POLITECNICO DI TORINO

Master of Science in Engineering and Management

Master of Science's Degree Thesis

The Digital Payment industry: a strategic perspective for Europe

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2. Preface

During my academic activity I have been engaged in an internship at PricewaterhouseCoopers Advisory, the biggest management consulting firm worldwide as a technology consultant in the field of financial services. Here I had the chance to work for leading Italian banking client from day 1.
This internship experience gave me the opportunity to deep dive on the interesting spectrum of core competences of the "Tech FS-Bank" organization within the Technology consulting line of services of the firm. These include:

- Core Banking
- Open Banking
- Payments&Cards

Working in the field and discovering the diverse technological solutions adopted by the firm's clients I have gradually assembled the daily experiences and contribution until the renowned "big picture" of the industry arose to my mind.
I have started reading business and technology articles on specific magazines, searching on the firm's documentation and talking with subject matter experts in order to increase my comprehension of the industry, its mechanisms and its levers. This parallel exercise have become more interesting day by day as my understanding was allowing me to apply the precious set of skills and knowledge achieved during my academic studies in Engineering and Management at Politecnico di Torino.
While many distinct professionals in financial services are legitimately concerned with revenue and margins, my unbiased - despite inexpert - vision allowed me to reason on the industry as a whole, putting aside the component of the individual player's interest within it.

My interest in digital payment industry further increased when I realized that a concrete political will to strengthen the European cluster was pushing EU to undertake an uninterrupted series of projects aimed at integration and harmonization of local realities.
The mission of this dissertation is to present the industry in terms of features, stakeholders and trends, with the ultimate goal of forecasting the traits of the next emerging paradigm and designing a high level solution proposal applicable to the European case.

3. Industry Overview

3.1. Advantages for society

Digitalization has undoubtfully changed society in terms of simplicity, interconnection and efficiency of everyday activities. It has also revolutionized our economies and productions systems in almost every sector and industry. The opportunities offered by digital represented a life-saving factor in the unforeseen health crisis manifested in 2020. The capillary availability of fast internet connection in most households and the extensive use and development of remote interaction technologies allowed society to keep part of the productive systems active while respecting the principle of social distancing.

In the field of payments, the use of digital tools like payment cards, home banking and mobile banking has allowed in the least years to bypass the inefficiencies of cash-based transactions.
Diverse categories of risk are embedded within the use of cash, therefore several Countries today set upper bounds on transaction values for which non-electronic payment may be legally used. Among the main related risks can be counted:

- Business risk (use of counterfeit money, robbery etc.) which corresponds costs related to the cash processing and physical security
- Non-traceability risk such as money laundering, tax evasion and performance of illegal transactions bypassing bank sanction and embargo systems
- Biological risk of spreading disease through coins and banknotes

The reasons above discussed have contributed to a growing trend in the pursuing of the “cashless society” defined by B. Chakravorti, Executive Director of Fletcher’s Institute for Business in the Global Context (IBGC), as the “economic state whereby financial transactions are not conducted with money in the form of physical banknotes or coins, but rather through the transfer of digital information (usually an electronic representation of money) between the transacting parties” [1].

3.1.1. Financial Inclusion

One of the most iniquitous phenomena of contemporary society is the lack of financial inclusion for lower social classes, especially in underdeveloped geographical areas of the world.
Financial inclusion is intended as the accessibility and fairness of financial services for people willing to benefit affordable and reliable financial products such as bank accounts, mortgages, insurances.
The reliance on cash money reduces what is defined “financial resilience”, instead money saving, accessing credit and insurance products can preserve people from vulnerability to economic threats.
According to the Global Findex Database published by the World Bank, 31% of adults worldwide are still unbanked.

Owning a bank account is the first stage toward financial inclusion as it helps people to escape poverty by allowing investments in their health, education and businesses, driving development for the entire society. Indeed, an increasing set of research studies has revealed many potential development benefits deriving from financial inclusion and particularly from the use of digital financial services, including mobile wallets, payment cards, and other FinTech applications.

The deployment of digital payments solutions also increases financial risk management since people subject to income interruption can easily collect money from distant friends and relatives.

Moreover, when receiving governmental subsidies or payments for work, the use of digital payments significantly reduce the costs and risks which are embedded in cash payments.

Considering the positive social impact of digital financial services, the World Bank has provided local governments with a series of approaches to promote the use of such technologies.

