This partnership has allowed us to bring the same functionality to our clients. The process is totally digitized, enabling a one-click payment of all invoices," (Sairam Rangachari, Head of Open Banking, Treasury Services at JP Morgan as in J.P. Morgan, n.d.)

6.5.3. Technical Opportunities

The power of data has been unleashed through open banking, presenting significant opportunities for data analytics technologies, especially in areas such as credit scoring. Collaborations and open APIs facilitate the integration of external data sources, enabling personalized experiences and tailored products for customers.

"You have a lot of data, you have more data and if you can aggregate them, you can pull data together, you can do quite fascinating analysis. [...] So a classic application of machine learning has been in credit scoring, so this is one of the first applications actually in machine learning outside of image processing. So there is enormous potential in this one for coming up with things." (Interviewee 2)

"So data is of course a really big thing that fortunately that has really become a foundation and because of all those insights here you can create like a more uh personalized experience a really, really tailored product to a specific customer. So that's one thing, then I think I already mentioned it about consumer onboarding or risk assessments or credit assessments, those collaborations or the open APIs really allow

you to pull in data from external sources, so that that's something that really a result of the collaboration." (Interviewee 4)

Interviewee 2 further adds that the aggregation of real-time data can provide early indications of systemic risks, enabling timely actions to be taken for the benefit of society.

"There's sometimes systemic risk, OK, systemic risk, which is like you know something's going on because people not paying their bills. OK, so this might be an indication that there's an economic downturn in the sector. So this discovery is very often…late..too late, but if you have real time data as we mentioned before, you could easily, you know, discover. It's like, oh wait, there's something going on like it's the same techniques as intrusion detection and whatever. Maybe we should let the National Bank know that; it seems like the economy is a little bit shaken in this sector. OK. So there's enormous benefits to having all these data aggregated for society." (Interviewee 2)

Besides data analytics, interviewee 3 acknowledges the potential of technologies like machine learning for enhancing some processes like fraud detection. While interviewee 4 highlights the ongoing developments in technologies like AI.

"There are other technologies that can enable open banking and stuff. We can use like machine learning for example to do stuff like categorized transactions or like detect fraud or whatever. So those are definitely technologies that shouldn't be slept on and I don't know personally to the extent of which they are used in Aiia, but I do know that it is not something that we're like opposed to. And I am pretty sure that they are both used in some sort of way within Aiia to like enhance our products." (Interviewee 3)

"And then I think also everything that's happening at this moment in terms of AI and chatbots and virtual assistants and automating stuff. So I think yeah, a lot of things are, happening there." (Interviewee 4)

In line with the primary data, external sources show that banks must harness their data and develop data expertise to leverage techniques like Machine Learning and Artificial Intelligence. Fintech solutions could help banks utilize available data, enabling banks to enhance services.

> *"Data – banks need to tap into the power of their data, and to do this we need our talent to become data natives/experts with the ability to apply techniques such as Machine Learning and Artificial Intelligence."* (Gil Perez, the Head of Strategy & Innovation Networks at Deutsche Bank, as mentioned in an interview by Deutsche Bank, n.d.)

> *There is now an incredible opportunity for the financial services to utilise the data that is at their fingertips by leaning on the solutions the fintech industry is providing. This will help them navigate the new landscape, enhancing data access leading to more efficient and customer-centric services, meaning banks can remain competitive in an increasingly digital world.* (Fraser Stewart is Co-Founder and Chief Commercial Officer at Lyfeguard as in FinTech Magazine, 2023)

Wikander from Microsoft highlights that the current focus is on leveraging banking data and utilizing internal banking use cases to test new technologies and enhance efficiency in various areas.

> *So the dialogues now are very much about what can we as a bank do in order both to learn and test these new technologies but also how would this benefit our customers going forward. [...] It's all about having internal use cases where you try it out on your own data and work with that in order to learn. Looking for tangible cases where you can really measure the outcome, for example using it to analyze data or to extract data. Could be cases like fraud cases you are look for patterns in fraudulent behavior to see can we see a pattern here based on the massive data that we have in banking or similar cases.* (Sophia Wikander, General Manager, Financial Services, Western Europe, Microsoft, as in a Youtube interview at EBAday 2023 by Finextra, 2023)

6.5.4. Consumers Benefits

Despite consumers' concerns demonstrated in the earlier section, interviewee 3 states that how customers have welcomed open banking solutions confirms their desire for a more accessible and user-friendly banking experience. Open banking has provided both individual and business customers with improved accessibility, greater ownership of their financial data, and a better understanding of their finances.

"And I think the way customers have taken in open banking when it came out as like a solution for them has just confirmed that this is something that they want and something that is need in the market." (interviewee 3)

"This is a new era of banking, I think…oK, this is just my personal thought like idea, but yes, I think that it is. It opens up for a completely new way of doing banking and also making banking easier, more accessible I think more…like better for the individual. [...] It definitely makes banks more accessible for the common user and I think that's a very big part of it. " (Interviewee 3)

"I think also like giving people the sort of I wanna say the financial inclusion to be able to have a better overview of the finances and better understand them and also that they give them a feeling of ownership over their own finances. Like having both for individuals but also for businesses. Having that access to the financial services also allows them to have a better overview and therefore develop their products to be better and to be more cost efficient" (Interviewee 3)

Adding to the primary data, Hamish Thomas from EY summarized consumers' opportunities into four: choice, customization, control, and coverage.

"The first I would say choice, the potential of increased choice in terms of products and the services that we have access to and also the providers who deliver them for us. [...] There will be more opportunity to perhaps more specifically choose which products or services from which providers we can bundle together to give us experience and engagement with financial services that we are seeking. And then add to that control. Control over our data, control on who accesses that data, control over how we engage with this breadth of new providers. And then finally I'd talk about coverage - there are those segments across our society who are not well served by the financial services, perhaps to a degree, excluded. [...] If we look at the potential of open banking to provide more specific products and services to those segments who are underserved and then perhaps increase the coverage across all participants." (Hamish Thomas, Partner, EMEIA Payments Leader at EY as in a Youtube interview by Finextra, 2018a)

> *"PSD2 was set up to enable Fintechs like us providing innovative competitive services to businesses because the banks weren't providing services to businesses, particularly SMEs who were mostly ill-served by the banking market so far."* (Fliss Berridge, Director & Co-Founder of Ordo as mentioned in an interview by the Payments Association, 2021a)

Open banking grants consumers control over not only data access but also data management.

> *"When you're able to see and manage all of your finances in one place, you'll get a better customer experience. [...] We're currently working on a project that will enable our business clients to manage all their accounts in the different Nordic countries within Danske Bank's online platform. That feature solves a huge demand for businesses with accounts in different countries and in different banks"* (Jon Schäffer, Danske Bank's Head of Strategic Partnerships as in an interview by the Mastercard Fintech, Aiia, by Basse, 2019)

> *"I think Open Banking is one of the biggest innovations we've ever had. For the consumer the ability to be in control and live your life worrying less about the financial side of things is a great benefit for the consumer. Snoop will be part of that, helping the consumer take better care of their financial lives."* (John Natalizia, CEO & Co-Founder of Snoop as mentioned in an interview by the Payments Association, 2021b)

Further, open banking solutions help consumers finance responsibly and make well-informed decisions.

> *"Today I was in contact with a company in Denmark who have realized that private consumers want to be able to monitor and keep track on their money being invested responsibly. By using our Open Banking technology, they can track customers' shareholdings against the United Nations responsible investment principles. With approval through one click, customers are able to see how responsible their investments are. From my perspective, this is of course an Open Banking solution since we provide them with the technology. But, for the customer it is rather a great service"* (Tink Head of Communication as in Sturen & Thoresson, 2020)

6.6. Risks

Interviewee 1 argues that some banks could be at risk of being left behind due to the lack of capabilities to stay in competition. He further highlighted that it is not a matter of who is the most effective but also the most cautious because trying to keep up with the change without having a set strategy in mind could put banks at risk of bankruptcy. However, he argues that this is the case for any industry facing any transformation; there is always the risk of falling behind, and the most prominent example of this is Nokia in the telecom industry.

Interviewee 4 highlights that as fintechs grow and potentially become dominant players, banks may become less inclined to collaborate and engage in partnerships.

