

# LUISS



**Department of Business and Management**

**Chair of Organizational Design**

## **“Consumers’ Trust Perception towards Open Banking Initiatives: A Quantitative Study on Personal Financial Services in Italy”**

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## Introduction

The introduction of the Open Banking model, facilitated by the entry of the European Payment Service Directive 2 (PSD2), and the gradual evolution of technology are pushing intermediaries to adopt new solutions; this wave of innovation expands revenue opportunities but at the same time increases the spectrum of risks (e.g., fraud, threats to security and personal data protection, operational and strategic risks).

The rise of technology-driven finance is fundamentally altering customers' habits and expectations. With the proliferation of digital channels and innovative fintech solutions, customers now demand seamless, personalized, and accessible banking experiences. This shift underscores the importance for banks to prioritize enhanced customer experience and adapt to changing consumer preferences.

Secondly, the emergence of fintech players represents a significant disruption in the financial services environment. Fintechs, with their digital-first approach and unbundling of traditional offerings, are rapidly gaining market share and challenging incumbent banks. The question arises whether it is more advantageous for banks to collaborate or compete with fintechs, as strategic partnerships can unlock synergies, while competition drives innovation. Specifically, the payment landscape is undergoing a major transformation, driven by advancements in technology and changing consumer behavior. As digital payments become increasingly prevalent, financial institutions will innovate to meet evolving customer needs and preferences.

As a consequence, the digital challenge for the banking landscape extends beyond customer experience to include trust in online banking. Building trust in digital solutions is paramount, particularly in the context of open banking where data access and security are critical concerns for customers. Additionally, banks are investing in talent acquisition and skills development to remain competitive in the rapidly evolving digital landscape.

The regulatory framework of open banking, governed by PSD2, introduces a new paradigm where financial institutions facilitate the secure transfer of customer data across the ecosystem. APIs play a central role in enabling data sharing and fostering collaboration between banks and third-party providers. Strategic competitive behavior in the open banking market necessitates banks to forge partnerships with various stakeholders to leverage complementary strengths and drive innovation.

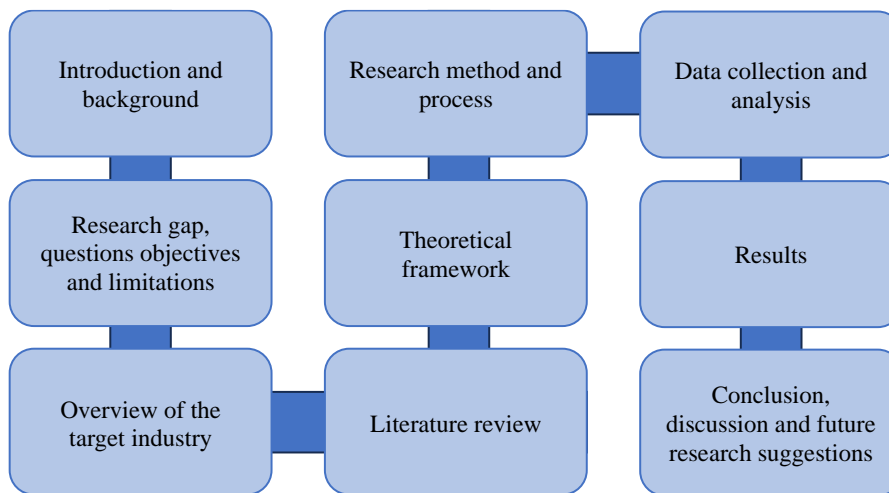
Previous studies have explored the technical and regulatory aspects of open banking but have often overlooked the specific relationship between the degree of openness adopted by banks and the level of trust consumers place in these institutions and the services they offer.

Accordingly, the first chapter digital aims to describe the most recent trends leading organizational changes, with a particular focus in technological advancements for financial services and the rise of new critical players in this ecosystem.

The second chapter presents a discussion above the digital challenges for the banking landscape; the open banking paradigm is introduced, explaining how banking operations are changing in the digital ecosystem. For the purpose of this study the evolution of data access modes is also described.

The third chapter analyses the methodologies and results of the research conducted on the model of online trust applied to the specific case of digital financial services offered by banks in relation to their position in the open banking ecosystem.

Figure 1 shows the logical construct that has been followed in writing this dissertation.



*Figure 1: Construct of this dissertation*

# Chapter 1

## 1.1. Digital Trends Leading Organizational Changes

### 1.1.1. Organizing data-driven companies

We are living in a period where innovation is recognized as a key driver for profitability and long-term survival of companies (Tornjanski et al., 2015). Today's environment and highly competitive marketplace drives companies to invest in innovation. According to Lüftenegger & Angelov (2010) most companies are using innovation to sustain their business models. As a matter of fact, some of the largest companies by market capitalization in the world count on innovative efficient strategies. For instance, the central role of data in recent corporate successes is highlighted by companies like Facebook, Amazon, Netflix, and Google (collectively known as FANGs) and their sophisticated use of data to enhance operations.

In his popular essay, Andreessen (2011, p. 1) states “*traditional industries were predicted to be taken over by software companies*”. The business world initially overlooked this warning but later embraced the significance of digital data and smart algorithms. Before going deeper into the subject, it's necessary to emphasize the pivotal role of software and digital ecosystems, outlining the rapid advancements in information technologies<sup>1</sup>, including big data, cloud computing, machine learning, and social media. These technologies form the foundation for various inventions and are expected to be further amplified by emerging technologies like 5G, advanced AI, edge cloud, and quantum computing. What is hidden from our eyes is the impact that this takeover is having on the organizational side of the companies, that are constantly pushed to optimize structure and strategy these days by an enormous number of stimuli. Indeed, “*information technology has the power to enable dramatic organizational transformation and to make traditional forms obsolete*” (Boudreau et al., 1998, p. 123). On one hand, digitalization fundamentally changes managerial mindsets, emphasizing the centrality of digital data, analyses, and automation in company operations. On the other hand, the replacement of human expertise with digital data and automation results in significant shifts in management and organizational processes.

Academics are recognizing as best the non-hierarchical forms of organizations, such as teal, agile, cellular, lean, and conversational firms. “Flat” organizations have been studied for long, but they found new popularity in the increasingly strategic role that software and data play in

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<sup>1</sup> Information technology (IT) refers to the utilization of computer systems, software, networks, and electronic processes to gather, store, process, transmit and manage information.

corporations. Digital data and algorithms, gradually replacing some human processes, explain the decrease in need of managerial coordination and oversight. Managers are indeed motivated to look beyond bureaucratic and hierarchic organizations while software are designed to carry out tasks usually human-dependent. Data-driven companies as such are those defined by an information system that is designed for organizations that process high volumes of information and aim to increase the firm's information-processing capacity (Burton et al., 2011). This is the organizational approach to run firms with new managerial mindsets, where strategic priorities are subject to a high pace of change. The information system is designed assuming that information is codifiable, namely, that they can be converted into a format that can be stored, processed, and transmitted effectively within the system. Low tacit nature of information is the fundamental key to the functioning of various types of information systems, including computer software, databases, and communication networks.

Since the “digitalization” concept will often come up in this dissertation, I shall dive deeper into its relevance for the context. In the reference literature, digital transformation is a multifaceted term that has been explored extensively. While definitions vary, certain key characteristics are consistently highlighted. Firstly, digital transformation is driven by digital technology, which serves as both the catalyst and the primary tool for this process. Firms strategically leverage diverse digital technologies to adapt to market changes and enhance collaboration within value networks (Vial, 2019). Secondly, successful digital transformation involves a dual focus on optimization and disruption. Firms undergo comprehensive restructuring, encompassing organizational culture, strategies, processes, products, services, and business models. This transformation combines incremental improvements with revolutionary changes, transitioning from digitization and digitalization stages to data-driven digital enterprises (Appio et al., 2021). Thirdly, digital transformation necessitates both internal efficiency enhancements and external value creation. Internally, organizations streamline operations and reduce costs through the digitization of processes and organizational structures. Externally, they prioritize user experience, meet personalized needs, and innovate new value propositions, often leading to the exploration of novel ways to create and deliver value (Warner & Wäger, 2019).

To address the evolving landscape of digital transformation, scholars have introduced the concept of ambidextrous digital transformation. This framework comprises two dimensions: efficiency transformation and value transformation. Efficiency transformation focuses on internal processes, emphasizing refinement and efficiency. This dimension includes organizational digitalization, involving changes in structure, management, and culture, as well as process digitalization, which transforms operational aspects like production, R&D, marketing, and finance. Digital technologies enable the establishment of smart factories, precision marketing, and intelligent

responses to market dynamics. On the other hand, value transformation is externally oriented, focusing on innovation. It involves the digitalization of offerings, where digital technologies are integrated into existing products and services, leading to exploitative innovation, and strengthened value-added activities. Moreover, business model digitalization emphasizes the reconstruction of business models, including the creation of new value propositions and redefinition of value networks. This facet promotes multi-actor value co-creation and explores disruptive and explorative innovation to generate new forms of digital offerings (Zhu & Li, 2023). In essence, ambidextrous digital transformation underscores the importance of balancing short-term gains with long-term strategic goals. Firms must navigate the synergy and trade-offs between innovation and process change, ensuring adaptability and sustainability in the ever-changing digital landscape.

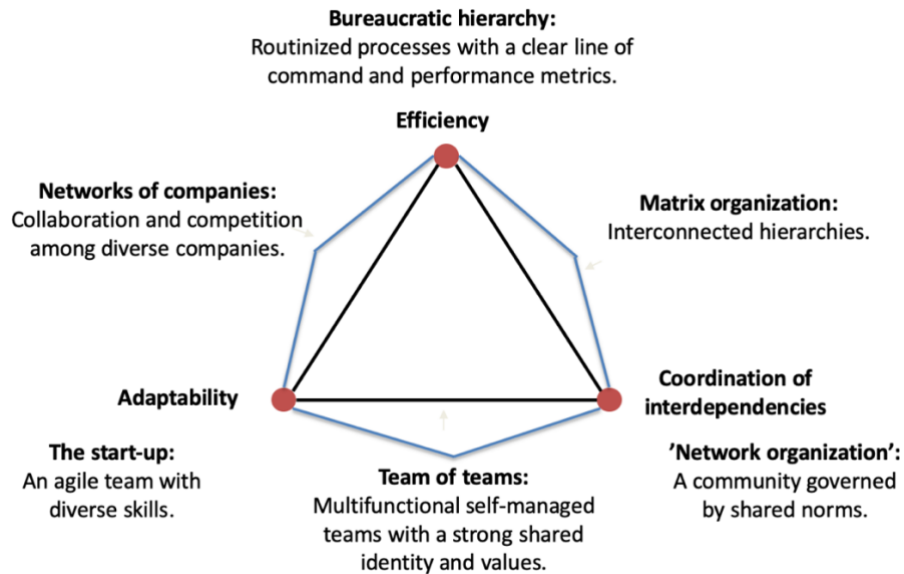
Digitalization has been at the center of everyone's economic development since the advancement in information technologies. This digital transformation is shaping how internal processes and external networks are managed, hosting a new bunch of demands for organizations. Managers have their focus driven by developing better and safer software while speeding up the decision-making and implementation, in other words becoming more "agile". This shifting paradigm requires a change in attitude, as well as a new management strategy that is more open, agile, collaborative and experimental (Verma et al., 2023). "Agility" entails the capacity for rapid adaptation and redirection within an organization. It prioritizes reducing handovers and bureaucratic processes, empowering individuals, and fostering comprehensive professional development among all staff members. Embracing agility goes beyond isolated changes within specific departments but hinges on the adherence to the 'end-to-end principle' and the collaboration within multidisciplinary teams, or squads. These squads consist of diverse professionals such as marketing experts, product specialists, user-experience designers, data analysts, and IT engineers, all focused on addressing client needs and united by a shared definition of success.

Traditional vertical organizations, once comfortable with rigidity, are now considered too slow to adapt to turbulent environment. Speed is required when the need to develop new ideas and the chance to bring them to the market arise. Large companies are indeed locked-in gigantic form of organizations with high degree of control on the whole supply chain, lacking where agility is required. The chance to be superior through scale-based efficiency is no longer a competitive advantage in every situation. Smaller companies that unlock digital-based practices are winning against the advantage of owning a physical infrastructure (Schildt, 2020). With automation taking the biggest piece of the cake, companies are heavily investing in software development and data management capabilities. Data flows enrich the creation of product and services powered by software by enabling constant exchanges of user experience through digital channels. Often, this may lead to the choice of increasing the number of in-house developers instead of out-sourcing projects, creating



the need for the management team to best combine them with the talented industry-specific experts (Schildt, 2020).

We have seen that companies are pushed to re-study and innovate their organizational structure, mostly driven by the increasing role of software and the need to respond quickly in an environment that is evolving rapidly. However, we must also specify what are the goals of new designs (Figure 2).



*Figure 2. Key objectives of organizing and the generic organizational forms. Source: (Schildt, 2020)*

The evolution of organizational structures, particularly in response to digitalization, involves a variety of approaches. Traditionally, bureaucratic hierarchies prioritized efficiency through specialization and routinization. However, these structures face limitations, especially when the demand for tasks changes. Start-ups, while adaptive, lack efficiency as they expand. Networked organizations, seen in industries like construction and entertainment, emphasize efficiency through competition but struggle with coordination.

While each of the three archetypal forms tries to score one of the strategic goals and lacks somewhere else, there are others that are designed to balance two or more objectives, increasing the chances to be successful. Matrix organizations, teams of teams, and ecosystems of companies are structures, though predating digitalization, commonly employed in digital strategies.

- The matrix organization, originating from the US space program in the 1960s, merges interrelated hierarchies based on functions or product lines, striking a balance between

efficiency and coordination. Despite its historical effectiveness, matrix structures struggle to adapt in turbulent environments due to complex hierarchies and rigid goals, often hindering quick responses to emerging opportunities.

- Networked organizations, prevalent in industries like construction and entertainment, achieve efficiency through competition among small firms and adaptability via distributed innovations and flexible partnerships. However, they excel in predictable industries with minimal capital investments and lack effective coordination mechanisms, making significant investments risky.
- The "team of teams" approach, popular in information technology companies, emphasizes adaptability and coordination by dividing tasks among autonomous multifunctional teams. This structure grants teams' autonomy in pursuing goals, enabling rapid experimentation. However, coordination across teams is challenging due to inherent social dynamics. To foster effective coordination, the idea of a superior "team of teams" places emphasis on extensive social networks that connect teams, allowing for a diversity of viewpoints and easing agreement.

Many established organizations employ hybrid organizational models, tailoring structures to their specific needs. For instance, some companies integrate agile teams for innovation with traditional hierarchical setups for core operations. However, managing interdependencies in such hybrid models requires careful attention, given the complexity of negotiations and collaboration between different organizational cultures and processes.

Certain organizations isolate agile structures from traditional hierarchies, granting autonomy while limiting genuine coordination. A concrete example of this hybrid approach can be seen in a major European bank, where agile structures handle the development of new applications and software-driven processes. Subsequently, these innovations are managed by conventional hierarchical business units. While this division of labor eases adaptability during development, it can lead to a lack of ownership and hinder the optimization of digital services when development and operation are separated. Overall, organizations navigate complex challenges by adopting hybrid approaches, integrating various structures tailored to their specific contexts and requirements.

### **1.1.2. Organizing beyond the firm: ecosystems and platforms**

This paragraph will discuss the broader context of ecosystems and platforms into which corporations organize their activities, and how data and digital practices affect inter-organizational networks.

In the last decades the need to own physical infrastructure and assets has been decreased by information technologies. Digital technologies, platforms, and infrastructures persist in offering chances for the establishment of fresh businesses and the growth of existing organizations, enabling them to shift from traditional offline operations to online environments (Verma et al., 2023). Digitalization has also revolutionized how businesses collaborate and interact beyond their internal structures. In the past, external collaborations relied on social bonds, trust, and geographic proximity, often involving complex organizational routines across firm boundaries. However, the rise of modular structures and digital interfaces within companies has enabled seamless coordination of services between firms through software. This transformation is characterized by two key concepts: ecosystems and platforms.

In the context of business, ecosystems are linked networks of enterprises (and occasionally non-commercial organizations, such as governments) that collaborate and exchange benefits with one another. Ecosystems contain collaborative interactions without explicit market transactions or central control, in contrast to typical hierarchical or market-based exchanges; all the organizations contribute to the overall consumer experience without engaging in direct commercial transactions.

Platforms instead serve as the technical backbone that facilitates data flow within companies, as well as their products and services. Digital platforms underpin the functioning of digital ecosystems. They can be categorized into transaction platforms, such as eBay and Airbnb, which connect buyers and sellers, and innovation platforms, like the Windows operating system, enabling various actors to develop and distribute business processes, services, or resources. Hybrid platforms, like Apple's iOS and Google's Android, combine innovation capabilities with matchmaking services for sellers and buyers through app stores.

Companies have the opportunity to transform their digital products into platforms by creating modular interfaces for external connections. For instance, SAP, a software company, evolved its corporate software suite into an open innovation platform. This transformation allowed other companies to develop specialized applications utilizing customer data stored in SAP and leveraging some of SAP's computing capabilities (*Innovazione e ricerca | Informazioni su SAP SE*, n.d.). Converting products into expandable platforms forms the foundation for the emergence of business ecosystems, characterized by interconnected goods and services that complement each other.

These days, our digital economy is driven by demand-side economies of scale, also known as network effects (Van Alstyne & Parker, 2017). They occur by value-adding between consumers and are improved by demand aggregation, app development, social networking efficiency-boosting technology, and other network-expanding endeavors. Businesses in the online economy can provide a better average value per transaction when they outperform rivals in volume by drawing in more

platform users: platforms have turned the traditional logic of success inside-out, establishing new rules for players. Platforms derive their value from their network of producers and consumers, prioritizing resource orchestration over control and emphasizing interactions and relationships over internal optimization (Van Alstyne & Parker, 2017). Successful platforms aim to enhance the overall system value through a circular, feedback-driven process. Platforms share a common structure with four key roles: owners control intellectual property and governance, providers interface with users, producers create offerings, and consumers use these offerings. Roles can shift rapidly, with users becoming providers and vice versa. Platform strategy hinges on understanding relationships within and outside the platform ecosystem.

Key success factors include:

- Defining the right level of openness: platforms developers must choose how to balance the most efficient number of participants with the value that each of them can bring.
- Launching small with high-value interactions: manager must understand which side of the market has to be emphasized and when, considering that both consumers and producers could be called in action.
- Focusing on critical mass and quality before monetization: other metrics rather than financial measures are to be considered in order to assess success and potential of the platform.
- Creating and fairly sharing value among all participants, including consumers, producers, and the platform itself: successful platforms prioritize building a network of engaged participants and valuable interactions, ensuring fair value distribution to sustain long-term growth.

## **1.2. Technological Advancements for financial services**

Technological advancements are not new in finance, but recently have brought improvements in connectivity of systems, computing power, and availability of vast and actionable datasets. These changes have led to significant reductions in transaction costs and have paved the way for the emergence of new business models and players in the financial landscape.