One of these is to pivot the set of routine cash payments such as pensions, salaries and subsidies to bank accounts, inducing people to participate the global financial offer and its benefits.

3.2. Business Returns

Digital payments industry has recorded a robust growth over the last decade, indeed new providers, platforms and tools are being launched almost every year.

The global digital payments market was valued at USD 3885.57 billion in 2019, and is expected to reach USD 8686.68 billion by 2025, recording a CAGR of 13.7%, during the forecast period of (2020 - 2025) [2], higher than the Total Market (11.94%) and the Total Market excluding financial activities (12.36%) [3].

In 2020, the turning point determined by the Covid-19 Pandemics, made society realize the common extensive use of cash in microtransaction represents not only an inefficient, time-consuming and value destroying practice but also a real danger for personal and public health.

In this sense, digital payment solutions are allowing individuals to perform personal and business payment practices directly from computer and smartphones, without a physical contact with materials acting as connection hub for biological disease spread [4]. Such a phenomenon has been signaled by the World Health Organization (WHO) which advised that respiratory droplets expelled from an infected person can contaminate and persist on surfaces and suggested the use of contactless payments as a mitigation action [5] [6].

Concerning all the bureaucratical practices often required to require financial services, digital payments are useful to avoid unnecessary and dangerous people gatherings at financial institution branches.

COVID-19 has introduced a legitimate concern of sharing or touching devices such as keypads, so text payments, contactless card payments and the whole set of technology reducing the risk of undirect physical contact make even more sense today.

The 2020's coronavirus is expected to have significant impact on global economies: the US stock markets have undergo abnormal fallen since the outbreak, unemployment has increased worldwide, and many advanced economies are expected to enter recession this year.
Within the uncomfortable framework depicted by the economic trends, digital payments are expected to suffer indirect impact from systemic economy break, but its idiosyncratic role within the pandemics is expected to be crucial both in terms of biological risk reduction and for its value creating traction for other business areas.

European central bank is putting effort in its mission to ensure availability of payment services. This is crucial for applying monetary policy implementation and for citizens necessities.
Today adequate availability of cash is still essential for the functioning of the economy.
During the pandemics the cash demand has reduced its predictability, depicting an increasing trend with the spread of the health crisis.
In mid-March the value of circulating banknotes has reached the peak of €19 B. The plausible interpretation proposed by the ECB for this phenomenon is an increase in grocery spending at supermarkets and the typical impulse to accumulate money savings in form of cash in times of crisis [7].

Despite the rise in cash demand registered by the ECB, it advises about the increasing demand for reliable payment methods by consumers and merchants. During the lockdown European citizens are intensifying their interest in low-cost and easy-to-use digital payment solutions. These are essential for sustaining SMEs, freelancers and social institutions.

3.3. Innovative Payment Product clustering

The set of payment methods traditionally included the credit transfer from checking account via home/mobile banking and the use of payment cards.
Beside the traditional schemes, today the payments market has become more sophisticated and can be divided in 8 sub-segments:

- Next Generation POS solutions: Mobile applications or virtual POS solutions based on NFC, QR Code or Bluetooth technologies. It also include new POS concepts, fully integrated with information management tools for orders, sales and statistics.
- VAS for merchants: Technological and marketing platforms enabling merchants to increase customer engagement through Artificial Intelligence solutions

- Online Checkout: Solutions to improve User Experience during online shopping checkout allowing diverse value added functions such as the possibility to split their online Payments among different cards and bank accounts
- Mobility and Vending Machines: Solutions for smart mobility or mobile ticketing applications and mobile payment solutions for vending machines
- P2P Payments & Digital Wallet: The evolution of retail payment solutions has led to the birth of the "digital wallets" or "e-wallets", a category of services allowing a party to make electronic transactions toward another through a digital currency. Within the e-wallet denomination it is possible to identify three main clusters:
    - Wallet with virtual card in cloud: Wallet where payment card data is virtualized within an online cloud (e.g. PayPal, Amazon pay)
    - Privative rechargeable wallet: Wallets rechargeable through an electronic money stock in which P2P / P2B payments can be made (e.g. Satispay, Zelle)
    - Dematerialized card on device: Wallet where the payment card data are stored in a secure environment in the operating system and acquired at the time of payment (e.g. Apple Pay, Google pay, Samsung pay, Android Pay)
- Cryptocurrency: Including cryptocurrency exchange platforms, solutions enabling companies to receive payments in cryptocurrencies and cryptocurrencies themselves
- Payments Solution Development and Other: Solutions to manage electronic payments for third parties and other offerings related to payment systems such as enabling foreign customers experiencing tax free shopping