> *"It's also about that the fintechs will grow. So they will become more powerful. And then the question is, OK, how will the traditional banks respond to that? And knowing that most banks are now also really rebuilding their tech stacks or actually upgrading it had to become more up to up to standard, sort of say. And then they might start building more things in house."* (Interviewee 4)

Furthermore, as indicated in the opportunities section, open banking has revealed the power of data and data analytics; however, this comes with some risks, as stated by interviewee 2.

> *"You have a lot of data, you have more data and if you can aggregate them, you can pull data together, you can do quite fascinating analysis, but then you have actually privacy problem. There's already a privacy problem that the banks that you're using know a lot about you and which is not always clear why they should. There's also the risk that we get basically a Google effect; there is somebody who's getting enormous amounts of knowledge, private knowledge about people."* (Interviewee 2)

In support of interviewee 1, the absence of a strategy can leave banks lagging behind.

> *"Many banks have been slow to enact strategies addressing this market momentum. [...] One sure path to a disadvantaged position, however, is to neglect to develop a data and customer strategy that reflects the ongoing evolution in open banking."* (McKinsey & Company article by Brodsky et al., 2018)

From a technical perspective, handling large volumes of data, both in receiving API requests and transmitting information to fintechs, can greatly impact operational efficiency and customer satisfaction.

> *"Additionally, APIs give financial institutions better data management. They are managing huge amounts of data as they receive API requests and send information to fintechs. When this data traffic isn't well managed, it can cause delays and a poor customer experience."* (Plaid article by Kopple, 2022)

> *"Building a platform to serve TPPs, who may not disclose their business usages and technical/performance requirements, can introduce unpredictable performance and cost issues if not managed carefully. For instance, a bank in Singapore faced an issue where their Open APIs experienced peak loads and crashes every Wednesday. After investigation, they discovered that one of the TPPs ran a promotional campaign every Wednesday, resulting in a surge of API calls that overwhelmed the bank's infrastructure. A scalable solution that can perform under unpredictable workloads is critical, besides meeting the performance requirements of a certain known volume of transactions."* (MongoDB article by Jenosh et al., 2023)

6.7. Summary

#	Main Theme	Key Findings
1	Status Quo	**Banks** faced challenges due to outdated infrastructure, scale, risk aversion, and large customer bases. However, they possess deep industry knowledge, consumer trust, and expertise in regulatory frameworks. **Fintechs** exploit the gap between banks and customers by providing faster, more efficient, and customer-centric solutions by prioritizing cost-efficiency, adapting to industry changes, and leveraging technology. **Landscape:** Open banking introduces transparency and reduces the power imbalance that favored banks' monopolization and customer lock-in that created a lack of competition and innovation. Open APIs and PSD2 encourage industry innovation,

		competition, and customer-centricity.
2	Drivers for Collaboration	The collaboration between banks and fintechs was driven by recognizing each other's valuable assets and the need to deliver high-quality products. **Data Access:** Collaboration between banks and fintechs is driven by the need for access to data. Banks possess valuable financial data that fintechs require to deliver high-quality products. Leveraging technology to access and utilize this data is crucial for creating better financial solutions. Collaboration ensures secure and reliable data access and transfer. **Regulatory Expertise:** Fintechs, while innovative, they lack the regulatory compliance knowledge required to navigate the highly regulated landscape. Through collaboration, fintechs can leverage the regulatory expertise of banks and ensure compliance with regulations, allowing fintechs to focus on innovation while relying on their bank partners to provide the necessary regulated services and coverage. **Access to Modern Technologies:** Banks, with their outdated technical infrastructure, struggle to adapt and meet the demands of consumers. This partnership allows banks to overcome the challenges posed by legacy systems, benefit from the expertise of fintechs in areas such as machine learning and AI, and tap into new opportunities enabled by these modern technologies. **Convenience, Time & Cost Efficiency:** Banks recognize that there are changes they cannot implement on their own, either due to financial constraints or the convenience of collaborative efforts. By partnering with fintechs, banks can leverage their solutions faster, cheaper, and more efficiently than developing them in-house, which shortens their time to market and allows them to stay in the competition. **Retain Customers and Competition:** By providing access to personalized and convenient banking experiences, banks can differentiate themselves from competitors and retain their customer base. Additionally, partnering with fintechs allows banks to access new customer segments and expand their market reach. This collaboration is crucial for banks to stay relevant and satisfy customer demands. **Changes in Landscape:** Implementing the PSD2 regulation and emerging API technologies have been key drivers for

		collaboration between banks and fintechs. **PSD2** has provided a regulated environment for collaboration and data sharing between banks and fintechs. The regulation requires banks to make certain financial data accessible to authorized third-party providers. It regulates the process of data sharing in a secure manner, which fosters trust between banks and fintech and accelerates collaboration. **APIs** allow for automated and secure data exchange, enabling fintechs to access and utilize the banking infrastructure. Banks provide APIs that expose data and functionalities to authorized third-party providers, allowing them to develop innovative solutions and services. The use of APIs has enhanced the concept of financial services, enabling fintechs to revolutionize banking by introducing new technologies and streamlining processes. **Responses to Collaboration:** Banks' responses to collaboration vary, with some initially hesitant due to concerns about data sharing and potential disruption to established business models but gradually recognizing the opportunities and benefits of collaboration. However, some banks recognize the importance of collaboration and have taken responsive steps to embrace it. On the other hand, fintechs view collaboration as an exciting opportunity to develop innovative financial services and enhance customer experiences.
3	Fears & Concerns	**Security:** Data privacy and security concerns arise due to the collaboration between banks and fintechs through open banking APIs. Cryptographic techniques, digital signatures, and encryption are implemented to ensure secure data transfer and third-party providers (TPPs) authentication. Multi-factor authentication, such as MitID, is used to authorize users for secure data access, and users are required to renew authentication periodically. **Liability:** The involvement of multiple parties in data flow raises concerns about assigning liabilities and resolving potential disputes between banks and third parties. As a result, PSD2 imposes security measures on TPPs to mitigate incidents and protect financial institutions. Liability concerns could also be addressed through clear contractual solutions, specifying responsibilities, and ensuring proper implementation. **Consumers' Concerns:** Consumers may be skeptical about

		sharing data with non-banks, but balancing risk vs. reward and convenience factors may drive adoption. This skepticism indicates a need for greater education and awareness about open banking and its benefits and risks. However, "dim awareness" of data access by third parties and bank notifications may not guarantee proper user understanding.
4	Challenges & Conflicts	**API Development & Integration:** Legacy systems in banks are resistant to changes required for Open API implementation, making it challenging to alter specific functions without affecting the entire system. Developing and integrating APIs requires significant time, cost, and resources, leading some businesses to opt for pre-built API solutions to save time and resources. **Shift in Midsets:** Differences in culture, working methods, and mindset can pose challenges during the integration process between banks and fintechs. Transitioning from traditional models to working within an ecosystem requires a change in mindset, understanding common objectives, and respecting differences in ways of working. **Compliance:** Ensuring compliance when partnering or acquiring smaller fintechs can be challenging due to differences in risk and compliance standards. **Complexity:** Collaborating with banks can be complex, involving complex processes, risk assessments, and learning curves for fintech companies.
5	Opportunities	**Developing Ecosystem:** The collaboration strengthens the ecosystem by interconnecting different actors and making technologies more scalable and accessible. With regulators being part of the ecosystem, open banking fosters a close working relationship between banks and regulators, allowing for effective communication. **Automation & Connectivity:** Open banking automates the collaboration process between banks and fintechs, reducing the manual effort required to manage contracts and data transfers. It enables banks to automate internal processes like account management and data analysis. This leads to increased efficiency, real-time data sharing, and improved services. Further, it facilitates the integration of systems, enabling connectivity between different banking platforms, third-party providers, and

		external data sources. **Technical Opportunities:** Open banking unleashes the power of data, allowing for advanced data analytics techniques, such as credit scoring and risk assessment. Aggregating real-time data can provide early indications of systemic risks, enabling timely actions and interventions. Collaboration and open APIs enable the integration of external data sources, leading to personalized experiences and tailored products for customers. **Consumers' Benefits:** Improved accessibility and user-friendly experience, greater ownership of financial data, coverage for underserved segments, a better understanding of finances, and responsible, informed decisions.
6	Risks	The absence of a clear strategy addressing open banking and the absence of necessary capabilities to compete in the open banking landscape can leave banks at risk of falling behind and even bankruptcy. Further, banks may be less inclined to engage in partnerships and collaborations if fintechs grow and become more dominant, which could hinder the progress of open banking initiatives. Lastly, operational challenges might arise as handling large volumes of data and managing API requests can impact operational efficiency.