The extreme wave of digitalization has caused a significant disruption in the financial services sector. A number of technical developments have surfaced, influencing how financial institutions function, engage with consumers, and handle data. These developments have increased productivity, decreased costs, and stimulated the development of fresh products and business strategies. The main technological developments are as follows:

- **Blockchain Technology:** Blockchain, a tamper-proof and decentralized ledger, has revolutionized transactions and helped cryptocurrencies like Bitcoin come into existence. Blockchain is utilized for safe, transparent, and effective record-keeping in a variety of financial activities, including cross-border payments, smart contracts, and trade finance, so its influence goes beyond digital currencies.
- **Artificial Intelligence (AI) and Machine Learning:** these algorithms examine enormous databases in order to find patterns, forecast market trends, and evaluate credit risks. Virtual assistants and chatbots powered by AI improve customer service by offering quick responses and tailored recommendations. The optimization of investment portfolios, algorithmic trading, and fraud detection all rely heavily on machine learning models.
- **Big Data Analytics:** The accessibility of big data enables financial organizations to learn a great deal about the habits, tastes, and market trends of their clients. The analysis of this data aids in the development of specialized financial solutions, the planning of focused marketing campaigns, and the comprehension of consumer sentiment. Real-time analysis of market volatility provided by big data analytics is crucial for risk management.
- **APIs and Open Banking:** Through the use of Application Programming Interfaces (APIs), open banking efforts enable the safe exchange of financial data between banks and outside service providers. Fintech services and apps that provide customers with a comprehensive view of their financial accounts, encourage financial literacy, and facilitate frictionless fund transfers across various institutions have been created as a result of this innovation.
- **Robotic Process Automation (RPA):** this business process automates routine operations and procedures, cutting down on operational costs and error-prone work. RPA is used in the financial services industry in processes like client onboarding, compliance checks, and back-office operations. Employees can concentrate on higher-value activities by automating menial jobs, increasing total productivity.
- **Mobile Payments and Digital Wallets:** The widespread use of mobile payment systems and digital wallets has been made possible by the rise of smartphones. Consumers may manage their funds, invest, and complete safe transactions all from their mobile devices thanks to this technology.
- **Innovations in Cybersecurity:** As the volume of digital transactions rises, so do cybersecurity dangers. Financial institutions have made investments in cutting-edge cybersecurity tools including behavioral analytics, biometric authentication, and encryption. These technological advancements protect customer information, stop fraud, and guarantee the reliability of financial transactions.

In conclusion all these progresses have enabled the creation of huge quantities of capturable data, new instruments for analyzing those data and new business model built around the analysis'

conclusion. Data can be arranged, verified, and analyzed thanks to storage and processing power, even when using computationally demanding methods like artificial intelligence (AI) and machine learning on enormous amounts of data. Big Data is therefore defined as digitally "native" data that has a large volume, variety, velocity, and veracity (Feyen et al., 2021).

### **1.3. Consequences for Financial Services**

#### **1.3.1. Globalization and Market Integration**

A general agreement in literature is that globalization helps countries and institutions to be more integrated into the international environment, increasing people interactions and information exchanges. Authors assume that greater transnationality improves a firm's performance (C.-C. Lee & Lin, 2016). Some studies (Tallman, 1996) states the existence of a linear relationship between internationalization and performance, while Ruigrok & Wagner (2003) theorize the evidence of a U-shaped relationship, where firms initially experience a negative performance when expanding, but then eventually learn how to coexist in the international environment and gain positive performance.

The digital transformation combined with ongoing developments in the financial services sector has exponentially increased the degree of globalization and integration; it has therefore revolutionized the way financial services are accessed, delivered, and regulated on a global scale. This transformative process has profound implications for the financial industry, reshaping cross-border transactions, regulatory frameworks, customer experiences, and innovation.

- **Cross-border transactions and investments:** Digital platforms have democratized access to international financial markets, allowing investors and institutions to engage in cross-border transactions seamlessly. Global trading platforms enable continuous trading, fostering international capital flows and encouraging diverse investment opportunities. As a result, individuals and businesses can participate in markets worldwide, enhancing portfolio diversification and investment strategies.
- **International Banking and Cross-Border Services:** Digital banking services have transcended geographical boundaries, enabling customers to access their accounts, make payments, and manage finances from anywhere. Mobile banking, digital wallets, and peer-to-peer lending platforms have facilitated financial inclusion, empowering unbanked and underbanked individuals globally. Microfinance initiatives, enabled by digital platforms, provide small-scale entrepreneurs with access to international funding, driving economic development in remote regions. These innovations have reduced costs and transaction times, promoting financial inclusion and economic growth across countries.

- **Regulatory Harmonization and Standardization:** Globalization has encouraged regulatory collaboration, leading to standardized frameworks in areas such as anti-money laundering (AML) and know your customer (KYC) regulations. Regulatory authorities across countries work together to create consistent guidelines, fostering trust and transparency in international financial transactions. Open banking initiatives, supported by standardized application programming interfaces (APIs), facilitate secure data sharing, promoting innovation and customer-centric services.
- **Innovation and collaboration:** Globalization has created a collaborative ecosystem where financial institutions, Fintech startups, and technology companies collaborate across borders. International partnerships foster innovation in areas such as blockchain, artificial intelligence, and payment technologies. A diverse global talent pool contributes to the development of cutting-edge solutions, ensuring the financial industry remains at the forefront of technological advancement.

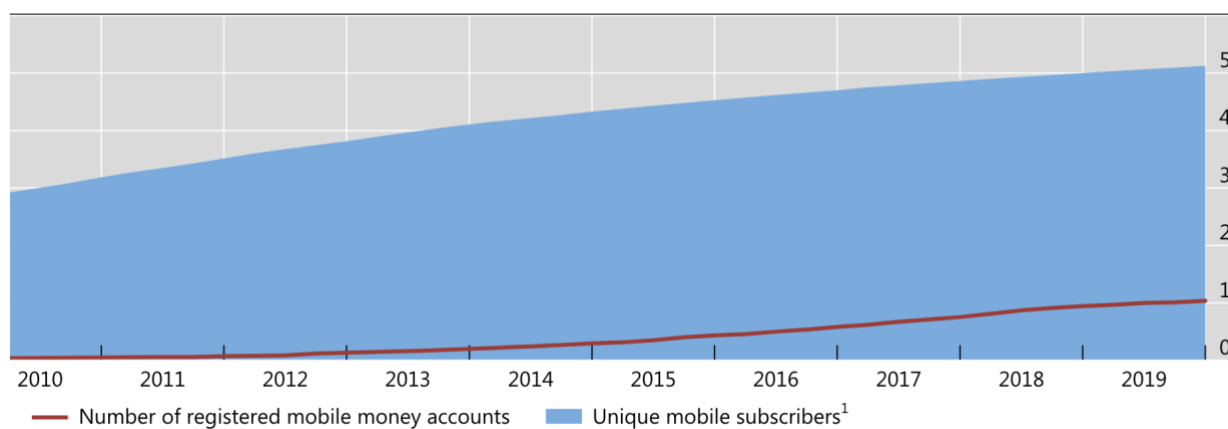
Despite the benefits, globalization poses challenges, particularly in cybersecurity and regulatory disparities. The interconnected nature of financial systems demands robust cybersecurity measures to protect against cyber threats and safeguard sensitive financial data. Additionally, navigating diverse regulatory landscapes requires adaptability and compliance expertise to ensure seamless operations in different countries. We emphasize the need for financial institutions to adopt flexible, innovative, and secure digital strategies to thrive in this globally integrated landscape, ensuring seamless cross-border transactions, enhanced customer experiences, and sustainable growth.

### **1.3.2. Technology-driven Finance**

Considerable progress in technology has been made in some key areas that have supported the present trend of technology-driven finance:

- One of the key outcomes of this digital revolution is the enhanced connectivity of financial systems. Through the internet and advanced networking technologies, financial institutions can communicate, share data, and execute transactions in real-time, globally. The widespread use of mobile phones has substantially improved access to and the efficiency of direct delivery channels, promising cost-effective personalized financial services. Popular applications and services such as social media and social communication platforms have enabled more casual peer-to-peer interactions, increasingly utilized for economic transactions, further empowering companies providing these services. This seamless connectivity has not only expedited the speed of financial

transactions but has also facilitated the integration of various financial systems, making it easier for consumers to access services and products from different parts of the world (figure 3).



*Figure 3<sup>2</sup>: Mobile and mobile wallet growth worldwide. Source: GSMA Intelligence*

- Simultaneously, the exponential increase in computing power and the decrease in its cost have revolutionized data processing and analysis. Financial institutions can now handle massive datasets and employ sophisticated algorithms to extract meaningful insights. This has not only improved risk assessment and fraud detection but has also enabled the customization of financial products and services based on individual customer needs and behaviors.
- Additionally, the availability of new and usable data has been a game-changer. The rise of big data analytics allows financial institutions to gain profound insights into customer behavior, market trends, and economic indicators. This information is invaluable for making informed decisions, designing tailored financial products, and predicting market movements.

Advancements in technology have introduced new business models, notably cloud-based computing, enabling seamless connections to externally managed data centers with affordable computing power. This has lowered entry barriers for financial service providers. Cloud adoption has surged, with evidence indicating accelerated growth during the COVID-19 pandemic (Feyen et al., 2021). Additionally, platform-based business models have become prevalent, with Fintechs, big tech companies, and some incumbents acting as intermediaries, connecting users and providers on their platforms. These platforms benefit from network effects, creating more value for participants as users as the numbers increase. This trend has led to the rise of "super apps" like WeChat and AliPay. Big tech companies leverage large customer bases and big data for financial services integration through the use of digital channels and application programming interfaces (API), embedding payments and

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<sup>2</sup> Defined by GSMA Intelligence as individual person that can account for multiple 'mobile connections' (ie SIM cards)



loans into non-financial services like e-commerce. However, the concentration of users on these platforms raises concerns about market dominance and potential anti-competitive practices. Multi-sided markets, with complex pricing structures, further complicate competition analysis in this context.

### **1.3.3. Key economic frictions**

The advancements in connectivity and computing decrease transactions costs between financial services providers and customers. All the incumbents of this sector leverage these technologies to manage economic frictions, such as alleviating asymmetric information and cutting costs.

Classic literature (Holmstrom & Tirole, 1997) about theories of intermediation tells how banks use information asymmetries between borrower and lender. Moreover, better knowledge, that comes from utilizing consumer data and analytics, may benefit risk assessment and lessen the requirement for collaterals as a lending creditworthiness indication (Gambacorta et al., 2020). Greater transparency would increase trust in customers, with intermediation between users and providers of finance becoming less necessary.

Increase use and availability of data and automation makes it possible to facilitate complex contracts and create more complete markets. Traditional banking systems work around standardized products without a consumer-centric approach to product development and marketing. More recently digital systems and automated processes made possible to find customized products and services that use smart contracts and innovative technologies.

The advancement of technology has significantly decreased the fixed and marginal costs associated with providing financial services. Traditional physical infrastructure, which used to drive fixed costs for financial services providers, has been replaced by digital solutions. Mobile money, especially notable in Emerging Market and Developing Economies (EMDEs), has reduced the need for traditional bank branches and payment acceptance infrastructure like point of sale (POS) terminals (see paragraph 1.5). Cloud-based infrastructure, including Banking-as-a-Service (BaaS), offers computing power, data storage, and compliance services without the need for extensive back-office infrastructure. Financial intermediaries leverage technology-enabled automation and data-driven processes, such as artificial intelligence, to reduce marginal costs. Digital innovation not only overcomes geographical barriers but also facilitates embedding tailored financial products into non-financial activities, significantly lowering customer acquisition costs and risks (Feyen et al., 2021).

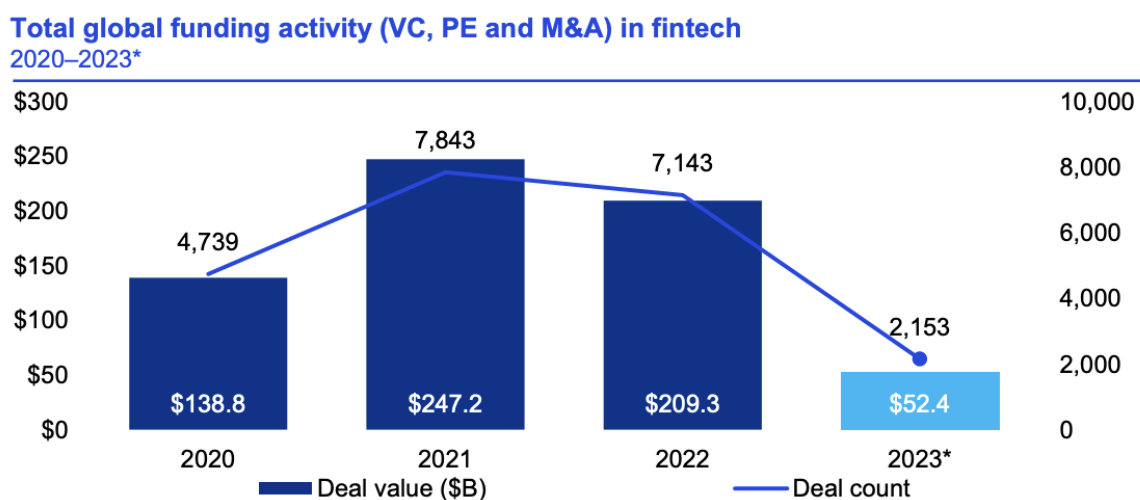
Latest developments in the financial services industry, such as improved connectivity, standardized protocols, and open banking practices have also significantly reduced search and switching costs for consumers. They enable consumers to easily find and use financial services globally, similar to finding services locally. This enhanced accessibility benefits both consumers and providers, allowing for the expansion of services on a global scale. Reduced search and switching costs empower consumers to choose services tailored to their needs, fostering competition and innovation in the market. Ultimately, these developments might lead to direct connections between borrowers and lenders, once again eliminating the need for intermediaries, and enhancing consumer choice and market competitiveness.

A significant consequence of these technological advancements is the disaggregation of financial services. Traditionally, financial services were bundled and offered by large, comprehensive institutions. However, the digital era has seen the rise of specialized players who focus on specific aspects of financial services, such as peer-to-peer lending platforms, robo-advisors, and mobile payment solutions. These specialized players have unbundled financial services, offering targeted and niche solutions to consumers. This unbundling has empowered consumers by providing them with the flexibility to assemble their preferred suites of financial products. For instance, a consumer can choose a banking service from one provider, investment advice from another, and insurance coverage from yet another, all based on their specific requirements and preferences. This phenomenon is often referred to as the "democratization of finance," where individuals have greater control and choice over their financial portfolios (Yáñez-Valdés & Guerrero, 2023). In conclusion, the digital innovation in finance has not only reduced transaction costs and improved efficiency but has also democratized financial services. The disaggregation of financial services, coupled with the availability of vast and actionable data, has empowered consumers, and fostered the emergence of innovative business models.

#### **1.4. Rise of Fintech Ecosystem**

Financial technology companies are a latest hot development in the financial industry. According to KPMG (2023), global funding in Fintech companies reached \$52.4 billion across 2,153 deals in H2 23' (Figure 4). The recent downward trend is explained by timing; profitability remains the top priority for investors but now we don't see major fundings in uncertain profitable companies. The beginning of the decade has shown a boom in Fintech's financing, with London being the hot spot. The volume of Fintech deals in the region has tripled since 2011 and accounted for more than half of all European activity (Julian Skan et al., 2014). Now Fintech investors are looking for

businesses that can show faster routes to profitability, a solid understanding of unit economics, and increase in top-line revenue.



*Figure 4: Total global funding activity (VC, PE, and M&A) in fintech. Source: ('Pulse of Fintech H1 '23', 2023)*

Fintech companies typically target specific areas within the financial institutions' value chain, aiming to offer services that reduce the reliance on traditional banks for clients, as noted by Kotarba (2016). According to Ahmed (2015), Fintech companies are agile entities focusing on specific aspects of a bank's business model, while Arner, Burberis and Buckley (2015) define Fintech as the application of technology to deliver financial services. Additionally, PwC (2017, p. 3) in *Redrawing the Lines: Fintech's Growing Influence on Financial Services* describes Fintech as “the evolving intersection of financial services and technology, which now encompasses any innovation in the financial services sector”. Lastly, Leong (2018, p. 77) defines Fintech as “any innovative ideas that improve financial service processes by proposing technology solutions according to different business situations, while the ideas could also lead to new business models or even new businesses”. The main point arising from these attempts to define Fintech is that cloud computing, faster access to processing power, and data servers have all made it simpler for small, innovative tech startups to promptly translate their ideas into products that can be sold. These disrupting startups share some of the following features.

Many Fintech banks are built from the ground to be digital-first, allowing them to offer a seamless and convenient banking experience through mobile apps and online platforms. By doing so, these firms have lowered overhead costs compared to traditional banks with majority of physical branches. With no need to maintain costly branch networks, they can pass the cost savings to customers in the form of better interest rates, lower fees, and customized services. *N26*, the German bank who operates online only, has managed to offer competitive banking services with low fees and

attractive perks, such as no foreign transaction fees for international travelers. Overall, these banks leverage data analytics and AI to provide more tailored financial services, like insights into customers' spending habits and budgeting tools. Fintech banks also have agile organizational structures that adapt quickly to changing market conditions, prioritizing innovations and less burdened by legacy systems. In terms of regulations and compliance, many of them have obtained banking licenses or partnered with traditional banks to provide regulated financial services. *Varo Banks* has been one of the first in the US Fintech environment to receive a national banking charter in 2020, representing the new generation of banks built on technology.

Fintech banks are thus conquering the financial industry due to their digital-first approach, cost-efficiency, personalization, ecosystem-building strategies, agile organizational structures, and regulatory compliance efforts. These factors have enabled them to attract a growing customer base and offer innovative financial solutions that resonate with the evolving needs of consumers (Figure 5).

Categories	Services
Money transfer and payments	Online foreign exchange
	Overseas remittances
	Digital-only branchless banking
	Peer-to-peer payments and non-bank money transfers
	In-store mobile phone payments
	Cryptocurrency eWallet
Budgeting and financial planning	Online budgeting and financial planning tools
	Online retirement and pensions management tools
Savings and investments	Lending on peer-to-peer platforms
	Investments via crowdfunding platforms
	Online investment advice and investment management
	Online stock broking
	Online spreadbetting
Borrowing	Online-only loan providers
	Online marketplaces and aggregators for loans
	Online loan brokers and broker facilitation websites
Insurance	Insurance premium comparison sites
	Insurance-linked smart devices
	App-only insurance

Propositions disrupted by FinTech challengers
  Propositions invented by FinTech challengers

**Figure 5:** List of individual Fintech services. Source: EY (2019)

After initially disrupting the financial services industry by unbundling traditional offerings, many Fintech companies have reversed course and started to bundle their services once again (Feyen et al., 2021). This means they are adding new products to their portfolios, either by developing them internally or through collaborations and platform strategies. This approach enables them to upsell to their existing customer base and become more appealing to new customers. Several examples of this

trend can be observed in Figure 6. For some Fintechs this shift is driven by the opportunity to enhance customer experience and boost revenue. For others, it's a necessary step for survival. Because achieving economies of scale and scope is still crucial, FinTech companies that initially focused on a limited range of products might struggle to merge funding synergies or spread out customer acquisition costs, regulatory compliance expenses, and investments in brand recognition across a large enough revenue base to generate profits or compete effectively on pricing with established incumbents.

It's interesting to observe how these recently packaged product sets develop. In contrast to traditional banks, which collected their product lines over decades up to today, modern startups are developing services suited to specific consumer categories. These are more likely to generate distinct product sets based on high-quality data on market demands and customer profitability. Newcomers initially avoided highly regulated financial industries that required substantial capital, permits, and compliance with regulatory requirements. As an alternative, they concentrated on less regulated fields including cards, payments, and financial advisory. Regulation gaps allowed new competitors to emerge and operate with few regulatory restraints, facilitating this strategic decision in many industries. Fintech tactics did, however, change as authorities caught up. Fintechs' operating environment changed when they were required to seek licenses in certain jurisdictions. Certain Fintech companies have voluntarily adopted regulated status as a component of their changing product plans; for example, alternative finance platforms avoided the regulatory complications of intermediation at first, focusing instead on linking capital supply and demand. Nevertheless, some Fintechs have pursued full banking licenses while combining services. Those that relied only on a peer-to-peer funding model or financed their operations in wholesale markets faced challenges, particularly lending platforms. As a result, companies have either obtained banking licenses themselves or have grown increasingly reliant on finance from well-established financial organizations. Examples are Stripe and Tradeshift, who have partnered with banks (MoneyTap also holds a non-bank financial company license), and Revolut and N26, which have applied for banking licenses. On the other hand, some Fintech companies choose to grow globally in order to get traction for their current product lines while avoiding increased regulatory requirements.