3.4. Industry Players

3.4.1. Incumbent

The incumbent players of digital payments are represented by those traditional companies and institutions providing non-cash payment solutions to the end users.
these figures can be identified mainly in bank offering wired-transfer solutions and payment card schemes stakeholders, primarily the "card association" or "card network".
It is important to note that financial institutions are stakeholders of both payment methods; in fact, these offer their customers payment solutions through the interbank network such as wire transfers, but they also offer products such as credit cards, debit cards and prepaid cards.

3.4.2. FinTech start-ups

The term FinTech generally indicates any technological innovation in financial services.

Industry operators develop new technologies to revolutionize the world of financial markets, traditional banks and insurance companies (Insurtech).
Today, the subjects most involved in this process are start-ups, but also important established institutions are embracing this transformation and are investing in the internal development or in the acquisition of fintech projects.

The number of FinTech start-ups has skyrocketed in recent years, covering a vast spectrum of services and topics. The main sectors for the application of FinTech has been identified in:

- Money Management
- Wealth & Asset Management
- Other Crowdfunding
- Lending
- RegTech InsurTech
- Capital Market & Trading
- Payments

The Italian FinTech landscape is one of the most dynamic in Europe and worldwide and count several leading start-ups both independent and acquired by bigger players.
In 2019 around 278 FinTechs could be counted in Italy, 49 more than in 2018; 60% of these are reported to be less than 5 years old. This data depicts a very fluid landscape populated by several young and small companies. Indeed 80% of these have less than 10 employees.
Despite the immaturity portrayed so far, the Italian FinTech landscape is well promising since revenues register a 40% growth in 2019 with respect to 2018. Moreover, the numbet of "Scale Ups" has increased from 28 to 38 in the same period. It is noticeable the birth of two new listed companies: UCapital24 and CrowdFundMe.
Milan is the core of the Italian FinTech landscape and 45% of the Italian FinTechs are based in this city.

In the subsector of payments 49 companies can be counted. These companies have registered the highest revenue growth in the whole Italian FinTech landscape in 2019; these increased by 62% with respect to the average 40% increase.
It is not surprising that the average marginality for these companies is negative since these innovative business model require a vast customer base to trigger the network effect.
Since this thesis concerns the payments sector, the most emblematic companies have been clustered in the complex system of services following the taxonomy provided in 3.3 above.