Table 6.3 Summarized Version of Findings

7. Analysis

This section will present the findings in relation to the Multi-level Perspective framework. It will start by analyzing the three main MLP levels (Regime, Niche, and Landscape) in the scope of this research. Then, it will examine the dynamics of the transition based on Geels' four phases of socio-technical transition. Lastly, it will conclude the transition pathway that open banking collaboration might be following.

The MLP framework offers a comprehensive analysis of barriers and opportunities, emphasizing the significance of a holistic strategy that considers the interplay among stakeholders across various levels (Geels, 2012). The framework recognizes that socio-technical transitions are non-linear (Wang et al., 2022), and it emphasizes the interplay between three levels of analysis:

the micro-level or niche; the meso-level or regime; and the macro-level or landscape (Geel, 2002).

7.1. Landscape Analysis

According to the findings, the landscape of the traditional financial sector needed more innovation and competition due to monopolization and customer lock-in practiced by traditional banks. Consequently, changes in the landscape to reduce banks' power were demanding. MLP identifies two leading roles for the landscape: exerting pressure on existing regimes to promote changes and creating opportunities for emerging niches while protecting them from dominant players (El Bilali, 2019). Further, Geels states that system innovations are not limited to technological changes; conversely, they include policy changes, users' practices and behavior, infrastructure, and industry structure (Geels, 2006; Geels, 2002).

Accordingly, regulatory, societal, and technical changes in the landscape were analyzed to understand the impact of the socio-technical transition. On a regulatory level, the implementation of PSD2 introduced regulatory standards and requirements that encouraged the collaboration between traditional banks and fintech companies in a secure manner. The results show that PSD2 counteracted the tardiness of the existing regime, pressuring banks to open up their systems and share their data while creating opportunities for emerging niches to generate revenue from banking data. Further, it safeguards the niche and regime by creating a regulated environment for collaboration.

On a technical level, adopting open API technologies facilitated the implementation of PSD2. As indicated by the findings, it allowed the niche players to leverage the established foundational banking infrastructure provided by traditional financial institutions, enabling the delivery of value-added services without the need to build an entire banking infrastructure from scratch. Additionally, it facilitates secure and reliable data sharing. Finally, on a societal level, the findings show that the digital changes impacting all industries, including the banking industry, have influenced customer behavior and raised customer expectations, putting pressure on the existing regime to meet the new needs.

These landscape changes occurring at three different levels, regulatory, technical, and societal, align with Geels' concept of system innovations, which involve the long-term co-evolution of interrelated elements among various actors, encompassing changes on both the supply side (technologies and structures) and the demand side (user preferences) (Geels, 2006). These changes have also lowered entry barriers for new participants and stimulated innovation and competition.

7.2. Regime Analysis

Geels proposes that regimes are rules and practices embedded in a complex system intertwined with institutions and infrastructures (Geel, 2002). These regimes encompass seven essential elements: technology, infrastructure, markets, user practices, cultural and symbolic significance, sectoral policies, and industry (Nykvist & Whitmarsh, 2008)

According to the findings, traditional banks, which shape the regime in this study, operate within a well-defined system governed by specific rules, practices, and components. Their long-standing presence, complex legacy systems, deep industry knowledge, and large customer base with established consumer trust created stability in the system. Geels suggests that this stability in the system gets traditional banks entrenched within the existing system, which hinders them from finding alternative and more innovative approaches (Geels, 2012).

The resistance to change is also reinforced by the fact that it is too risky and costly to make any changes in these complex, well-established systems or start new ones, as indicated by the findings in line with Geels' claim that sunk investments in infrastructure are one of the barriers to change (Geels, 2012). Further, the findings highlight that the highly regulated nature of the banking system solidifies system stability and makes it challenging to implement changes while ensuring compliance. These findings align with Nykvist & Whitmarsh (2008) argument that regulations, norms, worldviews, and practices that shape the regime are slow to change, hindering the potential for drastic system innovation. Consequently, as the findings demonstrate, banks developed closed systems in which everything is built in-house; and they focused more on locking in their existing customers rather than adapting to new customers' needs and embarrassing innovation.

7.3. Niche Analysis

Geels (2012) states that niches are crucial in facilitating transitions as they lay the groundwork for systemic change. Fintechs, the niche actors in this study, introduced novel solutions that diverged from the existing regime (Geels, 2012). They took advantage of banks' rigid systems that are hard to adapt to digital changes and the banks'-consumer gap and made their way to the market. Unlike banks, fintechs do not follow clear-cut rules; they are more flexible, which gives them room to learn about the infrastructure requirements, understand consumers' needs, observe the changes in consumers' behavior, and bridge the gap between customer demands and existing services (Geels, 2006).

Consequently, as the findings indicate, fintechs have built modern infrastructures that accommodate the technical requirements needed for modern solutions. Further, they were specific in their services and focused on entering new markets and targeting underserved segments like Small and Medium Enterprises (SMEs). They offered flexible, convenient, and time-efficient solutions for end users and businesses that influence customers' behavior and raise customers' expectations. As a result, the fintech niche encompasses various elements, including technology, institutions, markets, and cultural aspects (Nykvist & Whitmarsh, 2008).

Geels (2012) argues that niche actors aspire to have their innovative ideas adopted by or even replace the existing regime, despite the stability and lock-in of the regime. However, the findings demonstrate that fintechs aim to open up the market without attempting to win it all. Both banks and fintechs recognize each other's strengths and limitations. Fintechs acknowledge the power and the valuable assets of the regime system. On the other hand, banks acknowledge the ability of fintech to address landscape changes and apply modern technologies that positively impact the whole financial industry. Therefore, fintechs should be viewed as potential partners instead of competitors.

7.4. Dynamics and Transitions

MLP recognizes that socio-technical transitions are non-linear (Wang et al., 2022); they are dynamic interactions between the three levels of analysis over time through four different phases (Geels, 2006).

7.4.1. First Phase

The first phase serves as the pre-development phase, where innovations emerge in a niche to address problems and issues in the established regimes and the change (Geels, 2006). As previously mentioned, fintechs realized the problems in the traditional banking regime, including complex infrastructure and high regulations. They learned customers' needs and identified the gap between banks and evolving customers' behavior and requirements. Banks and fintechs acknowledge each other's benefits and limitations, leading to the development of collaborative initiatives. However, this phase is uncertain, as the findings reveal that banks' responses vary between resistant, hesitant, responsive, and adaptive.

Due to the traditional and critical nature of the banking sector, any altered changes are perceived as a threat. As a result, some banks resisted the collaboration and developed similar solutions internally due to concerns about data sharing and market loss. While other banks could foresee the opportunities the collaboration could bring and were responsive to the initiative, some were hesitant due to the lack of regulations.

7.4.2. Second Phase

The second phase represents the take-off phase, where the functionalities and potential benefits of the new change are progressively explored (Geels, 2006). In the scope of this study, this phase corresponds to the phase where banks and fintechs explore the drivers and potential advantages of collaboration. According to the findings, fintechs acknowledge the importance of collaborating with banks since they have the banking data needed for developing banking solutions, a large customer base, and an established regulatory framework that fintechs can leverage. At the same time, banks find it an opportunity to access modern technologies without significant alterations to their complex systems, which saves them money, time, effort, and

resources. Moreover, banks realize that digital solutions providing convenience align with customers' needs. Hence, partnering with fintechs allows banks to stay in competition and offer improved services that retain existing customers and extend their market reach.

This phase also involves technical exploration, as emphasized by Geels, where the new technology is selected and establishes its own rules and guidelines (Geels, 2006). The findings indicate that, despite not being forced by PSD2, open APIs were widely utilized by banks and fintechs for data transfer, adhering to PSD2 requirements and guidelines to address the regulatory implications and industry concerns relating to new technologies in the banking sector. Consequently, a dominant design of innovation starts to take shape (Geels, 2006).