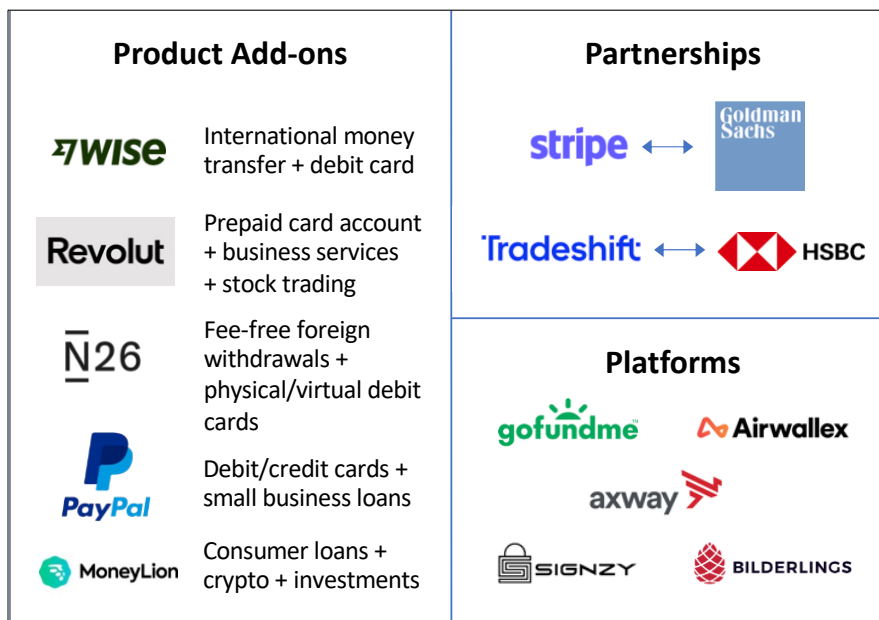


Figure 6. Fintech product offerings have expanded with time (personal elaboration)

## 1.5. The Payment Landscape

Financial institutions have witnessed these newcomer firms in the fast-paced environment challenging their market dominance in several of the key sectors. The payment industry is one of those most impacted by a radical transformation, as non-bank innovators are redefining how consumers send and receive (immediate) payments for products and services. Moreover, it is exceptional that digital payments contributed for 70 per cent of the global Fintech transaction value in 2022 (Statista, 2022). The trend shown in Figure 7 is forecasted to be confirmed in the upcoming years, with digital payments expected to have a leading role in Fintech growth (Omarini, 2018b). Once again, we see that the Fintech ecosystem may become increasingly important in driving the innovation across the financial services industry.

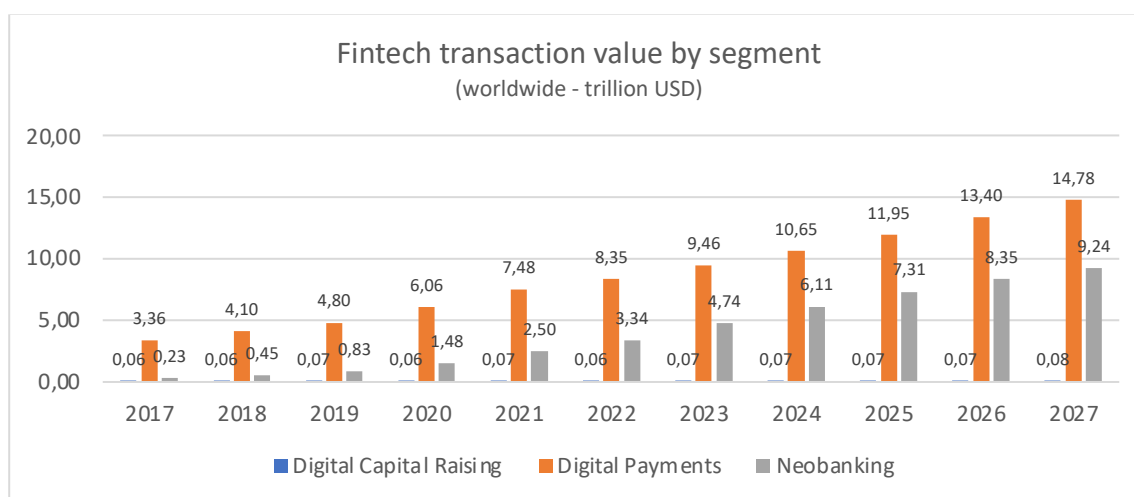


Figure 7. Fintech transaction value by segment. Source: Statista.com

The payment industry has experienced diverse and transformation phases in the last decades. First, credit cards entered the market in the 50's, signing the birth of electronic payments. The Barclays Bank has been the first to introduce an Automated Teller Machine (ATM) in UK in the 60's. This banking infrastructure was recognized as a revolutionary technology application that permitted banks to operate with economic savings over human labor. The 70's marked the birth of the Society for Worldwide International Financial Telecommunication (SWIFT), created to manage the international financial transactions. The financial industry was computerized in the 80's, with many of the major banks around the worlds introducing the online and home banking. But Internet Banking became a thing with the diffusion and increasing use of internet in developed countries in the 90's. Then, online banking quickly became a preferred option for many users due to its convenience.

This paragraph will be focused on the latest evolution in the field of payments, that is mobile payment transactions (between merchants and end-consumers). According to Statista.com, this market is projected to reach US\$3.30tn in 2023 and has high growth potential over the upcoming years. A mobile payment is defined as “*any payment in which a mobile device is used to initiate, authorize and confirm a commercial transaction*” (Laksamana et al., 2023, p. 1703).

Given that mobile payments rely on non-cash methods like cards, bank transfers, direct debits, and checks, it is relevant that cashless payments are experiencing robust double-digit growths, particularly in regions such as China and Northern Europe. Despite notable geographical variations, the increasing prevalence of cashless transactions suggests a gradual transition towards a cashless society. User acceptance though is a pivotal aspect influencing the diffusion of mobile payments, with factors like perceived security and convenience playing significant roles. The growing cashless payments market indicates a societal readiness for innovative solutions, marking a notable shift away from the centuries-long dominance of cash in the economy. Thus, the combination of mobile services and cashless payments has given rise to mobile payments. These can be classified as follows:

- Mobile remote payment: this service is used in transactions, such as e-commerce and m-commerce, to pay for goods or services independently from the mobile phone's location.
- Mobile proximity payment: this service is replacing contactless cards and allows in-store (proximity) payments through the use of the smartphone.
- Mobile P2P (Person to Person) or P2B (Person to Business): this service enables money transfer between two users, either from one's bank account or from a prepaid in-app account.

According to Ernst & Young (2019, p. 5), “*three out of four global consumers use a money transfer and payments service*”. There have been a few reasons why this market has caught on so quickly. Deloitte (2015) highlights three closely linked disruptive factors that contributed to the growth of the payment market, such as technology-enabled innovations, regulatory interventions and shift in consumers’ preferences.

Firstly, technological advancements played a pivotal role, with the widespread adoption of smartphones driving the mobile revolution. Features like Near-Field-Communication (NFC)<sup>3</sup> facilitate in-store payments, because “*NFC is a communication protocol that enables contactless payments by establishing wireless communication between two technical devices, for instance between a mobile phone and a point of sales (POS) terminal, by tapping the mobile device in proximity of the POS terminal*” (Pham & Ho, 2015, p. 160). Open Application Programming Interfaces (APIs) are considered essential for the future development of banking and payment system, with their ability to enhance communication between systems, enabling seamless integration of services.

Secondly, regulatory intervention is a significant force, as seen through initiatives like SEPA and ISO 20022, aiming to standardize electronic payments. The more recent PSD2 takes this a step further, breaking down entry barriers for new players and fostering competition in the European payments market.

Lastly, changing consumer preferences, fueled by widespread internet use, especially on mobile devices, are reshaping expectations. Consumers now seek efficient, real-time, integrated, user-friendly, personalized, and intuitive payment services. This shift in preferences reflects a dynamic landscape in the payments industry, mostly driven by non-bank digital entrants that use superior design and customized interfaces, outperforming the incumbents.

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<sup>3</sup> NFC has several other advantages: scope and availability, wide range of applications, easiness of use, list of value-added services and security guarantee.



## Chapter 2

Throughout the history of financial intermediation, banking has played a central role in progressive societies, symbolizing economic, financial, societal, and cultural advancement. Over time, banking has transformed in response to various economic factors, with its origins often linked to imperfections in capital markets and trade. Economists and finance theorists point to these imperfections, characterized by higher transaction costs and asymmetric information, as fundamental reasons for the emergence and growing significance of financial institutions (Murinde et al., 2022). These factors have driven the evolution of banking and continue to shape the importance of financial institutions in modern economies.

Lee & Shin (2018) outline the primary challenges that banks are likely to confront in the upcoming years, each posing distinctive challenges for the industry:

- (a) *Strategic Investment Decisions*: Banks face a critical decision regarding the management of investments and partnerships, particularly in the realm of Fintech. The dilemma involves choosing between internal investment in Fintech projects, competing with nimble start-ups, or opting for direct investments in these Fintech start-ups (see paragraph 2.3.1). The strategic choice between internal development and external partnerships will shape a bank's technological trajectory, determining whether it can stay at the forefront of innovation without necessitating a complete internal overhaul.
- (b) *Evolution of Customer Management*: The landscape of customer management is fundamentally changing, with customers increasingly adopting digital channels and becoming more discerning in their expectations. Banks must navigate the challenge of meeting these evolving demands, ensuring seamless and responsive digital experiences that align with the preferences of a digitally-oriented clientele.
- (c) *Regulatory Management Challenges*: Regulatory compliance represents a significant challenge for traditional financial institutions. Navigating complex and evolving regulations can be both intricate and costly. Striking a balance between adherence to regulatory frameworks and fostering innovation is a delicate task, requiring banks to invest in compliance measures while maintaining agility in adapting to regulatory changes.
- (d) *Integration with Legacy Systems*: Technological integration with existing legacy banking systems presents a substantial hurdle. Ensuring a cohesive and unified customer experience across various channels demands the seamless integration of new technologies with legacy systems. This challenge involves not only technological considerations but also strategic planning to enhance the overall efficiency and efficacy of banking operations.

(e) *Security and Data Management*: The rise of digital banking brings forth the challenge of safeguarding sensitive customer data. With an increasing reliance on digital platforms, banks must fortify their security measures to protect against cyber threats and unauthorized access. Effectively managing and securing customer data becomes imperative, requiring robust cybersecurity infrastructure and proactive measures to mitigate potential risks.

## 2.1. The digital challenge for the banking landscape

Banking institutions are rewarded for their position in processing information and calculating risk. That is, banks are an information business using cross-sectional and inter-temporal data to create value for their customers (Murinde et al., 2022). For example, before granting a loan the bank is required to ask for clients' information; even after the loan is performed the bank still collects information about the clientele. Innovations in information and communication technologies has altered the way information are processed and stored. Finance literature usually differentiates between *soft* and *hard information*. *Soft information* cannot be translated into numbers, further it needs a context to be understood and no separation from the environment where it was collected. *Hard information* is transmitted in impersonal ways, it is quantitative and easy to store. Latest technology developments are built to transmit and process this second type of information (Liberti & Petersen, 2019).

Banks are historically collecting mainly soft information based on relationship and contact frequency. However, the harder information become available the more banking institutions are changing sources when assessing clients' creditworthiness. For instance, Fintechs rely on this type of hard standardized information. Moreover, new technologies have made possible the "hardening" of some type of soft information, with the translation into codes. The result of this is a stronger customization of products and services, an efficient pricing and screening, and effective matching. On the other hand, the risk of discrimination, privacy invasion, identity theft and fraud increase. The processing of hard data has indeed significant legal and societal concerns including privacy, social mechanisms for reciprocal evaluation, and cyber danger. According to Navaretti et al. (2017, p. 20) "*the more information and data on the financial behavior of individuals become public, the lower barriers to entry, but also the more we move away from a society where screening occurs through direct economic and social interactions*".

On this wave, the rationale of embracing more digital experiences from traditional banks' perspective is twofold. On the one hand, digitalization can be a powerful solution to efficiency and cost reduction problems; on the other hand, the general shift to e-banking, mBanking and other

digital services is making new players, that are tech-savvy and don't have to handle with physical infrastructure – such as Fintechs –, more competitive.

Therefore, digital transformation has become imperative for banks to stay competitive in the evolving financial landscape. This involves a holistic shift towards digital technologies, encompassing various aspects. Previous literature calls the attention towards three key points to be addressed for an efficient digital transformation: degree of openness, collaboration, and investment.

In the first case, the term is used to explain the process that big companies undertake in order to outsource technological solutions (Stefanelli & Manta, 2023). Large financial organizations are increasingly recognizing the value of external technological solutions, especially those offered by fintech companies. These solutions often bring innovation, agility, and customer-centric features that traditional banking systems may lack. This involves integrating external systems with the core banking business through Application Programming Interfaces (APIs). By employing APIs, banks can securely and efficiently connect with external services, creating a more flexible and responsive ecosystem.

Continuing with the analysis of the literature, according to Gulamhuseinwala, Loyds, and Hatch (2017, p. 10) *“the success of commercial partnerships relies on effective collaboration and strategic alignment between financial institutions and external actors”*. It involves mutually beneficial arrangements where both parties can leverage each other's strengths. Simplifying internal processes is a key recommendation for leading organizations. This involves streamlining operations, reducing bureaucracy, and creating a more agile structure to adapt to the dynamic nature of the financial landscape. The emphasis on the usage of external utilities, platforms, and micro-services reflects a shift toward a modular and scalable approach, allowing institutions to build on existing capabilities rather than reinventing the wheel.

Lastly, a study by (Nazaritehrani & Mashali, 2020) reinforces the business case for embracing e-banking channels. The positive correlation between the use of electronic banking channels and both profit growth and market share suggests that investments in digital technologies can directly impact the financial success of banks. The findings underscore the importance of a strategic approach to digital transformation, where the adoption of e-banking channels is not merely a technological upgrade but a driver of business growth and competitiveness.

### 2.1.2. Enhanced Customer Experience

A turning point in the discussion is how digitalization of financial services and the online economy have influenced the way people manage their money and interact with banks. The future of retail banking lies in the needs of their customers, which are going through important changes (Omarini, 2018a). Banks have lost focus on customer-centricity with time, but they are now awakening with other businesses sizing up potential gaps in the market, with a major interest in specific banking activities. Omarini (2018a, p. 24) points out *“how the real challenge is going to be to keep the entire “customer game” inside the retail bank”*. This will eventually be possible under certain conditions.

The first contact between a bank and its clientele is more and more automated, with “digital onboarding” becoming a crucial step. With this term we allude to the process that allows a lead<sup>4</sup>/prospect<sup>5</sup> to become client (from the stages of recognition and authentication to contract signing), complying with the relevant regulations, using digital tools and channels (Internet and Mobile). Becoming a customer instead refers to signing up for various banking products and/or services, not exclusively bank accounts. The industry maturation is then explained with the evolution of consumer priorities when they look for a provider. According to Ernst & Young (2019, p. 12), *“Chinese consumers (where China is the forerunner) ranked ease of onboarding as the least important consideration when selecting a top provider”*, reflection of the widespread adoption in that market of open APIs and platform-based services.

The first step in many digitalization agendas is to develop digital channels and further increase diverse accessibility, with the use of dynamic data sources (Murinde et al., 2022). This concept refers to the implementation of strategies and technologies that enhance the availability and usability of financial services for a broad and varied audience. This involves leveraging dynamic data sources, which are continuously updated and adaptable, to make digital banking channels more inclusive and accessible to diverse groups of users. Some of the already set up instruments include:

- Mobile banking apps: traditional banks are investing heavily in user-friendly mobile banking applications. These apps provide customers with convenient access to their accounts, transactions, and various financial services on their smartphones.
- Online portals: user-friendly online portals enable customers to perform transactions, access account information, and engage with the bank's services through web browsers.

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<sup>4</sup> *Lead* is a potential client that already had some direct interactions with the seller, driven by interest.

<sup>5</sup> *Prospect* is a person that is targeted for being a potential client but still missing a direct connection with the seller.

- ATM and branch transformation: banks are optimizing their physical touchpoints, such as ATMs and branches, by incorporating digital interfaces and self-service kiosks, enhancing customer convenience.

Personalized financial planning instead includes a pool of strategic instruments to manage an individual's short- and long-term financial goals, considering customized needs and risk tolerance.

- Robo-advisors: these are automated investment platforms that analyze customers' financial situations and goals, providing personalized investment advice and portfolio management.
- Budgeting tools: banks offer digital tools that help customers in tracking their spending, set budgets and achieve goals, while promoting financial literacy and responsible money management.

AI-powered customer support tools leverage advanced technologies like natural language processing and machine learning to enhance customers' interactions and satisfactions while supporting businesses in meeting the evolving expectations of their clientele.

- Chatbots: AI-driven chatbots provide instant customer support, answering queries, assisting with transactions, and offering personalized product recommendations.
- Virtual assistants: banks are developing virtual assistants that use natural language processing to engage in interactive conversations with customers, enhancing the overall customer experience.

Customized product offerings involve tailored financial products and services to customers' needs and preferences. AI systems analyze vast amount of customers' data, creating detailed profiles that allow the creation of specific product recommendations.

- Tailored banking products: banks analyse customers' data to design personalized banking products, such as loans, credit cards, and insurance policies, based on individual financial behaviours and needs.
- Specialized services: premium and high-net-worth customers receive personalized services, including dedicated relationship managers and exclusive access to financial experts.

In order to ensure and omnichannel experience, banks create an ecosystem where customers can seamlessly transition between channels, access personalized services, and experience a consistent and convenient journey across their entire banking relationship.

- Seamless multichannel integration: banks are ensuring a consistent experience across various channels, allowing customers to start transactions on one platform (e.g., mobile app) and complete them on another (e.g., website), providing flexibility and convenience.

- Personalization across channels: customer preferences and behavior data are used by digital marketing tools to customize interactions, ensuring that customers receive relevant offers and recommendations, regardless of the channel they are using.
- Cross-device user identification: systems that enable banks to identify users across devices ensure a continuous and consistent experience. This may involve secure login mechanisms or device recognition; biometric authentication, for example, such as fingerprint or facial recognition, provides a secure and consistent method for users to access their accounts across channels.

Lastly, the key to data-driven personalization is to gather, analyze, and act on customer data in a way that respects privacy regulations and enhances the customer experience by providing relevant, timely, and personalized services.

- Behavioural Analytics: banks use historical customer data to understand customer preferences and habits, enabling targeted marketing, product suggestions, and loyalty programs.
- Predictive Analytics: predictive modelling tools track users' interactions with digital platforms, helping to understand how customers navigate and engage with services. They help banks anticipate customer needs, enabling proactive service offerings and personalized communication to enhance customer satisfaction and loyalty.

Traditional banks seek to give their clients a smooth, easy, and highly customized banking experience by emphasizing these factors. In addition to increasing client loyalty, personalization helps banks cross-sell and up-sell valuable products and services, raising revenue and customer lifetime value.

### **2.1.3. The trust phenomenon**

In the past decade, there has been a notable surge in the adoption of Internet e-banking services by commercial banks and financial institutions within the banking sector. This transition towards digital banking signifies a shift away from direct interpersonal interactions, necessitating that banks elevate the quality of their services to remain competitive. As technology continues to progress, the expectations and preferences of banking customers regarding services have undergone significant expansion. In this evolving landscape, several pivotal factors come into play when customers make decisions about their banking relationships. Security and transaction speed, user-friendly interfaces, trustworthiness, and concerns related to privacy emerge as primary considerations for individuals selecting a bank (Ahmed et al., 2023).