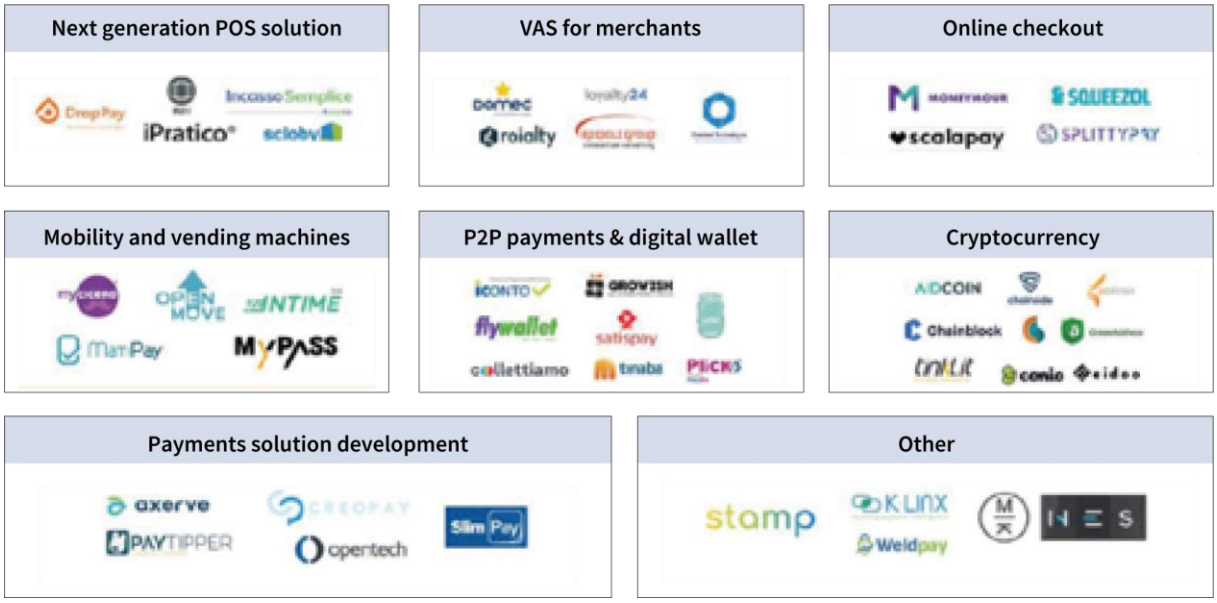

Figure 1 Main Italian FinTech start-ups

3.4.3. BigTech

BigTech or Tech Giants are terms referring to the largest and dominating companies in IT industry. In 2019 the Forbes Global 2000 List was not surprisingly dominated by big banks, however on 6th place the list places the largest Big Tech, Apple. The Forbes's list is not simply a market capitalization based rank, but it considers the annual sales, profit, assets and also the market capitalization together with the overall market valuation [8]. In Table 1 we report the top Big Techs extracted from the considered list.

Company	Country/Territory	Sales	Profits	Assets	Market Capitalization
Apple	United States	$261.7 B	$59.4 B	$373.7 B	$961.3 B
Samsung	South Korea	$221.5 B	$39.9 B	$304.1 B	$272.4 B
Microsoft	United States	$118.2 B	$33.5 B	$258.9 B	$946.5 B
Alphabet (Google)	United States	$137 B	$30.7 B	$232.8 B	$863.2 B
Amazon	United States	$232.9 B	$10.1 B	$162.6 B	$916.1 B
Alibaba	China	$51.9 B	$10.3 B	$133.7 B	$480.8 B
Facebook	United States	$55.8 B	$22.1 B	$97.3 B	$512 B
Tencent	China	$47.2 B	$11.9 B	$105.4 B	$472.1 B

Table 1Big Techs in "Forbes Global 2000" (2019)

It is interesting to notice each Big Tech company in this list has entered Digital Payments industry.
The 2020 ABI Lab survey on innovation acceleration has showed banks expect five of these big players will offer particularly innovative financial services in the short term in the Italian market. 90% of respondents indicated Facebook and Amazon, 80% Google and Apple, while only 40% have identified Alibaba as new possible entity operating in the Italian financial ecosystem. Moreover, bankers indicated their vision on which fields the Big Techs will gain strong competitive advantage. The survey results are reported in Table 2 [9].

Bigtech	Service
Alibaba	• Digital Payments • Digital Bank/Currency • Consumer and Corporate credit (focus on merchant hosted on platform)
Amazon	• Digital Payments • Checking account • Digital Lending for SME on the platform • Instant Lending for buyers • SCT arrangement from the e-commerce portal
Apple	• Digital banking • Digital payments • Core banking services (cards and accounts)
Facebook	• Payments • P2P payment (WhatsApp) • Digital Banking • Consumer credit • P2P lending • Cryptocurrencies (Libra)
Google	• Checking account • Digital Banking • Payments • Card issuing • Lending

Table 2 Short term Big Tech competition fields

The technology giants are preparing for greater engagement in banking but the regulatory barriers to becoming a bank are strict and managing the burden of a core banking infrastructure is not interesting for their competence portfolio.
Their entry to the market is occurring in the form of a “Banking as a Service” (BaaS) platform or by offering solutions to incumbent banks, such as AI-based core banking tools.
The trending BigTechs’ strategy is to let banking and credit unions partners provide the underlying financial infrastructure and deal with regulation and appropriate the segment of the value chain concerning the development of smart interfaces and user experiences.
The phenomenon in progress has been associated by observers to the one started in in the 2010s in which “every app eventually offered an instant messaging service” in the same way as today “every tech company will eventually offer financial services”
This trend is progressively leading to a state where customer relationship is no longer a competence for financial institutions as a long term implication.

3.5. Payments innovation lifecycle

The Payments market is today very fragmented and characterized by high complexity level due to continuous technological innovation and proliferation of new products and services and the turbulent entry of non-traditional players.
According to the Abernathy and Utterback’s model of the Technology Lifecycle, this can be ideally separated in different phases according to the dimensions involved.