7.4.3. Third Phase

In this phase, the new system diffuses into the existing system and becomes widely adopted (Geels, 2006), capitalizing on the landscape changes that pressure the regime (Geels, 2018). According to the findings, partnering with fintechs shortens the time to diffuse into the market. The results show how collaboration between banks and fintechs has created a range of opportunities at both the regime and landscape levels, promoting the adoption of the new system. On the landscape level, consumers benefit from a wider choice of services and providers and tailored and customizable products. Further, they gain more control over their data accessibility. In addition, the wide adoption of the new system includes underserved segments that were overlooked by the old system. On the regime level, the collaboration showcases the opportunities for automating regime processes and enhancing connectivity, making business processes easier, faster, and more efficient.

According to Geels (2018), this phase is also characterized by struggle and conflict between regime and niche, including:

- Political conflicts and power struggles - The complex structure of banking systems creates political struggles for fintechs collaborating with banks to manage and mitigate compliance and legal risks they may be unfamiliar with. Banks also face challenges in effectively collaborating with fintechs while remaining compliant.

- Cultural struggles - As proposed by the findings, collaboration challenges not only involve technology but also require a shift in mindset towards a more collaborative approach, which challenges the traditional banking culture.
- Economic competition - Developing and integrating APIs requires changing the entire banking infrastructure, which is time, cost, and resources consuming, creating some economic struggle for banks, especially small-sized ones. However, the findings show that this also promotes collaboration at a different level, as many banks opt for pre-built APIs provided by fintechs to integrate into their system, reducing the cost of changing the whole infrastructure.
- Business struggles that might lead to the fall of existing firms - Increasing competition in the banking sector creates business struggles that may lead to the downfall of banks that cannot keep up with the changes. Without setting the right strategies, banks become at risk of losing market share and going bankrupt.

7.4.4. Fourth Phase

Finally, in the fourth phase, the new system becomes more dominant after widespread adoption in the third phase. Gradually, the system starts to replace the old system, creating views of normality, habits, and technical capabilities (Geels, 2006; Geels, 2018). The changes in the ecosystem of open banking reflects the shift from the old closed system, where everything was developed in-house, to a new open system, where diverse actors collaborate to contribute collectively to the growth and development of the system. Additionally, the new system reveals untapped technical capabilities of data not utilized in the old system while opening opportunities for emergence of new business models and the development of new revenue streams.

7.5. Transition Pathway:

As proposed by Geels & Schot (2007), a change can follow various transition pathways depending on the interactions between niche, regime, and landscape (Geels & Schot, 2007 as in Wang et al., 2022). Based on these proposed transitions and the research findings, it can be concluded that the transition pathway for open banking collaboration aligns with the "technology

reconfiguration" pathway. According to El Bilali (2019), technology reconfiguration occurs when a niche innovation gradually gets incorporated into the existing regime leading to changes and adjustments under landscape pressure.

The findings show that fintechs initially focused on addressing specific consumer needs and bridging the gap between existing bank services and customer expectations. Gradually fintechs gained momentum through widespread adoption, leading to increased consumer preferences and expectations. Simultaneously, the introduction of the PSD2 framework exerted pressure on traditional banks, prompting them to consider collaboration with fintechs.

With the driving forces of both banks and fintechs, the willpower to overcome fears and challenges, and the landscape pressure, fintechs started to incorporate with banks creating a new collaborative open banking ecosystem.

8. Discussion

This section will present the findings in relation to other research and incorporate additional discussions. The content will be organized based on the main themes identified through the thematic analysis. Table 6.2 in Chapter 6 provides an overview of the main themes.

8.1. Status Quo before Collaboration

The digital transformation happening in the banking landscape has favored fintechs over banks, making the competition harder. It is challenging for traditional banks with their legacy technologies and highly regulated infrastructure to adapt to the digital changes, while it presents an opportunity for fintechs to use their modern technologies and less complex organizational structure to exploit the digital changes (Hornuf et al., 2021).

In agreement with the findings, Anagnostopoulos (2018) argues that traditional banks have relied on established practices and regulations to maintain their position in the industry for years, which aligns with Geels (2002) definition of regime as the set of rules and practices embedded in a complex system. Traditional banks have relied much on their long reputation, heritage, and trust without having competition as a major concern (Pincovski, 2022). However, this has resulted in a

comfort zone that is resistant and suspicious to any change that alters the industry, leading to a lack of innovations and creating a gap with consumers (Anagnostopoulos, 2018).

Moreover, the findings show that this long-standing presence of traditional banks resulted in a complex IT infrastructure banks had for years that are risky and expensive to change. Indra (2014) added that it is not only the IT infrastructure but also the regulatory landscape that served banks for years by increasing the entry barriers. This regulatory landscape is now expensive to maintain, making it an obstacle for banks to cope with the changes. Following the financial crisis in 2008, the regulatory fees for banks have increased Wingard (n.d.), leaving banks with lower IT budgets to compensate for profit loss (Indra, 2014). According to Lee & Shin (2018), it is very expensive for traditional banks to meet regulatory requirements while also competing against fintech. Furthermore, Banks relied on in-house systems and infrastructure, which were often closed and not easily accessible by external entities. This closed nature of technology uses limited collaboration and innovation within the industry (Pincovski, 2022). Additionally, the high entry barriers and low competition have limited the incentives for banks to create better products (Brodsky et al., 2018).

Conversely, according to the findings, fintechs exploit the gap between banks and customers by providing faster, more efficient, and customer-centric solutions. This finding aligns with OECD (2020) research that concludes that fintechs identified the gap between the regime and customers' needs, thoroughly understood user behavior and preferences, and developed their business models accordingly. Hosseini et al. (2022) emphasized the importance of researching users' behavior as users judge products based on their benefits and potential outcomes, drawing from past experiences. Further, Pincovski (2022) supports the findings, stating that fintechs established modern, legacy-free infrastructures that targeted specific market segments, such as small and medium enterprises (SMEs). The increasing dependence on technology has empowered consumers, granting them more agency and control over their financial activities (Indra, 2014), which revealed the limitations of the existing regime that still exercise power over users' finances (Interviewee 3).

By leveraging their expertise in consumers' needs, fintechs developed digital technologies offering personalized solutions for businesses, often called Fintech-as-a-Service, which encompasses payment, management, credit, insurance, and other finance methods (Pincovski,

2022). These services have gained attention and widespread adoption. According to the EY Global Fintech Adoption Index report, the adoption of fintech services has steadily increased over the years, rising from 16% in 2015 to 64% in 2019 due to increased awareness among non-adopters. Attractive rates and fees primarily drove end users, while SMEs were attracted by the range of functionalities and features (EY, 2019). These statistics highlight the growing momentum of fintechs in the market.

Despite their strong technology backgrounds and customer-centric business models, it was still challenging for fintechs to compete with banks due to their lack of banking infrastructure (Pincovski, 2022). On the other hand, traditional banks also struggle to match the speed of fintechs developments despite the valuable assets and resources they possess (Pincovski, 2022; Brodsky et al., 2018)

8.2. Drivers for Collaboration

According to OECD (2020), the digital changes happening in the financial sector were driven by supply and demand factors. On the supply side, technological development was the main driver. API technologies, for example, enabled unbundling of services and data sharing, while cloud computing improved data storage on remote servers. These technologies have raised users' expectations on the demand side as they enable faster, more convenient, and more user-friendly financial services (OECD, 2020).

As digital changes transformed the financial sector, both fintechs and traditional banks recognized the significance of collaboration and partnership, each driven by their own motivations. The background research shows that this collaboration is driven mainly by fintechs needing access to financial data and banks needing technical revamp (Axis Corporate & Efma, 2016). The findings add that fintechs are primarily driven by access to data and regulatory expertise, leveraging them to offer innovative solutions. On the other hand, traditional banks are driven by their pursuit of modern technologies, efficiency, customer retention, and product expansion to stay competitive and adapt to the evolving customers' needs. Further, Hornuf et al. (2021) summarize that fintechs seek access to a broader customer base, regulatory expertise, and banking licenses. While banks mainly collaborate to secure their competitive advantage and

product development (Hornuf et al., 2021). Consequently, as indicated in the background research, this concept of openness and data sharing creates a network of interconnected financial services which broadens the customer base for banks and fintechs and increases the adoption of these services leading to a positive network externality (Zachariadis & Ozcan, 2017).