In the banking sector, establishing and maintaining consumer trust in the overall integrity of the financial institution is of utmost importance (Kantsperger & Kunz, 2010). Despite the banking sector being traditionally characterized by a contractual culture, where written agreements are often presumed to substitute for trust, it is crucial to recognize the nuanced nature of trust within this new evolving context. Sako's (1992) framework, delineating trust into three distinct levels—contractual trust, competence trust, and goodwill trust—proves pertinent in understanding the multifaceted dimensions of trust in banking. Mou et al. (2017, p. 2) define trust in the e-context as the consumer's confidence in and the willingness to depend on:

- (1) e-service provider's reliability, good intentions, and ability to deliver on expectations.
- (2) product or delivered service to meet the consumer's needs.
- (3) e-service website or platform to perform the required functions.
- (4) integrity and dependability of the enabling technological environment.

Anneli Järvinen (2014, p. 554) defines in their paper consumer trust in the banking context as a sum of various elements. Trust in banks and banking services is intricately tied to consumer experiences, contingent on the ability of banks to consistently exhibit reliability, adherence to rules and regulations, operational competence, and a commitment to serving the broader public interest. Furthermore, trust is cultivated when a bank fulfils its promises, remains dedicated to its obligations within the customer relationship, and demonstrates sincerity. It is important to note that, in the banking sector, distrust among consumers may stem from incidents related to societal factors, the actions of banks, or even consumer behaviours. However, the significance of written contracts, typically assumed to be a cornerstone in fostering trust, is notably diminished in this digital context. Instead, trust is primarily built and sustained through the tangible actions, reliability, and ethical conduct of the banks themselves.

According to Yousafzai et al. (2010, p. 1181), *"The banking industry is strongly associated with high levels of trust related to security and privacy issues in the physical environment. However, this association has not yet been fully exploited in the realm of electronic consumer behaviour."* The physical distance between bank employees and their clients forces an impersonal exchange that creates a unique environment where trust issues become crucial. Banks' customers may be reluctant to adopt any form of Internet Banking when security and privacy concerns exist. It is suggested that customers will grow to trust online banking transactions when they feel that their information won't be seen, altered, or stored by parties other than the bank (i.e., perceived security); and when they feel that the information they provide will be collected, accessed, used, and disclosed in a way that meets their expectations (i.e., perceived privacy) (Yousafzai et al., 2010).

When lack of trust is generated, Anneli Järvinen (2014, p. 562) again states that “*bank managers should also take care of good financial standing and reputation of their banks, but not at consumers’ expense. This means maintaining customer service at high priority even in the rainy days.*”. Previous studies (Shahid et al., 2022) have shown that a better user attitude toward technology is correlated with higher perceived value and higher service quality. Moreover, since perceived risk is known to have a negative effect on perceived trust (Almaiah et al., 2023), managers could begin by adopting the recommendations of (Steinhart & Mazursky, 2010) in order to present high-complexity banking services as simpler goods and lower the perceived risk associated with them. In this sense, less informed customers would find financial services more tempting. Accordingly, Ganesan (1994, p. 5) argues that “*trust develops with experience*”.

#### **2.1.4. Talent acquisition and skills development**

In anticipation of the transformative era ushered in by open banking, banks that seek to claim a solid position are strategically investing in talent acquisition and skills development to fortify their position in the digitalized landscape. Recognizing the need for a workforce adept in navigating the complexities of open banking, banks are actively seeking professionals with specialized skills in information and communication technology (ICT). This talent acquisition initiative aims at building a team capable not only of implementing the technological infrastructure required for open banking, but also at envisioning innovative solutions that can enhance customers’ experience.

In tandem with talent acquisition, banks are placing a considerable emphasis on skills development programs. Continuous training initiatives are being rolled out to empower existing employees with the knowledge and capabilities necessary to thrive in the evolving digital ecosystem. These training programs cover a spectrum of topics, including API integration, cybersecurity, data analytics, and user experience design. The objective is to ensure that banking personnel remain well-versed in the latest industry trends and possess the skills needed to harness the opportunities presented by open banking.

Furthermore, it's noteworthy that some banks are extending their community development efforts beyond their internal workforce. They are actively engaging with local educational institutions, industry associations, and tech communities to foster a broader ecosystem of digital talent. Collaborative initiatives, such as hackathons, workshops, and mentorship programs, are being organized to bridge the skills gap and cultivate a pool of talents.



In the latest edition of the Open Banking Monitor (OBM), the crucial role of an Open Banking community is underscored, emphasizing banks' increasing efforts to foster collaboration and innovation within a broader community of API consumers, including developers and businesses (Cortet et al., 2020). The developer portals, assessed as the “shop windows”, serve as key interfaces for these interactions. To become “Masters in Openness” and position themselves at the core of the dynamic ecosystem, banks are urged to blend a robust API offering with a comprehensive community-building and engagement strategy. The competitive advantage lies not just in offering high-quality documentation and seamless API access, but in actively investing in strategies that build and nurture strong community relationships. Banks are now competing on an ecosystem level, necessitating the development of relationships that drive innovation and revolve around the bank's APIs.

Three key considerations for community building are highlighted (Cortet et al., 2020). Firstly, understanding the target audience is pivotal, encompassing developers, decision-makers, or a combination of both. Effective communication, tailored to resonate with the right audience, promotes engagement on the developer portal. Secondly, the purpose of the community influences its setup and tools, ranging from premium partnership programs to community-based initiatives, each serving different goals. Examples from various banks illustrate these approaches; the Scandinavian bank Nordea is at the forefront, with an exciting developer portal that has several useful resources, such as training videos, code samples and statistics sections (*Nordea | Open Banking Developer Portal*, n.d.). Lastly, the scope of API offerings, coupled with the customer base, influences the type of developers banks attract. This is exemplified by distinct strategies employed by banks like Bunq and Deutsche Bank based on their API catalogue focus and customer base.

In conclusion, successful Open Banking adoption requires banks to view it as a reciprocal relationship, where both banks and API consumers benefit from a vibrant community that explores new ideas and scales use cases. While there's no one-size-fits-all approach, understanding factors such as the target audience, community purpose, and API offerings helps banks tailor their strategies to effectively build, enhance, and serve their Open Banking community.

As we delve into the subsequent exploration of open banking, the foundation laid by these talent-focused endeavours will emerge as a key determinant of how effectively banks can leverage interconnected financial services to meet the evolving needs of their customers and the broader community.

## 2.2. Open Banking paradigm

The digital evolution undergoing in the financial services sector is making retail banks inevitably victims of disintermediation, as more activities become available online. Rethinking the value chain is about reconsidering business models and processes around superior value for the end customers. The pressure to innovate finds advocacy in the concept of open innovation. In literature, open innovation is defined as *“the use of purposive inflows and outflows of knowledge to accelerate internal innovation, meaning that ideas can come from inside or outside the company and can go to market from inside or outside as well”* (Chesbrough, 2003, p. 43). The author’s model is described as *“the necessity of letting ideas flow out of the corporation in order to find better sites for their monetization, and flow into the corporation as new offerings and new business models”*. This way of thinking changes the research functioning of a company, expanding the role of internal researchers by including not only knowledge generation, but also knowledge brokering. This also suggests that companies should interact with various types of partners and stakeholders to remain competitive in the market. On this flow, the ability to innovate and the chance to intake open innovation practices becomes a necessity for the growth and success of the financial services’ industry. Give all of this, banking and finance are evolving more into a strategic “enabler” rather than a provider of products and services.

Banca D’Italia (2021, p. 5) defines Open Banking as *“an open and digital ecosystem that allows, even without pre-established agreements, the exchange of data and information, not financial only, between (banking, financial and others) players that are part of”*. This new paradigm is even better explained from the Bank for International Settlements (2019, p. 4) as *“a form of sharing and exploiting customer-authorized data by banks with third-party developers and companies to build new services and applications, such as those that offer real-time payments, increased financial transparency for account holders, and marketing and cross-selling opportunities”*. Sharing clients’ data with third parties on behalf of the banks<sup>6</sup> is a well-known phenomenon in the financial sector, but this has gained in momentum with the digitalization and the diffusion of online and mobile banking. Financial services were previously vertically integrated in the offer from their bank, but in this new chapter third parties are playing to unbundle the service offer.

Operating on the principle of sharing information between parties who are not bound by pre-established agreements, open banking raises two issues to be addressed. On the one hand there is a technical-operational problem, related to how to access user information held by the bank; on the

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<sup>6</sup> later we will refer to banks as account servicing payment service providers (ASPSPs), or the entities with which customers have opened their account that is subject to open banking.

other hand, the problem is of a regulatory nature, with regulation of data access and sharing processes needed.

In the first case, customers authorize third-party entities to access their online banking information and services. Prior to regulation, these entities employed less secure methods, posing risks in terms of security and data retention. To address these challenges, global authorities, intermediaries, and industry players have turned to alternative technologies such as Application Programming Interfaces (APIs) and "tokenized" authentication (see paragraph 2.4). The introduction of APIs has enhanced efficiency and security while balancing the roles and responsibilities of involved parties. Third parties now have limited visibility of customer data, benefiting from savings in application development due to API interface stability. "Tokenized" authentication models also relieve third parties of managing customer credentials.

From a regulatory perspective, third-party access to user banking data, contingent on consent, is generally regulated or controlled by authorities. National and international institutions have taken actions, adopting regulatory frameworks to facilitate data sharing based on customer consent. Regulatory frameworks vary across jurisdictions, covering aspects such as third-party access, licensing requirements, security restrictions, privacy protection, data disclosure, and consent management. Protections for open banking customers have been instituted globally, allowing authorities to set requirements, conduct audits, establish standards, supervise, promote competition, and define obligations for data protection. Additionally, mechanisms for dispute resolution between consumers and organizations are provided.

### **2.2.1. Regulatory environment – PSD2**

European policymakers have implemented significant reforms in data portability and payment systems, aiming at empowering consumers and citizens by granting them greater control over their personal information. A secondary goal is to reshape the industrial landscape within banking and financial services. The intention is to replicate the positive outcomes witnessed in recent policies within the energy and telecommunication sectors, fostering increased competition, enhanced transparency, and reduced costs for consumers (Rousseau, 2019).

The Payment Service Directory 2 (PSD2) emerged as a transformative phenomenon, exerting a profound influence on the European payments landscape and market dynamics. It marked a decisive departure from the past, instigating the development of a novel competitive framework with redefined rules, thereby facilitating the inclusion of new market participants. Within the ambit of PSD2 lies the groundwork for a redefined banking paradigm characterized by increased openness,

accessibility, and simplicity, benefitting both customers and businesses. The antecedent directive, PSD1, enacted in 2007, aimed at enhancing competition in the European payments' market and fortify consumer rights by implementing standardized regulations across the EU. Despite the establishment of PSD1, the competitive landscape remained stagnant, as evidenced by the fact that a mere 3 percent of European consumers engaged in cross-border banking transactions in 2017 (Bank for International Settlements, 2018).

The dynamic nature of technological advancements outpaced the regulatory scope of the 2015 PSD framework, rendering it inadequate to govern the flourishing online payments sector. Consequently, on November 25, 2015, the Council of the European Union sanctioned PSD2 to enhance the security and innovation of payment systems. European Commissioner Jonathan Hill highlights the legislation's significance in advancing the digital single market<sup>7</sup>, asserting that it would foster growth for consumers and businesses alike. On November 27, 2017, the European Commission formalized the regulation by endorsing the final version of technical standards governing customer authentication and secure communication with third-party providers (TPPs) offering Payment Initiation and Account Information services. Subsequently, the text underwent parliamentary approval and Council ratification within a three-month timeframe. The technical regulations were to take effect after an 18-month transitional period, approximately in September 2019.

The initiation of the Second Payment Systems Directive (PSD2) on January 13, 2016 mandated member states within the European Union to transpose it within 24 months. The directive aimed to fortify the security, efficiency, and innovation of electronic payment systems for all European citizens. The responsibility of regulating and standardizing guidelines pertaining to "strong" customer authentication (SCA), common and secure communication, and the introduction of intermediaries between citizens and their credit institutions was delegated to the European Banking Authority (EBA).

In the Italian context, the PSD2 transposition occurred on December 11, 2017, under the auspices of the Council of Ministers of the Gentiloni government.

A seminal aspect of PSD2 was its unprecedented requirement for European banks to open their Application Program Interfaces (APIs) to fintech companies and other entities engaged in financial products and services. By doing so, this directive also promotes increased competitiveness by encouraging the development of new products and the opening of the market to non-banks

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<sup>7</sup> The digital single market has been introduced by the European Commission in 2015 to ensure free movements of people, services, and capital, allowing individuals and businesses to seamlessly access and engage in online activities irrespective of their nationality or place of residence; it opens new opportunities, as it removes key differences between online and offline worlds, breaking down the barriers to cross-border online activity.

players. This marked a pivotal shift towards fostering collaboration and integration within the financial ecosystem.

PSD2 targets all the payment service providers: banks, insurance companies, and so-called Third-Party Providers<sup>8</sup> (TPPs). To ensure transparency and security for banks and customers, third parties must be registered, authorized, and regulated at the European Union level. The transactions that fall within the scope of the regulation are mainly remote channels, credit/debit, or prepaid cards, and POS.

Unicredit (2022, p. 2) highlights that the PSD2 introduced new important features in this market, such as:

- Transparency obligations: the regulation strengthens consumers' rights and transparency in related to information obligations, execution and economic conditions.
- Scope expansion: the scope of application of the regulation has been extended to all geographical areas and all currencies.
- New security measures: Strong Customer Authentication (SCA) has been introduced to access accounts, place payment orders on online channels and to carry out transactions involving risks of abuse or fraud.
- Access to online accounts through TPPs: this regulation provides customers with the chance to access information on personal bank accounts and on transactions made, as well as placing payment orders through third-parties.

TPPs' access to customers' online accounts may be provided only with the explicit consent of the user, given to them and notified to the bank where the account is rooted. To enable a user to use the services provided by third parties, the bank with which he or she holds an online account will have to provide access via a dedicated channel (so-called Application Programming Interface - API) or by allowing the third-party direct access to the same online channels of the bank used by the customer. In both cases, the security of communication and information exchanges between the bank and the third-party must be guaranteed, while respecting the privacy of the customer.

Since September 14, 2019, payment service providers have implemented new security regulations governing online account access and payment authorization. Robust customer authentication is now mandatory for online account access, ensuring heightened user security. This authentication relies on a minimum of two factors falling into the following categories:

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<sup>8</sup> TPPs are payment services providers other than those with which users' account are rooted

- (a) Knowledge: information known only to the user (e.g., static password, code, personal identification number).
- (b) Possession: items exclusively owned by the user (e.g., token, cell phone).
- (c) Inherence: user-specific traits (e.g., biometric characteristics like a fingerprint).

These factors must be independent of each other, meaning a breach of one does not compromise the other. Furthermore, at least one element must be non-reusable, nonreplicable, and non-transferable via the Internet. The authentication process must be designed to safeguard the confidentiality of authentication data.

The Strong Customer Authentication (SCA) protocol applies to various scenarios, including accessing the online account, initiating an electronic payment arrangement, and executing any action through a remote channel that could potentially lead to payment fraud or other misuse.

For authorizing remote electronic payments, the SCA is complemented by the application of dynamic linking. This involves a unique code linked to the transaction's amount and beneficiary. If there are changes to either the amount or beneficiary, the code becomes null and void, necessitating the generation of a new one. This additional layer enhances the security of remote electronic payment transactions.

### **2.2.2. Open Banking Ecosystem**

This regulation (“*Direttiva 2015/2 366/UE*” on Italian payment services) amplified the definitions in the ecosystem of payment services, introducing new entities and actors (Figure 8): Payment Initiation Service (PIS), Account Information Service (AIS) and Card Initiated Service (CIS) (Banca D’Italia, 2021).

Payment Initiation Service (PIS) is a service offered by payment service providers, wherein, upon user request, the provider facilitates a payment order against a payment account held with another payment service provider, known as the Account Servicing Payment Service Provider (ASPSP). For instance, in an online purchase scenario, you can utilize a Payment Initiation Service Provider (PISP) to initiate a wire transfer from your account to the seller, thus enabling the acquisition of goods or services.

Account Information Service (AIS) is a service that provides information about the user's payment accounts across various payment service providers. This empowers customers with a consolidated view of their accounts through a unified dashboard. Users can efficiently monitor their

budgets, analyse expenses, and plan investments. The entity providing such a payment service is commonly known as an Account Information Service Provider (AISP).

Card Issuing Service (CIS) is a service provided by payment service providers that issue card-based payment instruments. In this context, payments made through card transactions are debited from a payment account held with another payment service provider. This is done in the absence of direct contractual arrangements. Third-Party Providers (TPPs) offering this service rely on confirming the availability of funds in the account via API. It's important to note that this service is not explicitly identified by PSD2 and cannot constitute the sole business of a payment service provider. Instead, it is carried out exclusively by payment service providers that issue card-based payment instruments.

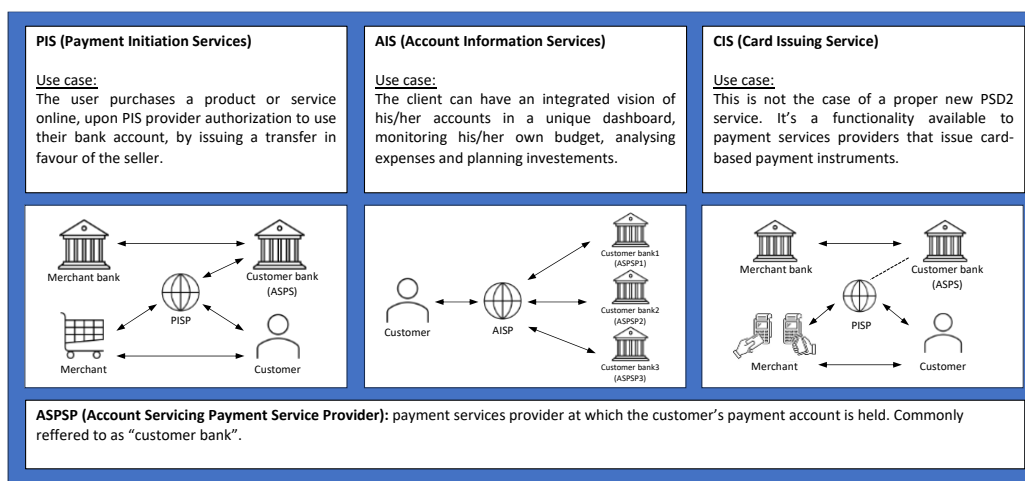


Figure 8. Open Banking actors. Source: personal elaboration

Open banking, governed by the PSD2 (Payment Services Directive 2) framework, revolutionizes traditional banking by facilitating secure and innovative financial services (Figure 9). The core innovation is the sharing of customer innovation assets. The process involves several key touchpoints and key features to ensure seamless interactions between different entities (Pellitteri et al., 2023):

1. Bank account access: ASPSP allow Third-Party Providers (TPPs) to access bank account information with the user's consent. This access extends beyond mere balance inquiries, enabling TPPs to retrieve transaction details and other relevant data.
2. Online only: all interactions within the open banking ecosystem occur online, fostering a digital environment that promotes efficiency, accessibility, and real-time data exchange.
3. No Contract: users engaging with Third-Party Providers in the open banking space are not bound by traditional contractual agreements. This flexibility encourages competition among

providers and allows users to explore various financial services without committing to long-term contracts.