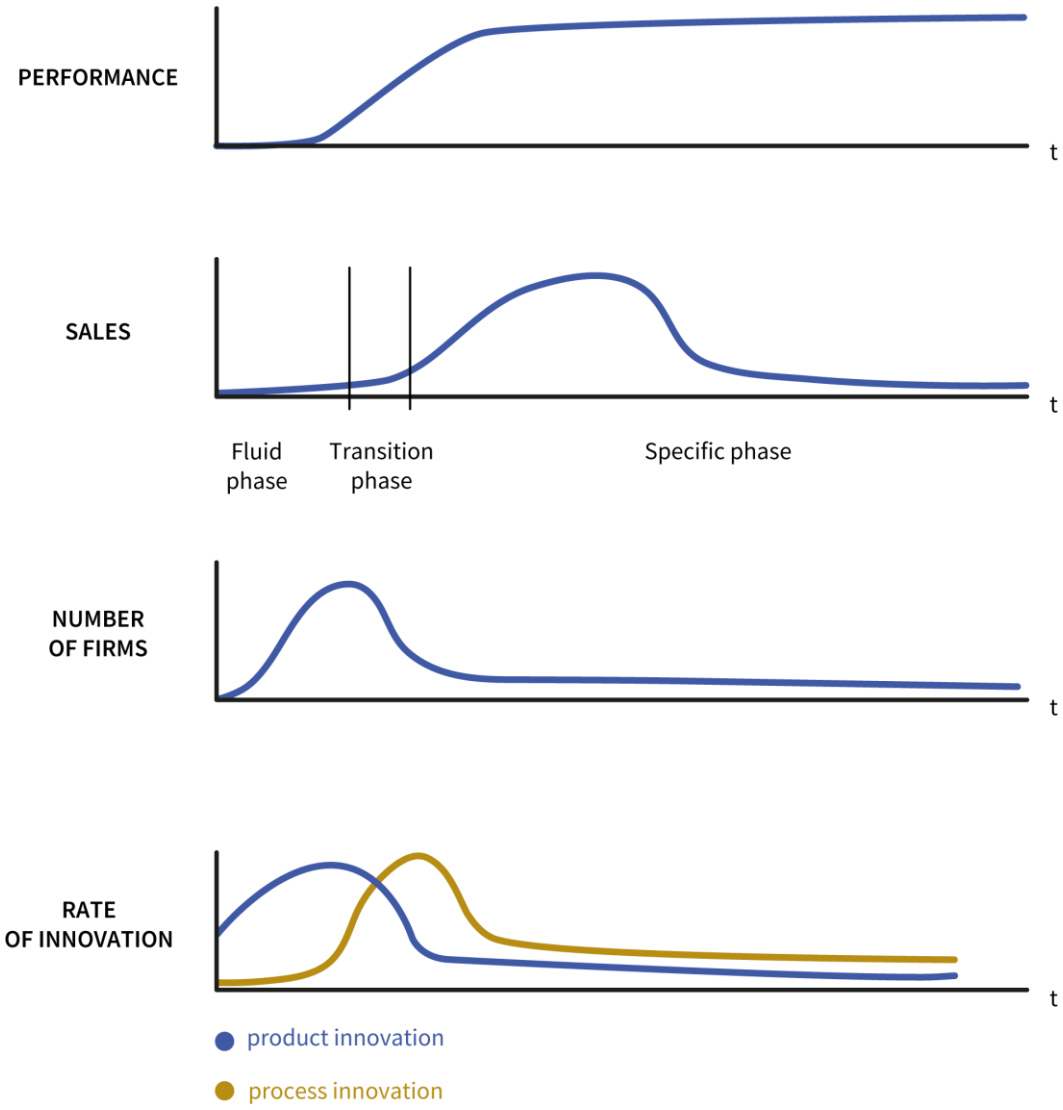

Figure 2 Innovation lifecycle scheme

The parameters of FinTech's technological innovation suggest the it can be positioned to the "Fluid phase" of innovation lifecycle. Indeed, the industry is now characterized by a low market penetration with respect to traditional players such as Payment Card Networks which is a more mature and consolidated industry, a still low performance immature technology with a consequently low demand, a high and growing number of new entrants despite the serious difficulties in making profits at this stage, since the industry is perceived as very promising in long term elapse.