Confirming the findings that present different banks-fintechs' responses to the collaboration, OECD (2020) argues that incumbents follow one of two strategies in response to the entry of new players; either they become resistant in some markets or accommodating in others. One strategy is known as the 'fat cat' approach, where incumbents rely on their large customer base and make switching costs high to protect profitability. This strategy may open the opportunity for new players to target unbanked or tech-savvy segments. In contrast, incumbents may accommodate the entrant, leading to mutual benefits. For instance, they can collaborate and receive interchange fees from operators accessing their customer base. Alternatively, incumbents may develop their own products to compete against the new entrant (OECD, 2020). Interviewee 3 further highlighted another approach where they have cases of adaptive banks who partner with them and provide them with the data needed via APIs, yet they still develop their own solution in-house that replicates the functionality of the fintech solution. The interviewee suggests that this behavior may stem from a perceived threat posed by fintechs' potential dominance in the market.

On the other hand, fintechs adopt other strategies when partnering with banks. According to OECD (2020), fintechs with banking licenses focus on selling their products to incumbent banks and providing the required IT infrastructure. Conversely, fintechs without banking licenses often seek partnerships with banks to access their customer base, leverage regulatory expertise, and utilize existing banking infrastructure (OECD, 2020). These different strategies support the findings that incumbents and fintechs respond differently to landscape changes and perceive collaboration differently based on the perceived opportunities.

However, the findings show that some banks expressed skepticism about having unregulated partnerships, which is supported by Anagnostopoulos (2018), who states that banks are comfortable dealing with digital changes and disruption if existing regulations bind them. Hence, according to the findings, PSD2 regulations had a transformative role, creating pressure on

regime systems that were resistant or hesitant to change and creating a level of trust for those who were for the change but needed regulatory guidance.

In order to ensure effective compliance with PSD2, digital technologies like RegTech are utilized to fill the regulatory requirements. RegTech is “the use of new technologies to solve regulatory and compliance requirements more effectively and efficiently” (IIF, 2016, p.2, as in OECD, 2020, p.29). While PSD2 remains technology-neutral, it has highlighted the potential of open banking APIs within the banking industry (interviewee 1). In line with interviewee 1, it is stated in a white paper by Ndigit fintech that open banking APIs are usually initiated by regulatory bodies, as in the case of PSD2, or by market-driven standards (Prahmann et al., n.d.). Hence, open banking APIs can be considered a form of RegTech that facilitates compliance with PSD2.

The collaborative engagement between regulators and industry experts is crucial to address the regulatory implications and industry concerns surrounding new technologies in the banking sector. A notable example is the establishment of an industry working group on Application Programming Interfaces under the revised Payment Services Directive from January 2019 to December 2021 by the European Banking Authority to discuss issues raised by the participants on APIs under PSD2 (EBA Website). One of the first concerns raised was the reliability of the API testing process, the need for various use cases, and clear testing guidance provided by regulators (EBA, 2019a). Further, participants emphasized the importance of clarity and transparency, suggesting that third-party providers should declare the identity of their technology agents through the API, with banks providing this information to users when the API supports its transmission (EBA, 2019b)

Additionally, third-party providers are concerned about how banks handle data access requests. Standardizing the process across Europe entails TPPs sending a request to the bank to access certain customer information without specifying the account or the type of information needed. Subsequently, banks notify customers on their app to specify the account and information they consent to share with the third party, ensuring users retain control over their data. However, concerns have been expressed about banks incorporating potential additional checks and making changes to agreed data access during this phase (EBA, 2021).

It is worth noting that the implementation of PSD2 in Europe has set a precedent for other markets like China and the United States, which are gradually trying to implement open banking (Botta et al., 2018). It has also sparked discussions on the challenges of applying similar regulations in the US market. Zach Perret, CEO US based fintech Plaid, highlights the difficulties of fitting PSD2 into the American market due to its numerous financial institutions (Brodsky et al., 2018). Nevertheless, the US has taken affirmative steps toward open banking in recent years due to increased fintech adoption among consumers (Kopple, 2022). With some regulatory pressure, they can push financial institutions to integrate APIs into their solutions to enhance and automate consumer connectivity. For example, in 2020, the Consumer Financial Protection Bureau (CFPB) requested the proposal of new regulations regarding consumer access to financial data (Kopple, 2022). Furthermore, President Biden's executive order 2021, which focuses on promoting competition in the American economy, urges the CFPB to develop rules enabling customers to download their banking data and transfer it elsewhere (Kopple, 2022).

8.3. Fears & Concerns

According to the findings, the concerns surrounding the bank-fintech collaboration are primarily focused on security and liability. In a report by Mansfield-Devine (2016), banks' concerns regarding partnering with Third-Party Providers (TPPs) on open APIs were summarized, where liability and security were also at the top of the list of concerns highlighted in the report. Banks prioritize security above all else and cannot afford to compromise even for innovation. That is why although open banking APIs bring innovation, banks still have significant security concerns (Mansfield-Devine, 2016).

Mansfield-Devine (2016) also emphasizes banks' concerns about liability. They often end up with the "lion share" without complete control over the process since their control is limited to their own APIs. It is challenging to mandate the same security standards to different players involved (Mansfield-Devine, 2016). That is why quality control over external services integrated into banking systems is crucial for gaining customers' loyalty and maintaining their reputation. To avoid uncertainties regarding liability, a contractual agreement between banks and fintech is essential when collaborating on APIs (Zachariadis & Ozcan, 2017). Data sovereignty is another concern arising from open banking. Since open banking APIs allow data to be stored on external

servers owned by third-party providers, data sovereignty concerns arise if the data is stored on non-EU-based servers, which raises questions about under which regulation the data will be protected. For example, suppose data ends up in a US-based server. In that case, users may worry about their data being subject to surveillance by US government agencies under laws like the Patriot Act that grant these agencies surveillance power (Mansfield-Devine, 2016).

Moreover, fintechs also express concerns about partnering with banks. According to a study by Zachariadis & Ozcan (2017), fintechs raise concerns about the different working pace of banks. Banks, being large and established institutions, operate at a different speed compared to fintechs. Fintechs face challenges with the speed at which banks approve their products and the time they take to release them to the market. Banks' slower decision-making processes and cautious approach, driven by their hard-earned reputation, necessitate rigorous testing and experimentation, which can be time-consuming. According to one of the study's informants, despite thorough testing, the algorithm of their partner fintech crashed when fed by real data. This lengthy approval process raises concerns for fintechs when partnering with banks (Zachariadis & Ozcan, 2017). That's why fintechs should be transparent on how they address security concerns and how they implement fraud prevention measures to gain consumers' and banks' trust. They further need to invest more in these areas to ensure the wide adoption of their products (WorldLine, 2019).

Due to the criticality of sharing financial data, and the security concerns it raises, the testing process becomes more critical. Therefore, banks release sandbox versions of their APIs for testing experiments (Kellezi et al., 2021). A Sandbox is a controlled and isolated testing environment replicating the production environment but not connected to the company's resources like servers and databases. It is used for safely testing changes, developing new features, and stimulating real-world scenarios without altering the production (Juviler, 2022).

While extra layers of authentication have been recommended in the findings, TPPs have concerns about it as they may lead to customers churn. Interviewee 3, for example, stated that they renew the consent with the users every 90 days for security purposes. Conversely, in the EBA industry working group on APIs under PSD2, TPPs argued that they face customer loss every time they require customers to re-authenticate because this repetitive re-authentication process mandated by banks is inconvenient for customers (EBA, 2021).

At the consumer level, the fear of open banking stems from a combination of factors, including data security, data sharing with external parties, data being used for advertising purposes, privacy protection, and data control, as per a study done by Bylykbashi et al. (2023). Although open banking grants users more power and control over their data, users are still more concerned about data security than having agency over their data. The study concludes that, like banks, security is the most critical factor for consumers over friendlier user interfaces, speed, or account management. Further, it shows that although open banking is meant to benefit end users, most consumers have fears and concerns about data sharing. That's why, in agreement with the findings, the study suggests that raising awareness about open banking and its benefits to users and transparency from financial institutions regarding data-sharing practices is crucial for higher adoption rates (Bylykbashi et al., 2023). However, as the findings state, dim awareness should be avoided as it does not guarantee proper user understanding.