4. **No Funds:** open banking platforms and TPPs do not handle or manage the actual funds. Instead, they focus on providing secure access to account information and enabling transactions with the user's explicit consent.
5. **PSU Consent:** prior to any data access or transaction initiation, the Payment Service User (PSU) must give explicit consent to the Third-Party Provider. This ensures that users have control over their financial information and maintain transparency in their interactions.
6. **TPP Identification:** secure identification of Third-Party Providers is a crucial aspect of open banking. TPPs must undergo rigorous identification processes to ensure the integrity and security of the financial ecosystem.
7. **PSU Authorization via ASPSP:** the Access Service Provider (ASPSP), typically the user's bank, acts as the gatekeeper, facilitating the secure exchange of information between the Third-Party Provider and the user. The ASPSP ensures that the access and transactions are legitimate and authorized by the PSU.
8. **PSU Credentials Security:** the security of PSU credentials is paramount in open banking. Strong encryption methods and authentication protocols are employed to safeguard sensitive information, preventing unauthorized access to user accounts.
9. **Sensitive Data Confidentiality:** open banking platforms adhere to strict protocols for handling sensitive data, ensuring that personal and financial information is kept confidential. Encryption and secure communication channels are employed to protect data integrity and privacy.
10. **Restrictions "Need-to-Know":** the principle of "need-to-know" is applied to data access, limiting the information shared between parties to only what is essential for the specific transaction or service. This approach enhances user privacy and minimizes the risk of unauthorized data exposure.



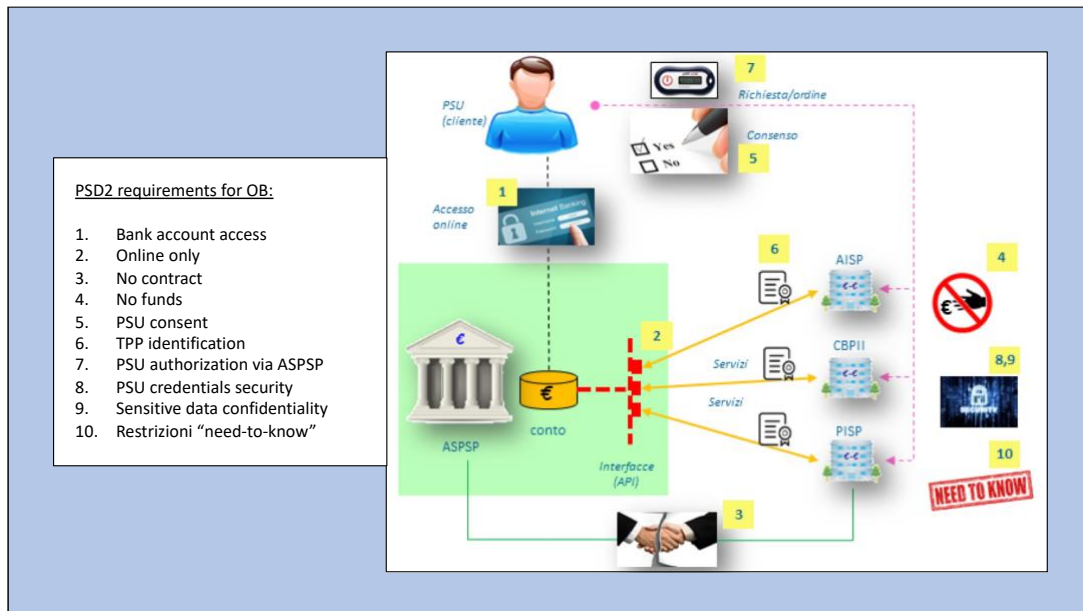


Figure 9. Open Banking ecosystem and PSD2 requirements. Source: Banca D'Italia

In summary, open banking under PSD2 creates a dynamic and secure financial ecosystem where users can leverage a variety of services through trusted Third-Party Providers, while maintaining control over their data and ensuring robust security measures are in place at every touchpoint.

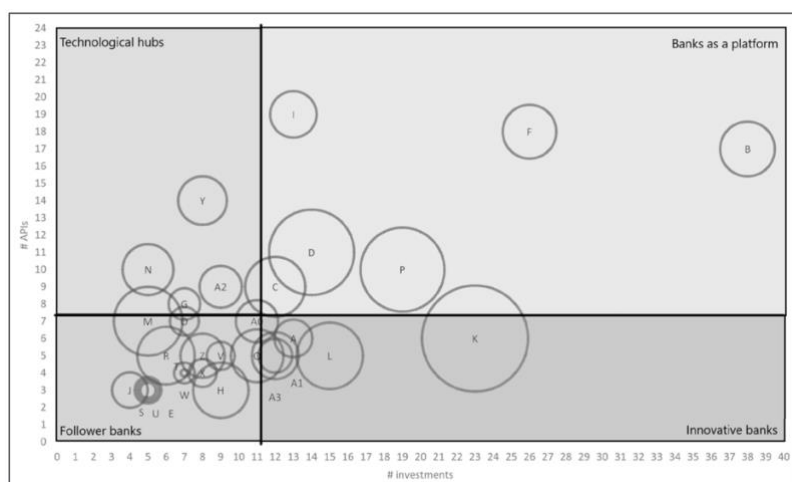
### 2.2.3. Importance of APIs in modern banking

Stefanelli & Manta (2023, p. 4) assume that “banks will move towards a model based on a customer-centric platform, which will be managed through Application Programming Interfaces”. With the PSD2, and the related implementing regulation, the payment service providers offering online accounts to their clients had to facilitate identification and secure communication with TPPs. This has been possible by customization of interfaces already in use by clients or arrangement of a specific interface that allows the access of TPPs, through APIs technology.

In their paper, Stefanelli and Manta (2023) map the directions of the developments of the digital strategies in the European banking sector. They contribute to the available literature that looks at the development of the financial ecosystem, with a specific focus on the new open banking paradigm. Many studies talk about this new phenomenon, but these authors bring interesting new variables into consideration in order to assess how institutes are already adopting open banking and which ones are still adapting. Major European banks' strategies are described in a matrix (Figure 10), that is organized as follows. First, the role of APIs is known to be essential in the OB ecosystem, however, no other researcher has considered the number of APIs as a relevant indicator. This

ecosystem is described as an architectural construction made of blocks that are managed via Application Programming Interfaces. Therefore, this number is used to represent the degree of openness and competitiveness of a bank.

The other variable is the collection of strategic partnerships entered by banks with Fintechs, an essential step already known in literature. These institutes increase chances to acquire technological skills and new customers by outsourcing some banking activities and services (see paragraph 2.3.1).



**Figure 10.** Map of the strategic digital innovation choices of European Incumbents. Source: Stefanelli & Manta (2023)

The banks analysed in this study are categorized into four strategic competitive behaviours in the European banking market, represented in a crescent order on the graph. The first group comprises "Follower" banks, including Italian, Polish, Irish, German, French, and Dutch banks. These banks adapt to regulatory changes by proposing the minimum required APIs and displaying a lower number of collaborative investments. The second group, labelled "Innovative", includes Dutch, Belgian, British, and Swedish banks. These banks outsource the digitalization process, entering partnerships with FinTechs, and show good technological levels with additional services offered via API. The third group consists of "Technological hubs" banks, such as German, Belgian, Swedish, and British banks, complying with legislation and offering additional APIs with diverse functions. Finally, the most advanced banks, termed "Banks as a platform," are represented by Spanish, French, German, and British banks, showcasing competitive advantages from internal technical skills, strategic agreements, and collaboration with important partners. Approximately 20% of the major European banks fall into this category. Observations on strategic choices reveal the "Best in Class" as the banks in the third quadrant, characterized by great internal technological ability and openness to new partners. The second quadrant, representing "Technological hubs," contains 14% of the sample,

emphasizing internal resource development with various APIs. The fourth quadrant, "Innovative banks," holds 20% of the sample, marked by high investments and fewer APIs. The majority, 46% of the sample, falls into the "Follower banks" quadrant, displaying a reactive approach to legislation.

The study suggests a need for banks to adapt to innovation, with an "outside-in" approach preferred, emphasizing partnerships over in-house development. The results also highlight the importance of human resources with strong ICT backgrounds. The digitization process varies across countries, with Spain, the Netherlands, and the UK leading in advancement. Italy and Poland lag behind, reflecting lower performance in the DESI Index and digital payment transactions per capita (European Commission, 2022). Future strategic directions for follower banks may include developing technological skills, focusing on core business with specific APIs, or investing in internal resources to re-enter the technological hubs sector.

In conclusion, it should be clear that open banking operations make use of these specific technologies (APIs) to grant access to customers' information assets to fintechs and third parties. Among other features, these technologies must also guarantee data accessed segregation, secure modes of interaction and limitation of technical complexity required for integration between traditional payments world and new players (Pellitteri et al., 2023).

From a technical point of view, Application Programming Interfaces (APIs) serve as crucial conduits for seamless data exchange between different software systems, whether residing on the same computer or distributed across a network. Technically, APIs enable the linkage of systems without requiring in-depth knowledge of their internal workings, fostering rapid software development for accessing shared information. When APIs facilitate communication between applications on different systems, they are termed "network-based APIs" a concept particularly relevant in the development of distributed applications across the Internet. The rise of "network-based APIs" is attributed to their suitability in orchestrating complex functions among software elements spread across diverse network nodes. When interface specifications are public and adhere to open standards, such APIs are known as "Open APIs." For instance, a public administration exposing its data through an interface with publicly defined technical specifications fosters collaboration among distinct applications and organizations. In the context of the web, APIs implemented through protocols like HTTP, following data exchange models reminiscent of web interactions, are referred to as "web APIs". This evolution transforms the web into a platform for software entities, comparable to the interaction between a client and server in the browsing context.

### **2.3. Transformation of Banking Operations in the Digital Ecosystem**

With European new regulations on data portability and payment's system changing the banking and financial services environment, the financial industry is under profound transformation. One notable consequence of these regulatory shifts is the facilitation of third-party access to account information and payment initiation. This development is about to bring several outcomes, including a reduction of online payment costs and a change in the interaction flow between the payer and the payee (Rousseau, 2019). Regulatory initiatives mandate increased competition and openness in payment systems. By introducing more competition into the payment processing landscape, traditional financial institutions are compelled to streamline their processes and offer more cost-effective solutions to remain competitive. This cost reduction is expected to benefit consumers directly, making digital transactions more affordable and efficient.

While traditional roles and responsibilities in financial transactions are evolving, regulatory frameworks provide the legal basis for these new forms of interaction, ensuring that they are conducted securely and in compliance with data protection and privacy standards. Moreover, the traditional banking value chain is set to be unbundled, making way for a more modular and adaptable financial ecosystem. Regulatory changes often encourage the disintegration of the traditional banking value chain by promoting open banking and interoperability.

With new technologies being introduced to the market, improving client authentication and security is paramount in the era of increased digital transactions. Since third-party involvement in payment initiation, there's a need for robust measures to ensure the integrity and security of financial transactions. This may involve the implementation of advanced authentication methods, encryption technologies, and continuous monitoring to detect and prevent fraudulent activities. The objective is to create a secure environment that fosters trust among users and stakeholders in the financial system.

As a matter of fact, the regulatory changes are catalysts for the emergence of innovative business models that transcend traditional banking paradigms. Account aggregation, comparison tools, and other value-added products are reshaping how financial services are delivered to retail customers. Account aggregation, for instance, becomes a cornerstone of the relationship between clients and advisors, providing a holistic view of financial portfolios. Comparison tools leverage open banking and data portability, enabling clients to make informed decisions by easily comparing fees, rates, and performance. These new business models empower consumers with more choices, transparency, and control over their financial affairs, contributing to a more competitive and consumer-centric landscape (Rousseau, 2019).

In this context of personal financial management, clients now have the option to access open architectures including diverse financial needs, from payment services, to credit facilities, investments, and protection products. Fabrick, the Open Platforms project created in collaboration with Banca Sella, already has a modular PFM suite enabling customers to manage current accounts held at different banking institutions in a single application, helping them to do analysis, forecasting and savings planning (*Personal Financial Management (PFM)*, n.d.). This newfound autonomy empowers clients to manage their financial affairs independently, while service providers offer personalized and customized products across various channels, from traditional to digital. This evolution also empowers clients with comprehensive insights, fostering an environment where financial decisions are both informed and personalized. Therefore, banks are driven to lower fees against this competitive market, where newcomers (Fintechs and others), increased transparency and comparison capacity are intensifying the pressure. The final goal is not only to face competitors, but also to retain current clients and their behavioral data generated through transactions.

### **2.3.1. Strategic Competitive Behavior in the Open Banking Market**

The introduction and growth of the Open Banking paradigm and the related regulations (PSD2) have forced banks to reconsider their business plans and to undertake partnerships with many of the participants in the financial industry ecosystem (Stefanelli & Manta, 2023).

The literature on open innovation identifies a distinction between inbound and outbound strategies. Saebi & Foss (2015, p. 204) define outbound open innovation as “*activities driven to leverage existing technological capabilities outside the boundaries of the company*”. Inbound open innovation strategies are instead referred by Chiaroni et al. (2010, p. 222) as “*the practices of establishing relationships with external organizations or individuals with the purpose of accessing their technical and scientific competences for improving internal innovation performance*”. The open banking ecosystem is exactly working in line with this last definition.

Once fintechs have entered the market, banks have experienced a wave of unbundling, changing the game and rules of competition. Customer’s choice has then become the issue for each business model in the arena (Omarini, 2018a). Companies (banks) may engage with fintech startups through a variety of strategic channels, for a variety of different reasons. The corporate partnership innovation vehicles are arranged and complemented by examples in Figure 11. Some of the most recognized motives driving banks in partnering with fintechs are listed.

For financial institutions, the primary collaboration motive is rapid access to externally developed innovations, offering significant cost savings and a shorter time to market. Business model











innovation opportunities also drive partnerships, allowing banks to identify and integrate new sustainable business models in response to changing technological, regulatory, and social environments.

Overall, financial early-stage firms and established incumbents commonly engage in partnerships with the primary aim of enhancing customers' satisfaction and creating customer value. Incumbents benefit from innovative solutions that address dynamic customer needs, leading to increased customer retention and successful relationship management. Startups contribute to customer experience by integrating financial incumbents' products and services, such as factoring solutions, insurance, trading, and leasing instruments, within their applications.

Financial return, often manifested as increased revenue, is another significant motivation for collaboration, with fintech gaining stable cash flows through extensive partnerships with incumbents. Early-stage companies can access the existing customer base of incumbents more effectively, establishing additional customer acquisition channels with fewer market entry barriers.

Collaboration also fosters mutual cultural and strategic knowledge transfer between financial incumbents and start-ups, allowing the latter to benefit from the industry expertise and network effects of established corporations. Financial institutions, in turn, gain insights into the innovative approaches of start-ups, facilitating adjustments to internal structures. The possibility of joining forces against significant competitors is also identified as a collaboration reason, enabling fintech and financial incumbents to respond more efficiently to other influential entities like bigtechs. This alliance creates a competitive advantage for both parties in the market.

Finally, strategic advantage motivates incumbents to engage in partnerships, leading to an improved corporate brand identity, increased control, and exclusivity regarding emerging technological financial services.

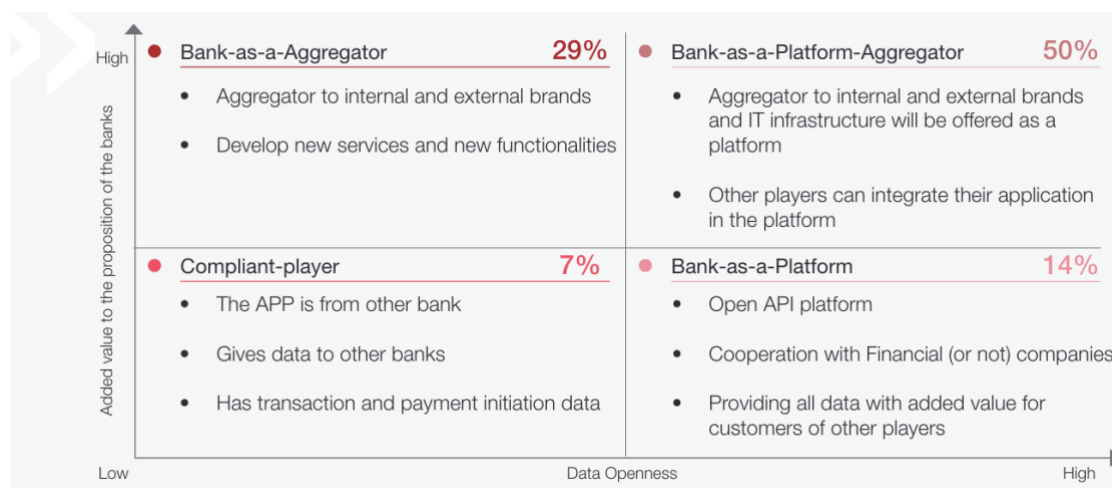
Cooperation Motive	Practice Examples	Description
<b>Customer Satisfaction</b>		Trade Republic enabled their customers to invest in approximately more than 1000 traded funds within the latest partnerships with Amundi and Lyxor (FONDS professionell Multimedia GmbH 2021).
<b>Financial Return</b>		Commerzbank invested via his venture capital funds in Marqeta. The purpose of the fund is to gain financial return via FinTech investments (Dohms 2020).
<b>Knowledge Transfer</b>		Commerzbank AG and Deutsche Börse AG did a strategic investment/partnership into the NFT marketplace start-up 360X, which creates a digital blockchain based trading environment for art and real estates (Deutsche Börse Group 2021).
<b>Competition</b>		Iwoca partnered with Royal Bank of Scotland and is an alternative lending provider. Despite the fact that both parties are offering the same product to the customers, it was decided to work together (Iwoca Ltd. 2020).
<b>Reputation &amp; Credibility</b>		Santander uses Kabbage's platform to apply for Santander-financed lines of credit. Kabbage engaged due to the deep financial expertise, large customer base, and a shared passion for innovation with Santander (Penn 2016).
<b>Regulatory &amp; Synergies</b>		Through the strategic partnership between P27 and a joint initiative led by Danske Bank, the start-up can accelerate their vision to set-up the first Nordic multi-currency real-time payment infrastructure (P27 Nordic Payments 2021).
<b>Product Development</b>		The partnership between the Commerzbank subsidiary CommerzFactoring AG and the accounts receivable FinTech Blando GmbH enabled the incumbent to provide additional services to their customers (Commerzbank AG 2016).
<b>Business Model Innovation</b>		Optiopy offers bank customers rewards if they share their financial data. DZ bank increases the net commission income via revenue share contracts with Optiopy (Nitsche 2019).
<b>External Innovation Access</b>		Gini's AI based transaction data outreading and processing technology enables the DKB to provide their customers a more comfortable transfer of paper-based invoices (Bajarat 2016).
<b>Strategic Advantage</b>		Banks have signed up to R3. R3's aims to repurpose blockchain software – the system that currently supports the contentious cryptocurrency Bitcoin – into a common protocol that will enable seamless, global transaction maintenance across and between all the leading institutions (The Association of Corporate Treasurers 2021).

*Figure 11: Overview of Cooperation motives. Source: Ruhland & Wiese (2023)*

Relating to the open innovation concept, banks can select the level of openness of the paradigm. In her paper, Omarini explains how PSD2 has opened the banking sector, shifting the intellectual property of data from banks to customers (Omarini, 2018a). But, besides of the mandatory prescription of PSD2, there is a whole set of choices that banks can select in terms of openness and services involved within the surrounding ecosystem. She suggests four different strategies for open banking models to be pursued, corresponding to a four-options matrix by PwC (Figure 12).

- **Compliant-player:** following the “comply” strategy, this player selects the minimum degree of openness and has a low value added to the proposition. Third parties disintermediate the bank, that stays as the backbone of the system.
- **Banks-as-a-aggregator:** following the “compete” strategy, this banks fights over customers with its own interfaces, maintaining a low level of openness. By doing so, this player rethinks the whole value proposition model.
- **Bank-as-a-Platform:** following the “expand” strategy, this player pursues new revenue streams, opening its full set of information to third parties. This way, the bank works as a gate through which other entities can access data, but it doesn't increase its own value.
- **Bank-as-a-platform-aggregator:** following the “transform” strategy, the bank undertakes a complete redesign of the business model. This player starts cooperative partnerships with

fintechs and other companies, while it tries to compete with its own architectural platform, monetizing APIs and enhancing value proposition.