3.5.1. The Current Paradigm

When analyzing the Digital payments industry, it is important to consider that, as well as most digital industries, it is a highly modular value system in which players can act as complements when combined each other and a combination of players can act as substitute to another.

In this sense, there is not, within the market, a firm offering a complete end-to-end solution for non-cash payment.

Most of the product and services offered by new entrants represent enabling or value enhancing modules for the use of traditional payment models, while a real threat on the dominion of these do not really exist so far.
Indeed, payment card schemes and interbank wire transfers represent the only two real payment frameworks commonly used today, and each of that has a slight polarization toward a specific type of use depending on their features.
While wire transfers are usually cheaper, they have a heavier use attrition and therefore are more suitable, in their traditional form, for high value and B2B payments, the cards schemes are commonly used for commercial purpose both in e-commerce and on-site purchase.

Business scholars has observed that technology does not follow a linear process, instead it is characterized by distinct and alternating phases of evolutionary and revolutionary progress [10] [11]. As a validation, they showed that, when representing a relevant performance indicator for an industry's products on a Cartesian plane, the evolution of such indicator will not proceed in a straight line but follow a sequence of S-curves.
The interpretation for these S-curves is that, at the emergence of a technology, the performance level is usually low and slightly increasing.
When a sufficient degree of maturity is reached, the performance starts rising at a substantial speed, until its intrinsic technological limit is reached.

Today, the established paradigm for everyday mass payments is based on card-schemes in which the card networks are the principal enabling player.
Indeed, the current dominant design for commercial payment solutions architecture is composed of a diverse stakeholder, which are often financial institutions, all connected to an infrastructure and regulatory network hold by card companies such as Visa and MasterCard.
These companies do not issue payment cards or merchant accounts. Instead, they act as a governing body and clearing house for participants to the respective card brand. It is their responsibility to establish interchange fees, qualification guidelines and play the role of arbiter between issuing and acquiring banks to maintain and improve the card network and their brand.

Analyzing the new FinTech wave, it is noticeable that most of the innovative technologies proposed are not aimed at radically change the current paradigm but on the contrary they represent incremental innovations aimed at inserting themselves into the paradigm itself, finding their place within the system and increasing its value.

In this sense, the market for card scheme networks appears as an armored and unchallenged space which enjoys “rent revenues” for its superior resources.

3.5.2. Porter’s Analysis for Card Associations

In order to present a clearer vision of the card network’s business within the industry, a Porter Five forces analysis has been performed:

Threats of New Entrants: LOW

Concerning the new entrants in the market of Card association, three main elements must be taken into account:

- The existence of barriers to entry is mainly due to the intrinsic importance of the network mass effect which will be further discussed in 4.2.2.
- There is a high cost advantage for incumbents due to economies of scale
- The historically established brands have cultivated, through decades, a capillary distribution network and consolidated partnerships with financial institutions. This ensures a fundamental “early entrance” advantage for the incumbents and high switching costs for their partners.

In light of these considerations, the threat of new entrants in the card scheme network industry is undoubtfully low

Bargaining Power of Suppliers: LOW

Payment schemes network’s supplier is embodied by the entire set of technology providers and system integrators supporting the firm in running and maintaining its IT infrastructure.

The market for this kind service is variegated: there are some big global firms such as IBM, Accenture, Fujitsu and NEC which lay within the Fortune’s Global 500 ranking list and there is also an extremely vast set of local and global IT consulting firms, system integrators and technology outsourcers which compete hardly to win project calls.

In this sense, the bargaining power of the suppliers is subject to:

- Low supplier concentration to firm concentration ratio
- Low degree of differentiation of inputs provided by suppliers
- Barely inexistent supplier competition in terms of forward vertical integration aimed at cutting out the buyer

Bargaining Power of Buyers: LOW

The direct customers for card networks are Financial institutions or specific firms acting as card issuer or acquirer**.**

Since the fees which represent the primary source of revenue for these subjects is established by the network, the latter exert his power in controlling the value appropriability regimes. In other words, they reserve the right to decide the revenue shares of each party involved in the business scheme.
This peculiar equilibrium status is mainly due to:

- Low buyer concentration to firm concentration ratio
- Medium buyer switching costs to pursue the best pricing scheme which is anyway dynamic and changes yearly
- Barely inexistent substitutes due to the slight differentiation between networks