As proposed in the findings, although consumers trust banks with their data and willingly share it, they find it challenging to do the same with fintechs or provide consent to banks for sharing data with fintechs. Premchand & Choudhry (2018) add that open banking APIs open the way to cyber attacks, either by targeting the technical infrastructure or by exploiting users' dim awareness, confusion, or trust to perform social engineering techniques and reveal sensitive data, leading to data loss and identity theft (Premchand & Choudhry, 2018). Consequently, as interviewee 2 proposed, banks involved in open banking need to be transparent with their consumers and provide clear instructions and explanations of the data-sharing process on their websites. ING Bank, for example, has a dedicated page on its website that explains what open banking is and its impact on users, including a comprehensive FAQ section addressing possible concerns. ING highlights the benefits of open banking for customers, such as easier product comparisons. It emphasizes that it is an opt-in service where users have complete control over the duration and type of data shared (ING Website, n.d.).

According to Premchand & Choudhry (2018), educating customers about the value of their data and the potential opportunities that come with sharing it with third-party providers is crucial but also challenging. The CEO of Nigerian fintech, Consumetrics, in an interview with the Nigerian news channel Channels, stated that customer education and awareness are key to the success of widespread adoption of open banking solutions. He mentioned that as Nigeria is taking the first

steps in open banking, they are learning from European countries' experiences in implementing open banking, where customer education played a significant role in adoption, especially since sharing data with TPPs is an opt-in, opt-out solution (Channels Television, 2023).

While security remains a major concern about open APIs compared to previous technologies used in the financial sector, API is more secure (Read-Parish, 2019). In the past, third-party providers used unregulated screen scraping methods to access financial data on behalf of their customers. Customers would provide TPPs with login credentials, including passwords, via a "mirrored login page" created by the TPPs, resembling the financial institution's login page. Once the TPP has the login credential, they can log in on behalf of the customer to their financial institution account, retrieve their data, and transfer it to external databases. However, this approach had three main problems. First, security, unlike open API, where data is retrieved based on users' consent without any need for login credentials, passing this security information, including passwords, to TPP for screen scraping, there is a risk of losing this information, or unauthorized parties could access it. Second, screen scraping was relatively slow; it could take 5-10 minutes to retrieve a large pool of data by screen scraping, whereas it only takes seconds with open APIs. Third, stability, because screen scraping scrapes a particular page with a specific layout, any changes to the webpage will affect the efficiency of the scraping process, and the tool may not work properly. Hence it affects the continuity and reliability of accessing data (Read-Parish, 2019).

8.4. Challenges & Conflicts

A general challenge on the landscape level is the market's readiness, as it takes time to adapt to the changes (Coeckelbergs, 2019). Industry awareness of the benefits of open banking is crucial to expedite the adaptation process (Natalizia, n.d.). While PSD2 sets requirements to regulate collaboration, it lacks clear guidelines on how to meet these requirements, making market adaptation more challenging (Brodsky et al., 2018).

According to the findings, developing and integrating APIs into banking infrastructure is time and cost-consuming as it requires a change in the entire infrastructure. In agreement with the findings, Mansfield-Devine(2016) argues that it requires many investments and a total change of

the infrastructure to create, manage, and secure APIs (Mansfield-Devine, 2016). To integrate emerging technologies into large banking systems, banks must shift their investments in maintaining legacy systems toward building scalable systems that accommodate new financial technologies like APIs (van der Kroft & Sweers, 2021).

In addition to development and integration, API management, including discoverability, publishing, and access control, is another challenge. Making the API easily discoverable by developers and providing them with clear and comprehensive documentation about API's functionalities, endpoints, capabilities, and limitations is crucial for the ease of integration. Further, another crucial factor is implementing robust access control measures that grant access only to authorized users (Mallick, 2020).

Furthermore, API standardization is a challenge discussed in the literature on API development and integration. With the rise of fintech APIs, there is an increasing call for API standardization in finance. Although PSD2 imposes some security standards on data access, more work still needs to be done (Simpson, 2023). Different types of data are handled and controlled differently (Premchand & Choudhry, 2018), and inconsistent data structures due to a lack of standardization can impose vulnerabilities that could lead to security breaches. Therefore, standardizing API data models is vital for API security and interoperability between different systems (Simpson, 2023).

Initiatives like the Open Banking Working Group (OBWG) and the Berlin Group work towards API standardization (Premchand & Choudhry, 2018; The Berlin Group Website, n.d.). OBWG provides an open API framework that includes data standards, security standards, and a Governance model (Premchand & Choudhry, 2018). Further, the Berlin Group is developing the NextGen PSD2 framework, a revised version of the PSD2 that concerns API standardization and interoperability (The Berlin Group, 2020). While having different standardization initiatives is a good stepping stone for a more unified standardized model, it poses a challenge for third-party providers in accommodating slight changes when developing APIs for different clients following different standardization frameworks. Moreover, these local/regional initiatives limit third-party providers from addressing all banks internationally without having one unified international framework (Worldline, 2019).

The findings also underline compliance as a challenge for both banks and fintechs when collaborating, as they must manage risks and ensure regulatory compliance. The CEO of Banca Sella Group further states that the challenge is not only in adhering to regulations but also in being responsible when regulations are unclear and avoiding taking advantage of any loopholes (BCG, 2017). Data compliance is another challenge that rises when collaborating globally. When receiving external data, banks and fintechs need to establish a strategy and develop algorithms that collect, store, and handle data while complying with local data privacy regulations of the sending country (Mallick, 2020). For instance, collaborating with two large banks in the UK led a US-based fintech company, Ping Identity, to establish a compliance framework aligned with UK regulations. To ensure scalability, they created a standardized framework that meets the requirements of PSD2 to enable adoption by multiple banks across Europe (Brodsky et al., 2018).

Furthermore, the findings emphasize the importance of a mindset shift for banks to embrace collaboration, stating that the challenge lies not in technology but in changing how banks work and fostering a collaborative culture. According to van der Kroft & Sweers (2021), a mindset gap between banks and fintech challenges their collaboration. Fintechs have a more innovative and entrepreneurial mindset, while traditional banks are more risk-averse, which makes them more reluctant to innovate (van der Kroft & Sweers, 2021). That's why, as stated in the background research, banks are now demanded to shift from a closed mindset to an open but secure one (Zachariadis & Ozcan, 2017). Additionally, with the emergence of open API and the collaboration between banks and fintechs, the issue of customer ownership arises. Banks need to shift their mindset from owning the customer to embracing a collaborative approach that involves sharing customers with partners. (Zachariadis & Ozcan, 2017).

The global fintech report by the Boston Consulting Group (Goyal et al., 2023) shows that cultural mismatch is among the most common issues incumbent banks face when acquiring fintechs. Slow decision-making due to conservative policies and deep hierarchies within incumbents can challenge the pace of innovation. To overcome these cultural mismatches, according to Goyal et al., incumbents should enclose or protect the partnering fintech from the rest of the organization, allowing fintechs to retain their autonomy, distinctive culture, and entrepreneurial spirit when collaborating (Goyal et al., 2023). As proposed in the findings,

choosing the right partner is crucial to overcome these cultural mismatches based on common objectives. It needs alignment, agreement on scalability, mutual understanding of differences, and clarity on the timeline. The findings are supported by an Ernst & Young (EY) survey, which reveals that operational alignment and partner identification are pain points reported by the respondents. To address these challenges, EY experts recommend aligning objectives, incentives, and scalability, as well as understanding the strengths and weaknesses of potential partners, to ensure making the right choice (Moseson & Akuma, 2023).

8.5. Opportunities

Open banking collaboration presents significant implications and opportunities across various aspects. The concept of openness under PSD2 regulations opens up the market for new business models and enables the emergence of the sharing economy (BCG, 2017). Further, it encourages customer awareness of data ownership and security, giving them more control over their finances (Gozman et al., 2018). Open banking empowers customers by giving them greater control and autonomy in managing their financial affairs while also creating opportunities for technological advancement (Brodsky et al., 2018).

As per the findings, The collaboration between banks and fintech has fostered the development of an ecosystem consisting of various stakeholders such as financial institutions, tech providers, developers, regulators, and consultants, making technologies more scalable and accessible. In addition, developing an ecosystem through open banking fosters an expansion of distribution channels (Gozman et al., 2018). It enables the emergence of new business models, services cross-selling, and customer references (Kopple, 2022). This ecosystem development created the opportunity for market growth and the rise of new markets, such as the Banking-as-a-Service market (van der Kroft & Sweers, 2021), where licensed banks not only share data with non-bank entities but seamlessly incorporate their digital banking services into the offerings of non-bank entities (Bessenbach, 2021). Furthermore, open banking allows banks to improve their service offerings by expanding beyond traditional payment and account services, gathering comprehensive data from different sources through partnerships, and gaining insights to develop better solutions that meet customers' needs (Gozman et al., 2018).