**Figure 12:** Which strategic positioning are Banks aiming to achieve in the long term? Source: PwC (2017)

## 2.4. Technical evolution in data access modes

In an extended digital financial ecosystem, the roles of banks, third parties, and regulatory authorities are delineated in various aspects. Firstly, the licensing and authorization of third parties differ across jurisdictions. While some do not mandate third-party authorization, others impose specific rules that vary in scope, ranging from narrow to broad. In regions with prescriptive open banking regulations like the EU, authorized third parties must adhere to data-sharing requirements, limiting the risk of fraud.

Before open banking services were regulated, third parties used to rely on different modes of accessing on-line bank accounts of customers grating access. For the purpose of this dissertation, we will not go deeper in the technical meaning, but an overview of their potential functionality will be given. Among the others, are worth mentioning:

- **Screen Scraping:** is a method where third-party applications extract data from the user interface (UI) of a website or application. In the context of online banking, it involves capturing information displayed on a webpage by simulating the actions a user would take.
- **Reverse Engineering:** this method involves analyzing a system, software, or protocol to understand its internal workings, often for the purpose of creating compatible or interoperable systems. In the context of online banking, reverse engineering may involve dissecting the communication protocols, APIs, or mobile applications to understand how they operate.



Both these techniques could pose several risks in terms of security and data conservation. By memorizing the credentials, there is a chance that third parties get more information than authorized, or that they start financial transactions without specific consent. Overall, the interested stakeholders recognize a number of risks featuring these mentioned modes, including credentials subtraction, fraud and forcing of the traffic capacity. To overcome this, some alternative technologies are deployed:

- Application Programming Interfaces (API): as we mentioned already, they provide a better control on the type and extension of shared data, ensuring a much greater level of security in the interaction between intermediaries and third parties.
- Tokenized Authentication: this is the case where the entity verifying the client's identity (Identity Provider - IP) is distinct from the entity managing data and services (Resource Provider - RP). The client presents credentials to the Identity Provider, which then issues a temporary identification code, known as a "token." This token, when presented by the client, grants access to authorized data and services from the Resource Provider (RP), typically a third-party service. Importantly, in this model, the Resource Provider (RP) never comes into possession of the user's original credentials, enhancing security and protecting sensitive user information.

On this theme, both national and international institutions have taken specific actions regarding the open banking regulatory framework. Pellitteri, Parrini and Cafarotti (2023, p. 37) highlights three categories of approaches that regulatory authorities take:

1. Prescriptive approach: authorities in this category require banks to share customers' data and mandate third parties to register with relevant regulatory or supervisory bodies. An example is the PSD2 regulation (for Europe), which obliges banks to share data, subject to customer consent, with entities appropriately authorized by national authorities.
2. Wait and See approach: authorities following this approach take a market-driven stance, without explicit rules or guidelines either requiring or prohibiting banks from sharing customer-authorized data with third parties. It allows the market to evolve without immediate regulatory intervention.
3. Facilitator approach: this intermediate strategy involves authorities issuing guidelines and recommendations, promoting the adoption of open API standards and technical specifications. The initiative starts from the authority, but the implementation of the infrastructure is left to the market. Going in this direction is the open banking initiative in the United Kingdom, where the competent authority requires large banks to create a development consortium with tasks of standardization, governance, and supervision.

Lastly, there are a set of mechanisms based on authorities that comprehensively are involved in protecting customers using open banking services.

- Bank supervisors and overseers: these authorities set requirements and conduct controls on banks, infrastructures, and other regulated payment service providers to ensure compliance and regulatory adherence.
- Technical standards setting bodies: entities in this category establish standards and certify organizations that comply with these standards, promoting interoperability and technical consistency within the open banking ecosystem.
- Competition authorities: responsible for supervising, promoting, and intervening if necessary to ensure healthy competition in the markets. Some jurisdictions, like Australia, entrust the Competition Authority with regulating and monitoring new open banking solutions.
- Consumer protection authorities: ensure that consumers are protected from unfair, deceptive, or abusive practices by all parties involved in service provision, fostering a secure and transparent environment for customers.
- Data privacy authorities: establish obligations to safeguard customers' personal data, addressing privacy concerns and ensuring compliance with data protection regulations.
- Alternative dispute mechanisms: provide technological platforms or processes for mediating disputes between consumers and organizations, offering an alternative to traditional judicial venues.

Concerning third-party risk management, jurisdictions typically have data-sharing, storage, and security requirements. However, supervisory authority over third parties varies, with some jurisdictions placing the responsibility on banks to ensure compliance, while others grant supervisory authority to registered third parties.

The customer data protection landscape involves various aspects, including data privacy laws, disclosure, and consent requirements. While many jurisdictions have general data privacy laws, differences exist, such as the EU's GDPR<sup>9</sup> emphasizing consumer ownership of data. Disclosure and consent requirements are prevalent in contractual agreements between banks and third parties, with some jurisdictions restricting screen scraping practices.

The potential future of API use in open banking indicates its impact on various services, with two-thirds of jurisdictions expecting an influence on banking services, especially payment services, lending, investment, and account services. Third-party entities like data aggregators and payment

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<sup>9</sup> GDPR or General Data Protection Regulation is an EU regulation on information privacy in the European Union and the European Economic Area. Its goal is to protect individuals' rights and control over their personal information, and to simplify regulations for international business.

service providers commonly access customer-permissioned data. API risk management therefore involves identifying operational and cybersecurity issues, including data breaches, denial of service attacks, and misuse. Mitigation mechanisms include access privileges, encryption, authentication, vulnerability testing, and compliance assessments with regulations like GDPR.

This comprehensive overview highlights the diverse landscape of open banking regulations, risk management, and the evolving role of APIs in the digital financial ecosystem across jurisdictions.

#### **2.4.1. Data Sensibility and Trust**

In the evolving landscape of digital banking, customers are encountering a shift in control over their personal and financial data due to the growing presence of authorized financial service providers. In the context of the banking sector's role in the digital trust era, identity management becomes crucial, involving personal data, KYC procedures, policy regulations, and secure authentication. Banks have a substantial opportunity to invest in identity management, enhance payment card services, and integrate digital identity capabilities, leveraging their strong position in trust and security measures (Ahmed et al., 2023).

However, challenges arise in this sensitive data-sharing context, including adapting to increased transaction volumes, complying with data policies and governmental regulations, and ensuring robust security and privacy controls. Given concerns about privacy breaches, customers seek control over and explicit permission for each data-sharing transaction, emphasizing the need for secure and transparent practices, in the wake of past data scandals like the Facebook–Cambridge Analytica incident.

There is a need for policy makers to think about other kinds of regulations that may be necessary to have in sync with the whole open banking infrastructure. The issues are mainly focused around data privacy, where consent plays a fundamental role to ensure the trust of customers. Explicit customer consent has been an important topic to investigate for the academics and for policy makers. There is now a group of Fintechs that focus specifically on customer consent, aware of the fact that data at banks level are so messy that they may stop banks from analyze them and placing product offerings.

In their study, Lappeman et al. (2023, p. 341) point out that *“trust and digital privacy concerns are factors that influence the user’s decision to disclose private information”*. For this reason, consent

management is, therefore, becoming a very important issue in an open data and open banking economy (Zachariadis, 2022).

With the use of internet being increasing steadily over the past years, it is now regarded as the best channel for distribution of products and services in several types of businesses; as we have seen, Internet banking is one of them. Trust is being looked at as a major relationship problem as more financial organizations look for ways to increase the adoption rates of Internet banking (Goudarzi et al., 2015). This may be explained by the fact that bank clients worry about the security of handling sensitive data like financial information.

With technology creating more and more opportunities for digital channels to be used, and banks handling the usage of traditional and new channels in parallel, it becomes imperative for managers to build trust in these channels. According to Almaiah et al. (2023, p. 4), *“trust in banking has become a significant factor influencing the adoption of digital banking, which banks should consider by strengthening the security and privacy of their customers”*.

We have seen that the main goal of the PSD2 is to combat frauds and increase consumer confidence in digital payments by modernizing the regulatory framework governing innovative digital services. Even though non-financial services companies have led the way in deploying new technologies to deliver innovative services and have raised the bar on consumer expectations, they do not yet have the full confidence of consumers when it comes to providing financial services on their own. In his study Yousafzai et al. (2010, p. 367) explains that *the lack of trust on the attribute of the bank and the overall online environment is an obstacle for the widespread adoption of direct banking*, where direct banking is referred as the offer of services through channels directly accessible by clients without banks' intervention.

In the context of open banking, several factors can influence clients' trust in sharing personal data and financial information. Specifically, clients might be scared about data being shared with third party companies or services outside the traditional banking sector. For instance:

- Data sharing with Fintechs and non-banking entities: open banking encourages collaboration between traditional banks and third-party financial service providers, such as fintech companies. Clients may be also concerned about their data being accessed by entities outside the traditional banking sector, especially if those entities are less regulated or unfamiliar.
- Risk of data misuse: clients might worry about the data security measures implemented by third-party entities. If these measures are perceived as inadequate, it could raise concerns about the misuse of sensitive information. In the same way, the fear of data breaches is heightened

when information is shared with multiple parties; therefore clients may question the ability of third parties to safeguard their data effectively.

- Understanding consent mechanisms: it is crucial for banks to ensure that clients fully understand and explicitly consent to the sharing of their data with third parties. Ambiguous or complex consent mechanisms can lead to mistrust.
- Scope of data access: clients may want granular control over what specific data elements are shared with third parties. The ability to specify the scope of data access can enhance trust.
- Purpose of data sharing: clients are more likely to trust when they understand the specific purposes for which their data is being shared with third parties. Lack of transparency about the use of data can raise suspicion.
- Reputation of Third Parties: the reputation and track record of the third-party entities involved matter. Clients may feel more at ease if the fintech companies have a positive history of data handling and customer satisfaction.
- Legal Protections: clients are likely to trust the process more if there are legal safeguards in place, such as data protection regulations, that hold both banks and third parties accountable for any misuse of data.
- Educational Initiatives: banks should invest in educational initiatives to inform clients about the benefits of data sharing with third parties, as well as the protective measures in place to ensure responsible data usage.
- Data Portability and Control: providing clients with the ability to easily move their data between institutions and revoke access to third parties can empower them and enhance trust.

In conclusion, addressing concerns related to third-party access involves a combination of robust security measures, clear communication, transparent consent processes, and regulatory compliance. As open banking evolves, institutions must prioritize building a trustworthy ecosystem that benefits all stakeholders while safeguarding clients' sensitive information.

## Chapter 3

### 3.1. Theoretical framework

We are particularly interested in getting to know whether individuals are more or less willing to trust banks with a higher predisposition to open banking, with particular emphasis on the customers of banks with high branching intensity – commonly called “traditional banks” - and newcomers specifically customized on online banking platforms – so-called “Fintechs”.

The interest towards studies regarding customers’ trust in online banking has recently risen, even though trust has always been considered as an essential element in every business or relationship.

#### 3.1.1. Rationale/Purpose of the research

In order to support a logical construct, this dissertation has analyzed old and newest literature above the main topics of open banking and trust in the online environment. Our focus has been centered on the strategic importance of APIs in modern banking, as a great number of authors define this as the essential key for an effective digitalization in the realm of banking operations.

In the banking sector, technological innovation is generally associated with increased productivity, improved services, and greater profitability (Scott et al., 2017). As we have seen, this is particularly applicable to Open Banking (OB) platforms (Romanova et al., 2018), which operate by securely sharing banking data between banks and third parties through digital interfaces called application programming interfaces (APIs). However, as noted by Romanova et al. (2018), OB platforms come with security and privacy risks, which can be mitigated through the implementation of secure APIs and layered-permission access. The platform approach has allowed traditional banks to establish a collaborative environment with Fintechs, thereby avoiding the disruptive impact typically associated with technological innovation.

The reason for this is that security tends to play a crucial role for both service providers and users when participating in financial transactions through a specific FinTech solution (Hwang et al., 2021). A study by ING (2020) revealed that only 30% of European retail-banking customers felt at ease sharing their financial information with third-party providers (TPPs). It is interesting to observe the evolution of customers’ comfort and perception concerning open banking systems, where data sharing is a pivotal facilitator. Furthermore, it is worth to see whether variations in the openness of banks towards TPPs could play a role in influencing customers’ attitudes toward data sharing.

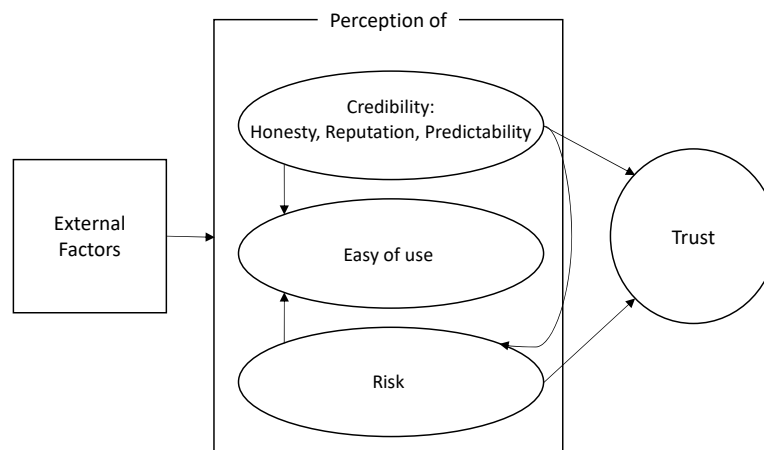
According to Stefanelli & Manta (2023), a bank with a high number of APIs demonstrates that it has made significant investments in the past to adapt to technological and market changes. Therefore, we wanted to test if any relationship between this factor and the perception of trust towards personal banks exists.

To do so, we used the online trust model from (Corritore et al., 2003). This model (Figure 13) is built upon the idea that individuals' degree of trust is influenced by two categories of factors, i.e. external factors, and the perception of them.

External factors are those aspects of the environment, both physical and psychological, that surround an online trust situation (Corritore, 2005). Some of these factors could be related to subjects' characteristics, the object of trust or the situation. In this specific case, we chose to give particular relevance to the demographics and the digital literacy/usage of the object of trust.

As follows,

- Demographics: Age, gender, and level of employment of the participants to the study were taken in consideration.
- Digital literacy: Some authors showed that trust is very dependent on consumer capability (Sunikka et al., 2010). For this reason, this study is constructed on premises above the level of digital literacy and usage of online banking services of the participants.



*Figure 13: Model of Online Trust. Source: Corritore (2003)*

The key of this model is the consideration that trust comes from the personal perception of external factors (Corritore, 2005). Therefore, three subcategories of perceived factors are meant to impact a decision to trust an online environment. As follows:

- **Credibility:** a positive relation has been found between the appearance of a strong and well-known brand and the perceived trust toward the organization (Yousafzai et al., 2005). Indeed, the authors explain that *“web-site quality is a strong factor in perceptions of trustworthiness; in fact, it is one of the strongest factors affecting customers’ trusting beliefs”* (Yousafzai et al., 2005, p. 196). Credibility is composed of honesty, reputation, and predictability. Honesty means that there are no misrepresentations and that the customer believes the other party’s information is sincere (Martínez-Navalón et al., 2023). On a reputational level, Muñoz-Leiva et al. (2010, p. 914) specify that *“The presence of a recognized brand will increase trust toward electronic banking”*.

Furthermore, previous literature (Barney & Hansen, 1994) suggests that predictability is a trustor’s expectation that an object of trust will act consistently based on past experience.

- **Ease of use:** Corritore (2005, p. 2421) explains that *“the perception of ease of use reflects how simple the website is to use”*. Other authors adapted the definition to the specific ease related to the use of a mobile banking application (Almaiah et al., 2023).
- **Risk:** this is described as the degree of danger an individual perceive in a mobile banking application, claiming that there is an inverse relationship between perceived risk and trust (Almaiah et al., 2023).

For the sake of this study, we used another essential variable in relation to the model above, that is the degree of openness of the banks. This measure is described as the volume of APIs used in data exchanging between banks and third parties in the open banking ecosystem, as suggested by (Stefanelli & Manta, 2023) and mentioned in the paragraph 2.2.3., the number of APIs developed by the banks has been found in the online portals of each institution, where a page for third parties developers exists. Most of the Italian banks work together with open banking platforms, created in timing with the PSD2 initiative. These platforms allow third parties to develop applications and interfaces to exchange data with the credit institutions system. The largest and most utilized in Italy are Cedacri Group, Nexi Group, CBI Globe and Fabrick.

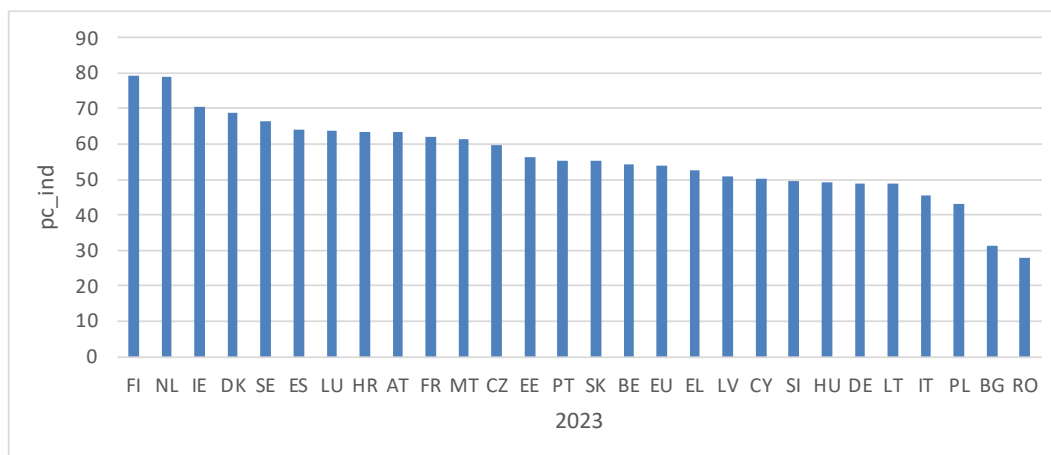
### 3.1.2. Hypothesis

The literature review evaluated in the previous chapters led us to formulate four hypotheses emerging from the results of the participants’ collected data.

Another interesting point of discussion concerns the digital literacy of open banking users and the length to which this affects the willingness of customers to trust online banking. However, this



issue is very much related to the differences within European countries (Figure 14). A large part of the EU population still lacks basic digital skills, even though most jobs require such skills.



**Figure 14:** Percentage of individuals with at least basic digital skills. Source: DESI index 2023

A previous study (Sunikka et al., 2010) highlight how above average financial capabilities may lead to a decrease in trust towards online banking, while most of the literature is arguing the opposite; that is that communities with low levels of digital literacy may distrust digital banking tools (Preziuso et al., 2023). Furthermore, some authors (Mukherjee & Nath, 2003) argue that a deficiency in experience might generate apprehensions about internet use, potentially leading to avoidance of online activities and subsequently contributing to a lack of trust. Therefore, we decided to test this variable in our study by asking people to share their level of comfort and confidence in navigating their bank’s online platform/mobile app and in performing several online banking operations.

***H1. Positive correlation between the level of digital literacy and online bank trust.***

Hwang et al., (2021) suggest in their paper a perspective that emphasizes the heightened significance of trust within the virtual environment compared to the physical world. Trust in online platforms is not only about personal interactions but also extends to the reliance on digital systems, algorithms, and information dissemination. As a result, the virtual environment becomes a significant arena for social control, where trust serves as a mechanism that guides and regulates individuals' actions and decisions. As mentioned in the paragraph 2.2.3., it has been recently studied how the degree of openness of a credit institution affects the formulation of external agreements (Stefanelli &

Manta, 2023). Since the PSD2 mandates the sharing of data with external parties within the open banking ecosystem, our goal is to study whether different levels of openness of a bank have an effect on customers' trust. APIs are indeed a source of data for a third party, because they let each one being in the system to access and use its information (Omarini, 2018a).