Threats of Substitutes: MEDIUM

There is no alternative for financial institution willing to offer card-based payment solutions but to join a card network for authorization to carry out issuing/acquiring activities.
Today, there is an interesting set of alternative payment methods, not based on payment cards, which imply the use of digital wallets or cryptocurrencies. This is an efficient but still immature technology and cannot rely on an equal users' network which the card-based payments benefit.
The main factors to be considered for this evaluation can be synthetized in:

- Low degree of differentiation perceived by financial institutions and their end users
- No available "close substitutes"
- Immature set of substitute solutions available in the market

Rivalry among the Existing Competitors: MEDIUM

The market for card scheme networks is particularly concentrated, in fact the market share of the four largest firms, the common CR_4, covers substantially the 100% of the market. The reasons that make this level of concentration physiological for card networks and the few main market players will be presented within a dedicated chapter of this dissertation.
Despite such high level of market concentration, the profit margins are not as high as their full market potential would allow because of price caps imposed by several local government regulations.
Moreover:

- The competitive strategy is mainly based on cost leadership since the service is hard to really differentiate. Some card network has reached a dominant position in specific segments such as hotel and travel services, or internalized some of the value chain process, or developed a reward/cashback scheme
- There is a medium-low expense in advertising since the direct customers are not end users but card issuing/acquiring firms

These elements depicts a medium degree of rivalry among the existing competitors overall.

4. Traditional Payment Models

4.1. Wire Transfer

The interbank payment system is a complex network infrastructure providing the settlement of financial transaction transferring monetary value.

The infrastructure includes the financial institutions, the capabilities, the set of rules and procedures, a communication standard and the technology base allowing the correct performance of transactions [12].

Diverse payment systems in contemporary history have developed their own protocols. Some of these systems adopted a common a standard and therefore have grown to a global scale. Some other systems remain bounded to country-specificity and product-specificity, renouncing global integration.

4.1.1. Key concepts: Clearing and Settlement

The "Clearing" and the "Settlement" are two procedures that allow two subjects to define and regulate the mutual credit and debt relationships.

The clearing consists in the updating of the ledger accounts of the parties involved in the transaction and this practice can be performed between the two parties on the mutual accounts they have with each other or it can be performed on the accounts they have with a third party. In the first case it is called "bilateral clearing" while in the second case it is called "central clearing".

Central clearing is today the most common practice as it benefits from "hub and spoke" model features ensuring high efficiency allowing connection with all the nodes connected to the central hub. This is often facilitated by a dedicated financial institution called "clearing house", logically standing between the two clearing parties – in this context called "participants".

Concerning the settlement operations, these are performed through dedicated systems allowing the actual transfer of funds between institutions in "real-time" and without any netting of reciprocal financial positions of the parties. For these reasons such systems are named Real Time Gross Settlement Systems (RTGS).

Several currency-specific RTGSs exist, these are dedicated to transactions performed in a single currency. The most relevant examples are: FEDWIRE (USD), CHAPS (GBP), TARGET2 (EUR).

On a global level, for cross-currency transactions this role is accomplished by the SWIFT system.

4.1.2. Target2

The "Trans-European Automated Real-time Gross Settlement Express Transfer System" – hereinafter Target2 - is the RTGS system for the Eurozone. This is based on an integrated central infrastructure ran by three main central banks in Europe; these are Deutche Bundesbank, Banque de France and Banca

d'Italia. It represents the central hub for settlement of payments for financial institutions and other interbank systems such as multilateral clearing systems.