The findings further show that open banking automates collaboration between banks and fintechs, streamlining processes, enhancing efficiency, and enabling real-time data sharing and system integration for improved services and connectivity. In agreement with the findings, APIs facilitate the secure automation of manual tasks (Rangachari, n.d.) and facilitate internal and external systems integration resulting in real-time data sharing (Deutsche Bank, 2023). Further, open banking automates the data-sharing process allowing customers to use their bank account data as assets that could be shared and migrated compared to the traditional data-sharing techniques where customers have to manually ask for a bank statement, usually printed in PDF format to transfer their data (FinTech Magazine, 2022). Yapily adds that open banking data surpasses the limitations of traditional data sources like Beru data. Beru data is usually not up to date and does not include all sources of financial information about the customers, like gambling and income data, for example. So if customers are vulnerable, Beru data will not recognize it. However, with open banking data, it is up to the minute and connected to different data sources, which increases the ability to fully assess creditworthiness, customer identification, and fraud detection (Yapily, 2023).

Moreover, the findings show that the open banking collaboration has brought to light the significance of data utilization. In support of the findings, a recent survey by Ernst & Young (EY) shows that data analytics is the future opportunity for banks-fintechs partnerships, where 55% of banks expect partnerships to play “very important” roles in their strategies by 2025 (Moseson & Akuma, 2023). Further, in a panel discussion by the Fintech Magazine, Yapily Fintech highlighted the emergence of different smart data proposals aimed at incorporating new financial data sources like pension, utilities, insurance, and savings for analysis, which unlock insights and patterns, enabling informed decision-making and operational improvements (Fintech Magazine, 2022). J.P. Morgan emphasizes that the power of data will not only be limited to APIs, but also it will be leveraged to integrate with advanced technologies like machine learning, artificial intelligence, and the Internet of Things, which will play a crucial role in differentiating and widely adopting open banking (McKenzie, 2023).

AI technologies can analyze vast amounts of data in real time, improving business processes, enabling automation, and faster and more accurate identification, thus enhancing fraud detection capabilities (Fong et al., 2021). Moreover, AI can analyze customer data to gain insights into

spending behavior and preferences, enabling customized, personalized products and services (Kreger, 2023). It is worth noting that the data-driven trend in banking is only a stepping stone toward open business, where open data and APIs will be leveraged in other sectors like government, supply chain, and healthcare. This indicates that open banking's impact on technology advancement goes beyond the banking industry, extending into various sectors to drive innovation and collaboration (Brodsky et al., 2018).

According to the findings, open banking offers consumer agency, ownership, and management of their financial data as stated in the findings. Data shared between banks and fintech through APIs empower users to connect their financial accounts with other apps and services, giving them more control and the ability to utilize their data across various platforms (Kopple, 2022). Open banking offers customers more control over their data compared to closed banking. In closed banking, customers are stuck with one entity, mainly their primary banks, without room to move their data around. Whereas with open banking, customers can connect their bank accounts with a third-party provider app or another bank, giving them more agency and power over their data (Fintech Magazine, 2022).

Danske Bank's collaboration with Aiia fintech exemplifies the benefits of open banking for consumers. By utilizing Aiia's open API platform, Danske Bank can access banking data from all Nordic banks allowing customers to conveniently access and manage their different bank accounts from their Danske Bank banking platform. This collaboration provides customers with convenience, control, streamlined financial management, and improved financial insights (Basse, 2019).

As proposed in the findings, open banking can provide early indications of systemic risks, enabling timely actions to be taken for the benefit of society. Yapily fintech further argues that open banking fosters inclusivity and creates opportunities that address societal needs. Yapily conducted a survey on the cost of living, revealing that a significant percentage of respondents expressed concerns about the cost of living. Many reported utilizing budget and bill management products, which are open banking products, for the first time. This demonstrates the opportunities created by open banking to address financial challenges and provide accessible solutions (Fintech Magazine, 2022).

8.6. Risks

In a panel by Fintech Magazine, Yapily Fintech states that open banking is still new, so the industry now is still in the midst of a learning process where new cases are coming out (FinTech Magazine, 2022). The findings show that The absence of a clear open banking strategy and necessary capabilities can put banks at risk of lagging and hinder progress. Further, fintech dominance can discourage banks' engagement in collaboration. Finally, the risk of operational failure due to extensive data handling needs to be considered.

In confirmation of the findings on the risk of fintechs becoming dominant, Banca Sella argues that there is a risk of banks ending up in the background merely providing transaction and banking data losing the customer relationship against fintechs superior services and value (BCG, 2017). This is known as "disintermediation," where traditional banks are bypassed or marginalized due to the direct interaction between fintechs and customers and the potential fintechs have to attract and retain customers. This disintermediation could lead to customer base deterioration which puts banks at risk of not benefiting from economies of scale due to the cost pressure banks will experience because of the decreased volumes (Gozman et al., 2018). A BCG report argues that it is still early to worry excessively about fintechs domination since fintechs are still in a very early stage of development where they represent only 2% of the annual financial services revenues globally (Goyal et al., 2023). Anagnostopoulos (2018) further suggests that fintechs put pressure on banks when it comes to products and business aspects that are easily replicated. However, products/services that are difficult for newcomers to replicate, such as infrastructure issues and deposit insurance, may provide some protection for traditional banks (Anagnostopoulos, 2018). Overall, there is a general agreement that banks should strive to cope with the new dynamics, providing excelling services to remain relevant in the evolving financial ecosystem or risk being relegated to providing basic deposit-taking services as innovative institutions take the forefront (BCG, 2017; Gozman et al., 2018; Anagnostopoulos, 2018).

Another risk is the risk of unregulated organizations associated with fintechs. Due to the complexity of the ecosystem of open banking collaboration, many entities in the data supply chain are not mandated by regulations, making it hard to track who accesses consumers' data.

Although PSD2 imposes regulatory standards on fintechs involved in open banking collaboration, there are regulatory gaps that lead to unregulated entities, known as 'agents', acquiring licenses or digital identities from fintechs to access APIs and consumers' data, acting as intermediaries in the data exchange process to facilitate the flow of information (Woods, 2023). This risk has been identified by the European Banking Authority (EBA), and they are investigating how to reduce it. For now, EBA mandates fintechs to inform the National Competent Authority Registers about any agents they deal with; however, to improve the security of onward data sharing, any banking data recipient needs to be regulated by appropriate regulatory bodies (Woods, 2023).

9. Limitations

A limitation of this research is the conservative nature of the banking industry, which resulted in a limited number of positive responses for interviews despite extensive outreach to a diverse range of potential interviewees, which limited the availability of primary data. However, to compensate for this, external sources were extensively utilized to support the empirical evidence. Although it was challenging to secure interviews with banks, their perspectives were considered through a systematic review of external sources. The study draws upon diverse opinions from banks and fintechs found in external sources, thereby enhancing its credibility. According to Guba (1981), a study must be confirmable to be trustworthy. Confirmability means that data goes through various cross-checks to ensure the best outcomes (Guba, 1981). To ensure confirmability and credibility, the research employed data triangulation by cross-checking primary data against external sources (Stahl & King, 2020).

Although some interviewees joined their organizations after the initiation of open banking initiatives, limiting their perception of pre-collaboration experiences, they could provide insights based on feedback from other individuals within the organization who were present during that time. It is important to note that this research is focused on the collaboration process, and future studies can explore additional factors contributing to the success of bank-fintech alliances and propose methodologies for measuring this success. Acknowledging and addressing these limitations maintains transparency of the research while identifying areas for further exploration and advancement.

10. Conclusion

Open banking collaboration is reshaping the financial industry landscape, changing the dynamics between banks and fintechs to foster a more collaborative approach. This research analyzed the open banking collaboration process between banks and fintechs, exploring the drivers behind the collaboration, the fears and challenges, and the opportunities and risks it may hold. It aimed to investigate the impact and explore the implications.

- What are the key opportunities and risks associated with open banking collaboration? (SQ 1)

Open banking collaborations have given numerous opportunities for banks, fintechs, and consumers. In this collaboration, banks can access innovative fintech technologies and modern solutions that broaden their customer base, keep them ahead of the competition, and automate banking operations for better efficiency. Fintechs, on the other hand, have a better chance to scale by connecting to banking infrastructure and accessing their large customer base. Finally, open banking collaboration improves consumers' accessibility to more cost-efficient and inclusive financial services and products, providing a better customer experience.