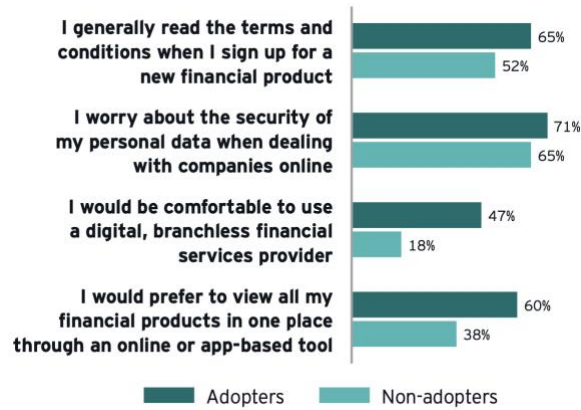
***H2a.*** *There exists a significant positive effect in the relationship between banks' openness (as indexed by the number of APIs) and customers' online banking trust.*

In this digital environment, where secure access is becoming a necessity for banks, reputation is proved to be a significant determinant of consumer trust (Jarvenpaa et al., 2006). Since almost all banks now provide services online, trust has grown to be a crucial factor that can be managed through institution-based trust mechanisms like website quality, transaction security, and reputation (Muñoz-Leiva et al., 2010). This makes the issue even more pressing.

The more a bank develops APIs, the more it disappears from the territory, and the more it is present in the "cloud". This generates some pros in affirmation, including an improvement in economic sustainability and financial inclusion (Stefanelli & Manta, 2023). As we have seen before, and supported by some authors (Scott et al., 2017), technological innovation carried by an increased openness is proved to be also signal of overall improvement in bank performance. Therefore, we are driven to suppose that a greater technological openness of a bank towards the OB environment leads to a greater perceived reputation and vice versa.

***H2b.*** *There exists a significant and positive effect of the level of banks' openness (as indexed by the number of APIs) and their reputation.*

Ernst & Young (2019, p. 11) analyzed the differences between adopters and non-adopters of Fintech services regarding attitudes towards online data privacy. The chart in Figure 15 shows that, while heavy adopters are more willing to favor diverse online tools or solutions, they are also more concerned with privacy and security.



*Figure 15: Analysis of views on personal risk management and digital financial services. Source: EY (2019)*

However, according to Mukherjee & Nath (2003), customers' inclination toward engaging in e-commerce and their extent of utilizing e-commerce technology are outcomes of their confidence in electronic systems, acting as an incentive for their trust in online banking.

Therefore, our supposition is that a greater frequency of usage of online banking by individuals elevates individuals' willingness to trust new solutions and third parties' options.

*H3. Moderation effect of frequency of usage in the relationship between openness (as indexed by the number of APIs) and online banking trust.*

### 3.2. Research method

This study has used an online survey as an instrument to collect data, specifically, data were collected using Qualtrics XM. After providing proper informed consent, a survey was administrated to the participants. Therefore, a quantitative method was utilized to test and analyze the pool of data. SPSS (IBM SPSS, 2021) is the software used to run analysis and build the models, along with the PROCESS macro for moderation analyses (Hayes, 2014).

#### 3.2.1. Participants

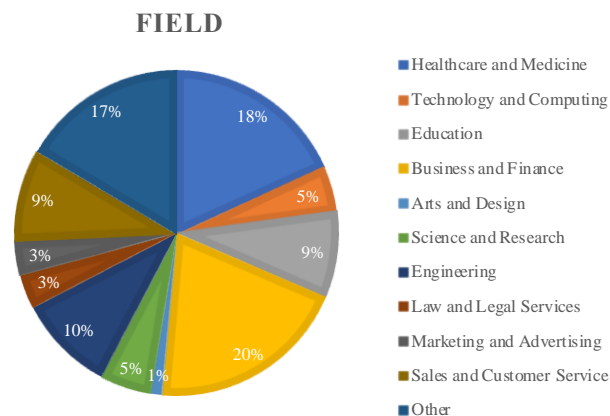
The sample encompassed a total of 175 respondents (98 F, 77 M; mean age = 37,62 ± 16,39 s.d.). After providing informed consent in compliance with the EU Regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 related to the protection of personal data (Radley-Gardner et al., 2016), participants were informed of their right to discontinue participation at any time.

Participants were reached through a selection of multiple channels. Anonymous links and QR codes were shared via different social media platforms, such as Instagram, Facebook, WhatsApp as well as via direct and indirect contacts.

Even though the study is mostly interested in the Italian sample of respondents, the survey was shared without any nationality filters. For this reason, both Italian speakers and English speakers took part to the experiment.

Regarding the occupational level of the population sample, 59% declared to be full-time working. Among the others, 5% work part-time, 11% are self-employed and 3% are unemployed. A 22% of the total instead is made up of students. In order to catch everyone’s background, we asked to select the best category describing their field of work/study. The interest is directed at assessing the digital literacy of the population, assuming that people with a technological/financial/economical background have a higher chance to be digitally literate.

Accordingly, figure 16 shows the distribution of the fields related to the data collected. The biggest piece of the cake (20%) tells that the population has a background in business and/or finance, which leads us to expect a somewhat well-educated sample around the object of this study. However, the volumes appear to be well distributed and therefore the participants have heterogeneous background experience.



*Figure 16: Breakdown of participants' job fields.*

### 3.2.2. Questionnaire

The survey administered was made up of nine blocks. The starting point was asking participants to select the language between English and Italian. This choice had the ultimate goal to

reach more people as possible, in order to eventually compare Italian banks' trends with others. Right after, the introductory part provided informed consent, explained the goal of the study, and gave some useful information for the respondent to read, specifically related to the object of the study. Information were given to make sure that participants had at least a minimum understanding of the survey.

From that point, Corritore's model of online trust helped us to build the survey. First, some demographics were asked (age, gender, employment). Then, participants were tested on six control questions, i.e., the external factors in the model.

The background/job field was asked in order to make some assumptions regarding the participants' literacy above open banking materials. For similar reasons, we asked people to express their level of comfort in navigating their banks' online platforms or mobile apps. Then, participants were asked to assess their ability to perform a series of tasks using digital channels on a scale from 'not confident' to 'very confident'. These tasks included checking account balances, transferring money between accounts, paying bills online and setting up automatic payments.

The usage of online banking services is extremely interesting to consider in this context. Thus, participants were asked to describe the frequency of use of these services on a weekly basis. We used this scale as a metric to differentiate 'heavy users' from 'light users'.

Lastly, we asked about awareness of the security measures initiated by their bank and about their attention to personal security measures taken around online banking services.

Prior to continue with the main section of the survey, participants were given a list of banks where to select the bank holding their account. The list comprises of 43 banks, of which 24 Italian, 13 from selected European countries and 6 online-only banks. The decision to include or not some banks was taken upon thoughtful considerations. Nonetheless, participants has also the option to write the name of their bank in a given space in case the institution holding their account was not in the list.

The analysis sample was identified on the basis of market capitalization, according to data provided by Refinitiv Eikon. The 24 Italian banks are classified as the largest by market capitalization at the moment of research, filtered by sector (banks NEC and private banks). The other banks were chosen among the top three banks by market capitalization for the biggest ten European countries by GDP. The overall choice to select the biggest banks is suggested by the positive nexus between firm size and innovation performance (Kleinknecht, 1989).

Once the bank was selected, a series of four blocks were built with a 19-scale instrument for measuring the components of a model of online trust of an individual towards a given website

(Corritore, 2005). Three of them constituted the perceived factors of the model. The first section was about credibility, evaluating participants' perception of their bank's reputation, honesty, and predictability. The second section asked them to rate the ease of use of their bank. Later, participants were asked about the perceived risk associated with operating with their bank. The fourth and last section was directly assessing the trust perception of the respondents. All the questions used a rating scale capable of identifying intermediate ranges of the variables analyzed (i.e., 5-points Likert scale).

### 3.3. Data collection and analysis

The first step after the data collection has been the cleaning of those data. After excluding incomplete answers, data were scored in order to obtain a single individual score number for each scale and subscale included in the survey. Data were also z-transformed before statistical testing.

The formal analyses included a series of exploratory Pearson's correlations across all the variables of interest. Then, a series of linear multiple regressions were used to test hypotheses 1 and 2. In such regressions the various Trust measures (i.e., the total score for the entire scale, as well as the scores associated with the subscales) were used as dependent variables, while the level of openness (i.e., number of APIs) was used as independent variables along with the external factors i.e., Frequency, Comfort, Task, Awareness, and Security, as well as the control variables age, gender and employment.

Finally, to test hypothesis 3, based on the results of the exploratory Pearson's correlations, a moderation model was conducted using the subscale predictability from the online trust questionnaire as dependent variable, the level of openness (i.e., number of APIs) as independent variable, and the external factor frequency as moderator, along with the covariate age, gender, and employment.

### 3.4. Results

The sample of participants to this study is summarized as follows (Table 1):

*Table 1: Descriptive statistics*

	Minimum	Maximum	Average	Std. Deviation
<i>Frequency</i>	1	5	3,37	1,141

<i>Comfort</i>	1	5	4,07	0,971
<i>Task</i>	5	20	16,47	3,373
<i>Awareness</i>	1	5	3,23	1,102
<i>Security</i>	1	5	2,93	1,127
<i>APIs</i>	0	21	5,56	3,039
<i>Honesty</i>	4	20	15,78	2,893
<i>Reputation</i>	3	10	8,05	1,500
<i>Predictability</i>	3	15	11,64	2,282
<i>Ease of use</i>	3	15	12,41	2,431
<i>Risk</i>	4	20	7,82	3,260
<i>Trust</i>	4	10	8,52	1,372
<i>Tot</i>	39	90	72,57	9,922

It is interesting to note from the descriptive statistics that the average values for perceived security and perceived risk are rather low, respectively 2,93 in the range of 0-5 and 7,82 in the range of 0-20. Together, these premises help explaining why the ‘tot’ (merged variables of online trust) scored a minimum of 39 and an average of 72,57. The overall group of participants seems not be highly trustful when considering the object of the study.

**H1.** As a first step in the statistical analysis, Pearson’ correlations were computed across all the scales and subscales in table 2. The results of Pearson’s correlation analysis provide valuable insights into the hypothesis regarding the existence of a positive correlation between the level of customers’ digital literacy and online bank trust. Digital literacy, in this context, is primarily described by two variables: ‘comfort’ and ‘tasks’ (see Table 2).

In particular, the correlation coefficient between online bank trust and ‘comfort’ is found to statistically significant ( $r = 0.396$ ,  $p < 0.01$ ) indicating a moderate positive correlation and suggesting that individuals who express higher levels of comfort in operating their bank's online platform or mobile app tend to have greater trust in online banking. Similarly, the correlation between online bank trust and ‘tasks’ is statistically significant ( $r = 0.220$ ,  $p < 0.01$ ), denoting again a positive correlation. This implies that users who report higher confidence in performing various online

banking operations, such as payments, scheduled payments, balance checking, and money transfers, tend to exhibit higher levels of trust in online banking. Those findings were in line with our assumption, hence confirming hypothesis H1.

*Table 2: Results of the Pearson's correlations across the variables of interest*

	1	2	3	4	5	6	7	8	9	10	11	12	13
<b>1-Frequency</b>	r												
	p												
<b>2-Comfort</b>	r	,292**											
	p	0,000											
<b>3-Task</b>	r	,340**	,340**										
	p	0,000	0,000										
<b>4-Awareness</b>	r	,324**	,231**	,391**									
	p	0,000	0,002	0,000									
<b>5-Security</b>	r	0,055	,209**	,219**	,277**								
	p	0,467	0,005	0,004	0,000								
<b>6-APIs</b>	r	<b>0,125</b>	0,101	0,051	0,045	-0,002							
	p	0,101	0,185	0,502	0,557	0,978							
<b>7-Honesty</b>	r	0,004	,335**	0,054	0,062	-0,003	-0,053						
	p	0,959	0,000	0,475	0,419	0,969	0,486						
<b>8-Reputation</b>	r	-0,006	0,073	-0,078	-0,062	-0,059	<b>,168*</b>	,386**					
	p	0,932	0,340	0,304	0,414	0,436	0,026	0,000					
<b>9-Predictability</b>	r	0,062	,248**	0,138	0,148	-0,010	0,030	,581**	,396**				
	p	0,416	0,001	0,069	0,051	0,899	0,693	0,000	0,000				
<b>10-Ease of use</b>	r	0,131	,418**	,347**	,181*	0,096	0,038	,495**	,283**	,594**			
	p	0,085	0,000	0,000	0,017	0,205	0,622	0,000	0,000	0,000			
<b>11-Risk</b>	r	-0,140	-,283**	-,213**	-0,024	-0,024	-0,022	-,299**	-0,137	-,391**	-,327**		
	p	0,065	0,000	0,005	0,757	0,756	0,774	0,000	0,071	0,000	0,000		
<b>12-Trust</b>	r	0,109	,256**	,209**	0,124	0,071	0,083	,455**	,382**	,535**	,596**	-,487**	
	p	0,151	0,001	0,005	0,102	0,347	0,276	0,000	0,000	0,000	0,000	0,000	
<b>13-Tot</b>	r	0,107	<b>,396**</b>	<b>,220**</b>	0,112	0,029	0,045	,766**	,522**	,807**	,759**	-,674**	,758**



p	0,157	0,000	0,003	0,141	0,702	0,557	0,000	0,000	0,000	0,000	0,000	0,000
* . Correlation is significant for $p < 0,05$												
** . Correlation is significant for $p < 0,01$												

Later on, we computed a series of linear multiple regressions the set of Hypotheses 2.

**H2a.** We started by testing the overall effect of the model on the total score of the online trust scale. The result shows that the main effect of the banking online trust is significant ( $F_{1,172} = 5.531$ ,  $p < 0.001$ ) (Table 3). The overall model's statistical significance suggests that the set of independent variables jointly explains a significant proportion of the variance (23%) in the dependent variable,  $Z(\text{tot})$ , at a confidence level of 99.9%. However, it is essential to delve into the specific coefficients of the individual independent variables to understand their contributions.

**Table 3:** Results of the multiple linear regression conducted using the total score of the online trust scale as dependent variable, the external factors (i.e., frequency, comfort, task awareness and security) the level of openness (i.e., APIs), and the control factors as independent variables.

	$\beta$	SE	t	p
Frequency	0.00	0.08	0.02	0.98
<b>Comfort</b>	<b>0.35</b>	<b>0.08</b>	<b>4.46</b>	<b>0.00</b>
Task	0.14	0.08	1.73	0.09
Awareness	0.05	0.08	0.60	0.55
Security	-0.05	0.07	-0.75	0.46
APIs	0.02	0.07	0.28	0.78
Age	0.00	0.00	-0.77	0.44
<b>Gender</b>	<b>0.31</b>	<b>0.15</b>	<b>2.11</b>	<b>0.04</b>
<b>Employment</b>	<b>0.09</b>	<b>0.04</b>	<b>2.05</b>	<b>0.04</b>

Of particular interest is the finding that Z(APIs) does not emerge as a significant predictor in the model. This implies that, within the context of the examined variables, the degree of openness of banks towards digitalization in banking services does not have a statistically significant impact on customers' online banking trust. This result contradicts the initial hypothesis, H1a, which posited a significant effect in the relationship between banks' openness and customers' online trust.

Nonetheless, the external factor comfort was found significant ( $\beta = 0.35, t = 4.46, p < 0.001$ ) indicating that the level of customers' online trust increases as a function of their level of comfort in engaging in online banking. The effect of gender ( $\beta = 0.31, t = 2.11, p < 0.05$ ) and employment ( $\beta = 0.09, t = 2.05, p < 0.05$ ) was also found statistically significant, indicating that surveyed people's trust in online banking services, as measured by the model above, varies significantly based on their gender and employment status. All the other variables, on the other hand, were found non-significant (all  $p > 0.05$ ).

In conclusion, while the overall model is statistically significant, suggesting that the chosen set of variables collectively explains a significant portion of the variation in online trust, the non-significance of the APIs indicates that this specific factor does not play a significant role in influencing customers' online banking trust. This finding prompts a reconsideration of the factors that contribute to online trust, emphasizing the need for further investigation into the aspects of customers' perceptions and behaviours in the increasingly digital banking landscape.

**H2b.** Later, H1b was tested, namely the significant and positive effect between a bank's openness (APIs indexed) and the reputation of that bank. For this reason, another linear multiple regression was computed (Table 4).

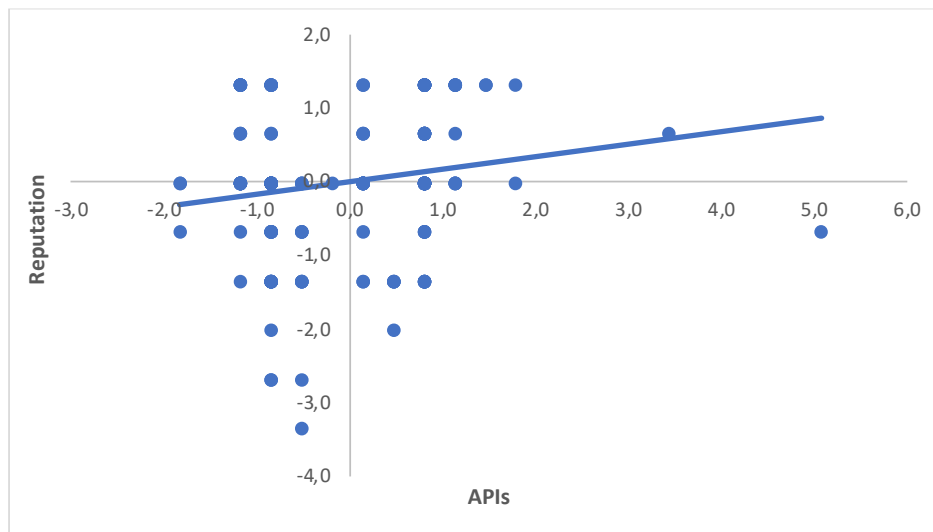
**Table 4:** Results of the multiple linear regression conducted using the reputation as dependent variable, the external factors (i.e., frequency, comfort, task awareness and security) the level of openness (i.e., APIs), and the control factors as independent variables.

	$\beta$	SE	t	p
Frequency	0.03	0.09	0.40	0.69
Comfort	0.09	0.09	1.04	0.30
Task	-0.07	0.09	-0.78	0.44
Awareness	-0.02	0.09	-0.25	0.80
Security	-0.03	0.08	-0.38	0.71

<b>APIs</b>	<b>0.18</b>	<b>0.08</b>	<b>2.40</b>	<b>0.02</b>
Age	-0.00	0.00	-0.20	0.84
<b>Gender</b>	<b>0.37</b>	<b>0.16</b>	<b>2.33</b>	<b>0.02</b>
Employment	0.06	0.05	1.21	0.23

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In this analysis, the overall model demonstrates statistical significance ( $F_{1,172} = 1.943$ ,  $p = 0.049$ ), suggesting that the set of independent variables collectively explains a significant proportion of the variance (10%) in the dependent variable, reputation, at a confidence level of 95%. Notably, the positive and significant effect of APIs on the dependent variable indicates that the degree of openness of a bank's APIs is associated with a positive impact on the reputation of the bank ( $\beta = 0.18$ ,  $t = 2.40$ ,  $p < 0.05$ ). The confirmation of this hypothesis aligns with the expectation that a more open approach, as reflected in the use of multiple APIs, can contribute positively to a bank's reputation.



*Figure 17: Scatterplot graph of the correlation between Z(APIs) and Z(Reputation)*

The observation of outliers in the scatterplot graph (Figure 17) introduces an additional layer of insight into the relationship between a bank's openness (specifically, the volume of APIs) and its reputation. Outliers, in this context, refer to data points that deviate significantly from the general pattern of the data.

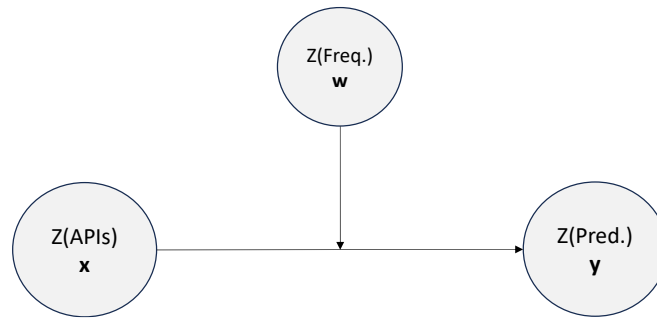
In this case, the scatterplot suggests that some banks with a substantial volume of APIs may be influencing the observed effect. We will discuss about these outliers in the next chapter.

**H3.** In a subsequent stage, a moderation analysis was conducted in the effort to further characterize the link between banks’ openness, online trust, and external factors. In particular, based on the results of the exploratory correlational analyses, it is possible to see how the only external factor that appears to significantly correlate with some dimension of online trust and level of openness (APIs) is represented by the variable ‘frequency’. Along the same lines, the only dimension of online trust that correlated with both APIs and at least one external factor is represented by the level of predictability. Hence, in the final step of the analyses the variable frequency was used as moderator of the relationship between the level of openness of the bank (independent variable) and the predictability dimension of online trust (dependent variable). See figure 18 for a graphical presentation of the model.

The regression model is overall significant ( $R = 0.2770$ ,  $R^2 = 0.0767$ ,  $F = 2.3266$ ,  $p < 0.05$ ) indicating that the combined variables significantly contribute to the prediction of ‘Predictability’ (Figure 20). Even though the main effects of ‘Frequency’ ( $\beta = 0.11$ ,  $t = 1.41$ ,  $p = 0.16$ ) and ‘APIs’ ( $\beta = 0.04$ ,  $t = 0.51$ ,  $p = 0.61$ ) were not individually significant, the interaction effect instead was statistically significant ( $\beta = 0.18$ ,  $t = 2.02$ ,  $p < 0.05$ ), showing that the frequency of usage did have a moderating influence on the association between banks’ openness towards third parties in increasing digital solutions (‘APIs’) and the predictability of digital banking services (Table 5).

*Table 5: Results of the multiple linear regression conducted using the predictability of the online trust scale as dependent variable, the external factor frequency, the level of openness (i.e., APIs), and the control factors as independent variables.*

	$\beta$	SE	t	p
APIs	0.04	0.08	0.51	0.61
Frequency	0.11	0.08	1.41	0.16
<b>Int_1</b>	<b>0.18</b>	<b>0.09</b>	<b>2.02</b>	<b>0.05</b>
Age	-0.00	0.00	-0.78	0.44
<b>Gender</b>	<b>0.31</b>	<b>0.16</b>	<b>1.96</b>	<b>0.05</b>
Employment	0.06	0.05	1.19	0.24



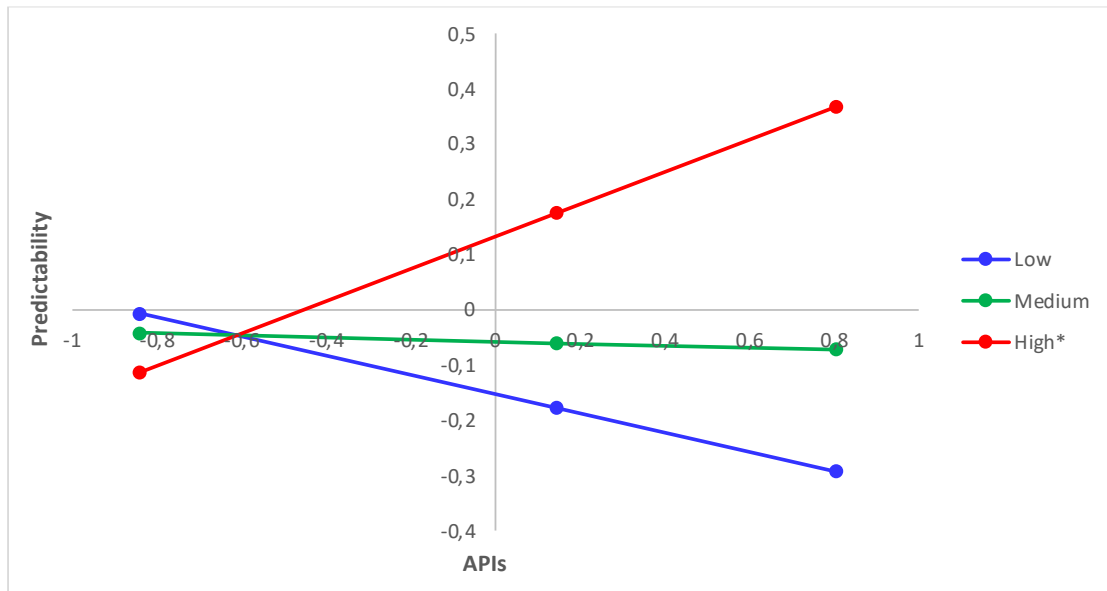
*Figure 18: Summary of the model*

The conditional effects analysis (Table 6) revealed that there was a significant positive effect ( $p = 0.050$ ) at the highest level of frequency. In other words, when the frequency of usage is high, there is a direct increase in individuals’ predictability with the rise in the volume of APIs, as depicted in the graph where the red line illustrates this positive relationship (Figure 19). Furthermore, the graph shows a parametrical effect wherein at medium frequency of usage no relationship exist between the number of APIs and predictability (see Figure 19, green line), and the relationship becomes even negative – hence, showing a reduction in the level of predictability with increasing number of APIs - for low frequency of use (Figure 19, blue line) despite this effect failed to reach statistical significance ( $p = 0.17$ ).

These results support the hypothesis (H3) by highlighting the moderating role of ‘Frequency’ in influencing the connection between ‘APIs’ and ‘Predictability’ in the context of online banking trust.

*Table 6: Conditional effects of the focal predictor at values of the moderator(s)*

	$\beta$	SE	t	p
Low	-0.17	0.13	-1.37	0.17
Medium	-0.02	0.08	-0.23	0.82
<b>High</b>	<b>0.29</b>	<b>0.15</b>	<b>1.97</b>	<b>0.05</b>



*Figure 19: Scatterplot of the moderation effect.*

## Chapter 4

### 4.1. Discussion

This study calls the attention to a series of results and considerations.

The results of the descriptive statistics picture an overall trusting population. Although the average scores of perceived risk and perceived security showed a low-key trend, these results find significance considering previous literature. Specifically, surveyed people do not update passwords as often as expected and do not worry about implementing many additional security measures, but also feel the need to be cautious when interacting with the digital services provided by their bank. Almaiah et al. (2023, p. 6) suggest that, “*by providing a high level of security, the trust of users would increase, and thus, users’ attitudes toward mobile banking services would become more positive*”. Prior studies (Widyanto et al., 2021) have claimed that there is a connection between perceived risk and perceived trust, as user trust can increase if the perceived risk levels are as low as possible.

Firstly, the lack of a significant relationship between the degree of openness of banks (indexed by APIs) and customers’ online banking trust challenges our assumptions about the role of technological openness in fostering trust (H2a). This result suggests that while APIs are pivotal in facilitating a safe and protected data exchange in the open banking ecosystem, they may not directly translate into enhanced trust among customers.

While the non-significant impact of APIs on overall online trust is surprising, it aligns with the evolving understanding of trust dynamics in digital environments. Moreover, recent studies in behavioral economics emphasize the role of perceived fairness and ethical considerations in trust formation. The lack of a significant effect suggests that customers’ perceptions might be influenced by intangible elements beyond the mere technological infrastructure.

While previous studies have documented gender differences in financial behaviors and attitudes, our findings contribute to this body of knowledge by demonstrating that gender plays a role in shaping trust in the use of online banking services. Of particular interest, Anneli Järvinen (2014) studied the demographics variations in trust among European countries. Specifically, they conclude that men tend to trust banks less than women. This is moderately supported by our findings, with our sample of participants confirming that the female portion of the population is more inclined to trust online banking services.

Specifically, the positive coefficient associated with gender (where a score of 1 represents ‘male’ and 2 represents ‘female’) suggests that, on average, female participants tend to exhibit a higher level of trust in online banking compared to their male counterparts. Similarly, the positive

coefficient related to employment (scored on a scale of 1-5) implies that as employment levels increase, there is a corresponding increase in trust, showcasing the influence of employment status on individuals' perceptions of online banking trustworthiness."

The positive relationship between a bank's openness, measured by APIs, and its reputation underscores the strategic importance of adopting a technologically progressive approach (H2b). The positive reputation associated with technological openness aligns with broader trends in the financial industry, where innovation is increasingly becoming synonymous with reliability and forward-thinking (Stefanelli & Manta, 2023; Omarini, 2018a).

Furthermore, this result accentuates the importance of transparency and collaboration in building trust in the digital banking landscape. Banks that embrace open banking principles and engage in partnerships with third-party providers signal a commitment to innovation and customer-centricity, thereby enhancing their reputation in the eyes of customers. This finding aligns with the discussions in Chapter 2 regarding the strategic importance of APIs in driving innovation and fostering collaboration between traditional banks and fintechs.

It is also interesting to note that our result is in line with a 2003 study from Mukherjee and Nath, suggesting that trust can be transferred between customers and third parties, when there is a strong tie between banks' web sites and third parties. Reputations is found to arise in multiple cases, such as the strength of a brand name, the endorsement from trusted third parties and on/off-line interactions history. Considering other factors unmutated, banks sites are seen as more trustworthy when they have a greater number of third parties referrals, explaining how third parties endorsement plays an important role in boosting the reputation of a bank.

The outliers in the dataset hint at potential variations in how different banks leverage openness for reputation enhancement. Our data tell that there are a few banks that outperform the average level in terms of openness, thus in volume of APIs. Namely, Banca Sella is the Italian bank with the greatest number of interaces, according to our research (*Developers - Fabrick*, n.d.). In collaboration with Fabrick, Banca Sella is actively working with the ecosystem and the community of developers to introduce new APIs to the market. Its openness, combined with a customer-centered focus, are installing an unrivalled reputation.

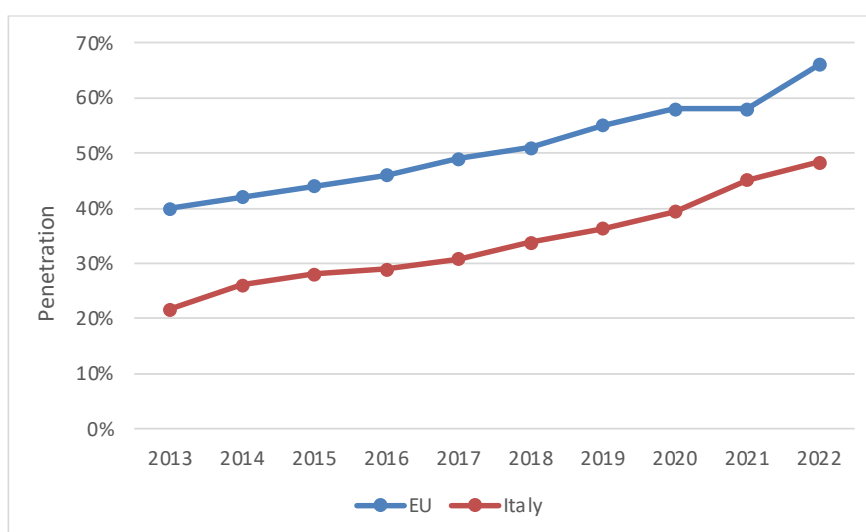
Furthermore, the positive correlation between customers' digital literacy and their trust in online banking emphasizes the role of education and empowerment in building trust in digital financial services (H1). Moreover, it supports the existing literature highlighting the pivotal role of user experience in shaping perceptions of trust. Extending beyond the study's scope, research



suggests that enhancing digital literacy involves not only improving users' technical skills but also fostering a deeper understanding of the security measures employed in online banking.

On this note, Mukherjee & Nath (2003, p. 7) state that “customers' orientation towards the technology of electronic communication and the Internet is frequently a proxy for their trust in Internet banking”. This is explained as more experienced customers tend to have greater trust in online transactions when they have more information and thus have an overall greater digital literacy. In an era where cybersecurity concerns are paramount, initiatives aimed at educating users about the robust security measures adopted by banks can further strengthen the positive correlation between digital literacy and trust. This, in turn, can contribute to the broader goals of financial institutions in cultivating a secure and trustworthy online banking environment.

The latest results instead finds the frequency of usage of digital banking solutions as moderating the expectations users have in terms of these services (H3). Our findings are partially explained by the fact that a major part of the population sample was Italian. That is supported by (Zachariadis, 2022). Even though the number of value-added services is increasing, the development of initialization services is rather limited. This implies that the volumes from the offer side are low compared to the European average. Moreover, as of 2022, online banking penetration in Italy was around 48 percent compared to the EU average of 66 percent (Figure 20). This suggests that the demand faces the same problem. Overall, the Italian market is struggling to take off within the PSD2 scope. This helped to formulate a couple of explanations, when considering H1 and H3. Indeed, these two assumptions of ours are tightly connected.



**Figure 20:** Online Banking penetration in EU and Italy. Source: Statista

The findings suggest that a greater frequency of online banking usage enhances individuals' trust in the predictability of digital banking services' outcomes. Customers who frequently engage with online banking services are more likely to trust new solutions and third-party options, particularly when banks demonstrate a higher degree of openness through APIs. The moderation effect of usage frequency introduces a dynamic element to the relationship between banks' openness and trust. This aligns with the notion that frequent interaction fosters familiarity, reducing the perceived risk associated with technological openness. It also underscores the importance of continuous engagement and positive user experiences in building trust over time. This aligns with Mukherjee & Nath's (2003) assertion that customers' confidence in electronic systems influences their trust in online banking, emphasizing the incentive provided by a robust and open digital banking environment.

## **4.2. Key findings and Implications**

This study aimed at understanding to what extent does the degree of openness in banking systems impact consumer trust, and what are the key factors influencing trust levels in the context of open banking.

At first, the study explores the impact of digital trends on organizational changes within the banking sector, highlighting the emergence of data-driven companies and the shift towards ecosystems and platforms. While these trends offer opportunities for innovation, they also raise concerns about data security and trust in digital services. Technological advancements have transformed financial services, leading to increased globalization, market integration, and technology-driven finance. However, these advancements have also introduced key economic frictions, challenging traditional banking models and necessitating adaptation to new digital landscapes.

Furthermore, the rise of the fintech ecosystem has reshaped the payment landscape, introducing new players and disrupting traditional banking paradigms. This evolution presents both challenges and opportunities for traditional banks to collaborate and compete within a rapidly changing industry. The implementation of open banking, driven by regulatory frameworks such as PSD2, has revolutionized banking operations and fostered innovation through data sharing and API integration. While open banking offers potential benefits in terms of customer experience and market competitiveness, it also raises questions about data sensitivity and trust in data-sharing practices.

The study sheds light on the complex interplay between technological openness, customer trust, and online banking behaviors. While the degree of openness, as measured by APIs, may not

directly correlate with trust levels, factors such as security measures, reputation, and digital literacy significantly influence consumers' trust perceptions.

One crucial determinant of trust in digital banking is the effectiveness of security measures implemented by banks. Consumers' confidence in the security protocols employed to safeguard their personal and financial information profoundly influences their trust levels. Understanding consumers' perceptions of security measures and identifying ways to enhance their effectiveness can contribute to building trust in digital banking services.

The reputation of banks is found to play a role in shaping trust perceptions among consumers. Banks that have a history of reliable service, transparent practices, and ethical conduct are more likely to instill trust in their customers. Building and maintaining a positive reputation through consistent delivery of high-quality services and transparent communication can strengthen trust relationships with customers over time.

Digital literacy emerges as another critical factor influencing trust in digital banking. Consumers' understanding of digital technologies, their ability to navigate online platforms, and their awareness of security risks profoundly impact their trust perceptions. Investing in initiatives to improve digital literacy among consumers can empower them to make informed decisions and build trust in digital banking services. That is even more true when considering our sample of analysis: figure 15 highlights the poor Italian level in digital literacy, confirmed by low scores of 'awareness' and 'security' in our sample population.

The findings underscore the strategic importance of adopting a technologically progressive approach in the open banking market. Banks that embrace openness and collaborate with third-party providers stand to enhance their reputation and competitiveness.

Transparency emerges as a key factor in building trust and fostering innovation in the digital banking landscape. Banks that demonstrate transparency in their operations, partnerships, and data-sharing practices can instill confidence in customers and stakeholders. Transparent communication about data usage, security measures, and privacy policies can mitigate concerns and build trust in open banking initiatives. Secondly, collaboration with third-party providers is essential for driving innovation and enhancing competitiveness in the open banking market. By leveraging the expertise and resources of fintechs and other ecosystem partners, banks can deliver innovative solutions that meet evolving customer needs. Collaborative partnerships also enable banks to expand their service offerings, enhance customer experiences, and differentiate themselves in the market. Lastly, customer-centricity should be a focal point of future managerial strategies in the digital banking landscape. Banks that prioritize customer needs, preferences, and feedback can build stronger

relationships with customers and drive long-term loyalty. By tailoring their services to meet customer expectations and delivering personalized experiences, banks can enhance trust and position themselves for success in the competitive open banking market.

The study highlights challenges facing the Italian market in realizing the full potential of open banking initiatives within the PSD2 framework. Limited development of value-added services and relatively low online banking penetration pose barriers to widespread adoption. Promoting the adoption of open banking principles requires collaborative efforts from policymakers, regulators, financial institutions, and industry stakeholders. The 2016 EU Payment Service Directive (PSD2) entered the market with the goal of levelling the playing field for all stakeholders and increasing market efficiency and security through increased competition. The initiative allows third parties to access customer's financial data in order to build new solutions.

Adapting to these paradigm shifts, large European financial institutions are not merely reacting but actively collaborating to establish industry standards, exemplified by initiatives such as standard APIs. This collaborative effort seeks to enhance security and safety within payment systems. Entities such as CBI Globe, Fabrick and Cedacri are operating as fundamental industry utilities and serve a large ecosystem of Italian banks by managing open banking interfaces. This could be seen as an additional layer of security that minimizes risk and increase trust in customers.

## **4.2. Future Managerial and Research Suggestions**

Future research could delve deeper into understanding the diverse drivers of trust in digital banking environments. An advanced exploration into the specific practices or contextual factors contributing to these variations could provide actionable insights for banks aiming to improve their reputation in an increasingly competitive landscape.

Mukherjee & Nath (2003) point out how banks must undertake many steps in order to earn greater trust in customers when online banking. They suggest highlighting shared value and cooperation with the clientele, meaning by “recognizing customers’ right to data ownership”. Institutions could introduce some customer-oriented information privacy models, that help customers to manage their information. This way customers can assess banks’ reliability and trustworthiness.

This highlights the need for banks to adopt comprehensive strategies that not only prioritize technological advancement but also address customer perceptions of security, reliability, and transparency.

With a booming Fintech ecosystem, Italy has a great potential for further development of open banking strategies. However, future managerial strategies should focus on transparency, collaboration, and customer-centricity to build trust and foster healthy innovation in the digital banking landscape. Future research could explore strategies to overcome any challenge and promote the adoption of open banking principles in the Italian financial ecosystem.

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