On a landscape level, open banking collaboration enhances the communication between industry players and regulators, offering potential benefits for other markets outside Europe to learn from this experience. The collaborative nature of open banking, automation, and connectivity have implications for the potential monetization of data and the rise of new and evolved business models, opening up opportunities for new revenue streams. Hence, it has the potential to expand and strengthen the financial ecosystem, allowing new players to participate and benefit from the interconnection. Furthermore, consumers benefit from the increased choices and diverse variations, customization, control, and coverage, enabling them to make well-informed financial decisions.

Despite the positive outcomes and potential opportunities open banking collaboration holds, potential risks need to be considered and mitigated. Some banks risk being left behind due to a lack of capability to collaborate or compete. A clear strategy for coping with the changes is necessary for progress. Further, as fintechs grow and potentially become more dominant, banks

may become less inclined to collaborate, hindering further partnerships. In addition, there is a need to raise consumers' awareness and understanding of the potential benefits of open banking to overcome fears and ensure widespread adoption.

- What is the impact of regulations (PSD2) on the collaboration? (SQ2)

The research shows that regulations like PSD2 significantly promote, maintain, and secure collaboration. PSD2 not only mandated banks to open up their systems and make their data accessible to fintechs but also fostered a layer of trust between them. It imposed security measures and guidelines for data-sharing, including fintech access authorization and consumer access authentication. Further, PSD2 put some security control measures on fintechs by mandating them to perform penetration tests to detect potential vulnerabilities. These measures encourage banks to respond more positively to collaboration and motivate them to take more responsive actions. Additionally, regulations create opportunities for technologies to rise to comply with these regulations, known as regtechs. The high-security measures PSD2 imposed revealed the potential of open APIs for automated, secure, and reliable data sharing.

- What are the technological advancements facilitated by open banking? (SQ3)

As demonstrated in the findings, open banking has unleashed the potential of data, allowing for the utilization of advanced data analytics techniques and facilitating the integration of other modern technologies like machine learning, which has significant implications in different areas. First, it can help in banking operations like credit scoring by checking borrowers' trustworthiness based on their financial behavior and past financial data. Additionally, data analytics can aid in fraud detection by analyzing extensive real-time data for identifying unusual behavior. Second, open banking collaboration can enhance customer experience by leveraging data analytics to gain insights into customer behavior and preferences, providing personalized products that better meet customers' needs. Lastly, aggregating real-time data can provide early indications of systemic risks, enabling timely actions and interventions.

- How has open banking collaboration transformed the relationship between banks and fintechs from rivals to collaborators? (RQ)

In conclusion, open banking collaboration has shifted the dynamic between banks and fintechs, transforming them from competitors to collaborators by combining their respective strengths and expertise, reshaping the financial industry landscape. The collaborations bring mutual benefits among banks, fintechs, and consumers alike, allowing banks to access innovative fintech technologies increasing their competitive advantage and relevance to the market, while fintechs benefit from connecting to banking and regulatory infrastructure and gaining access to a larger customer base. This shift has led to improved financial services for consumers and potential opportunities for new revenue streams and business models, creating a harmonious ecosystem that benefits both parties and fosters innovation in the financial industry.

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12. Appendices

12.1. Appendix 1 Interview Questions

Theme	Level	Questions
Status Quo	General	Can you share your thoughts on the status quo of banks and fintechs before open banking?
	Regime	What are the areas where banks are excelling over fintech?
		Do you think fintech were perceived at first as a potential threat for traditional financial institutions? a. Did banks try to resist this collaboration by developing and improving internal API solutions or were they proactive about the collaboration process? b. Were there strategies to defend the status quo?
	Niche	What issues did fintech try to solve that banks usually overlook? Which customer segment did fintech want to serve? Which customer needs they wanted to meet?
		What are the areas where fintech are excelling over banks?
		What factors make fintech innovations diffuse in the banking system?
	Landscape	On a general level, how do you think the open API technology has affected the rise and evolution of fintech and how did this impact the regime system of traditional financial institutions?
Drivers Fears & Concerns Challenges & Conflicts	Regime	What were the drivers for banks that made them collaborate?
		What concerns and fears did banks have about this collaboration?
		What challenges do banks face during this collaboration?
		Are there any conflicts or do you foresee potential conflicts between banks and fintech due to this collaboration?
	Niche	What were the drivers for fintechs that made them collaborate?
		What concerns and fears did fintechs have about this collaboration?
		What challenges do fintech face during this collaboration?
		Are there any conflicts or do you foresee potential conflicts between banks and fintech due to this collaboration?

	Landscape	How did open banking APIs and PSD2 impact the relation between banks and fintechs?
		What concerns and fears did consumers have about this collaboration?
		How has PSD2 influenced the adoption of open APIs? - Do you think PSD2 encouraged banks towards an open paradigm? - Do you think after PSD2 banks tend to collaborate more with fintech than before PSD2? - Do you think it eliminated some of the fear?
Opportunities and Risks	Regime	What opportunities do banks gain from this collaboration?
	Niche	What opportunities do fintech gain from this collaboration?
	Landscape	What opportunities do consumers gain from this collaboration?
		What are the digital trends that emerged from the use of open API between banks and fintech?
		What other technologies are being leveraged in this collaboration?
		What customers' needs did API services resolve? Was there a specific segment that benefited the most from this collaboration?
		In what ways did open banking APIs and PSD2 contribute to the development of a banking ecosystem of different actors?
		What risk did this collaboration bring or what risk do you foresee rising?

12.2. Appendix 2 Codebook

#	Main Themes/Sub-Theme	Description
1	Status Quo before Collaboration	Examine the initial state of the market landscape, banks, and fintechs before open banking collaboration.
2	Drivers for Collaboration	Identify factors that drove the collaboration.
2.1	Access to Data	Understanding the motivation for collaboration driven by the desire to access banking data

2.2	Access to Regulatory Expertise	Understanding the motivation for collaboration driven by gaining knowledge and expertise related to complex regulatory requirements and compliance.
2.3	Access to Modern Technologies	Understanding the motivation for collaboration driven by leveraging innovative technologies.
2.4	Convenience, Time & Cost Efficiency	Exploring how collaboration is driven by the banks' aim to improve internal processes, reduce operational costs, and save time
2.5	Retain Customers and Competition	Examining the reasons for collaboration to retain existing customers, attract new ones, and remain competitive.
2.6	Changes in Landscape	Understanding how changes in the banking landscape, including the introduction of PSD2 and the rise of open API technologies motivate collaboration between traditional banks and fintechs.
2.7	Responses to the Collaboration	Analyzing the various ways banks and fintechs respond to the collaboration.
3	Fears and Concerns	Understanding the fears and concerns during open banking collaboration between banks and fintechs.
3.1	Security	Investigating the worries related to data breaches, unauthorized access, and cybersecurity vulnerabilities that may emerge as a result of data sharing and collaboration.
3.2	Liability	Analyzing the concerns surrounding legal responsibility, and accountability for both banks and fintechs when engaging in open banking partnerships.
3.3	Consumers' Concerns	Exploring the fears and reservations related to consumers during open banking collaborations.
4	Challenges and Conflicts	Identifying the obstacles and clashes encountered during open banking collaborations between banks and fintechs.
4.1	API Development, Integration & Communication	Examining the difficulties related to developing and integrating, and APIs to enable seamless data sharing and the communication challenges between

		banks and fintechs with data sharing.
4.2	Shifting Mindsets	Investigating the different cultures between banks and fintechs and that challenges their communication.
4.3	Complexity of Banking Systems & Compliance	Examine the challenge fintech faces in navigating the complex banking systems when collaborating with banks and the compliance challenges.
5	Opportunities	Exploring the potential advantages and positive aspects of open banking collaborations between banks and fintechs.
5.1	Developing Ecosystem	Investigating how open banking collaboration strengthens and promotes the growth of a collaborative ecosystem.
5.2	Automation & Connectivity	Examining the possibilities of automating banking processes and enhancing data connectivity between banks and fintechs, leading to improved efficiency.
5.3	Technical Opportunities	Identifying the technical advancements that arise from open banking collaborations.
5.4	Consumers Benefits	Understanding the benefits that consumers gain from open banking.
6	Risks	Potential negative consequences in open banking collaborations.