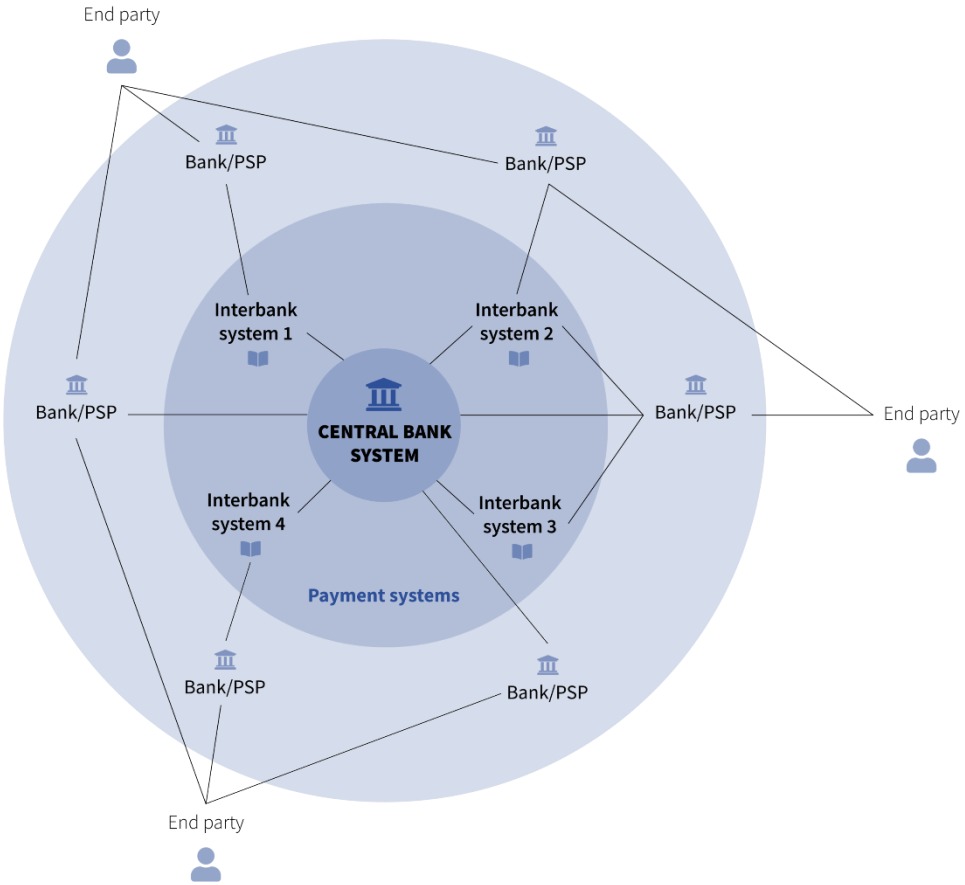

Figure 3 Domestic wire transfer scheme

4.1.1. SEPA

The Single Euro Payments Area (SEPA) is the area where citizens, businesses, public administrations and other economic operators can make and receive payments in euros, both within national borders and between the countries that are part of it, according to basic conditions, rights and uniform obligations, regardless of their location within SEPA.

The purpose of SEPA is to create a harmonized payment market that offers common payment instruments (wire transfers, direct debits and payment cards), which can be used with the same ease and security that you can count on in your national context.

After the changeover to the EUR in 2002, the SEPA project represents the next big step towards the integration of the European financial markets. Indeed, until the birth of the initiative, each Member State developed its own payment system based on rules and instruments defined in relation to the specific needs encountered at country level, but thanks to SEPA the current differences are gradually disappearing, and new payment instruments harmonized are replacing existing national instruments.

The new "domestic" market will therefore no longer be the single country but SEPA itself.

4.1.2. SWIFT

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) is an international payment network and one of the largest financial messaging systems worldwide.

The global SWIFT network was created in 1977 to replace the former Telex network, which was considered obsolete for its slow and unsafe messaging protocol.

The cooperative has continued improving its system both infrastructural and standard communication protocols since its foundation. In 2004 it started the migration to the modern IP internet protocol renaming its infrastructure with its current name “SWIFTNet”.

Today it allows participants banks to send international transfers instruction or “international wires” via its infrastructure.

While the payment order is sent through the SWIFTNet, the actual settlement occurs via “correspondent banking”. In this framework the payment is routed in the shortest path through a chain of banks having a relationship in terms of mutual correspondent accounts.

Comparing to SEPA, the SWIFTNet allows payment in non-EUR currency, then suffers from the negative aspects of managing non-domestic wires in terms of transaction costs and time.

The main competitors for SWIFT are:

- Ripple: A solution based on the blockchain technology and, therefore, undergoes scalability limitation
- INSTEX: The Instrument in Support of Trade Exchanges sponsored by European Union. It is a recent special-purpose vehicle established in 2019 with the intent to ease non-USD and non-SWIFT transactions with countries undergoing the US embargo (e.g. Iran) avoiding sanction restraints.
- CIPS - The Cross-Border Interbank Payment System is a payment system providing clearing and settlement to its participants for cross-border payments in Chinese currency RMB
- SPFS – The System for Transfer of Financial Messages is a Russian equivalent of the SWIFT system

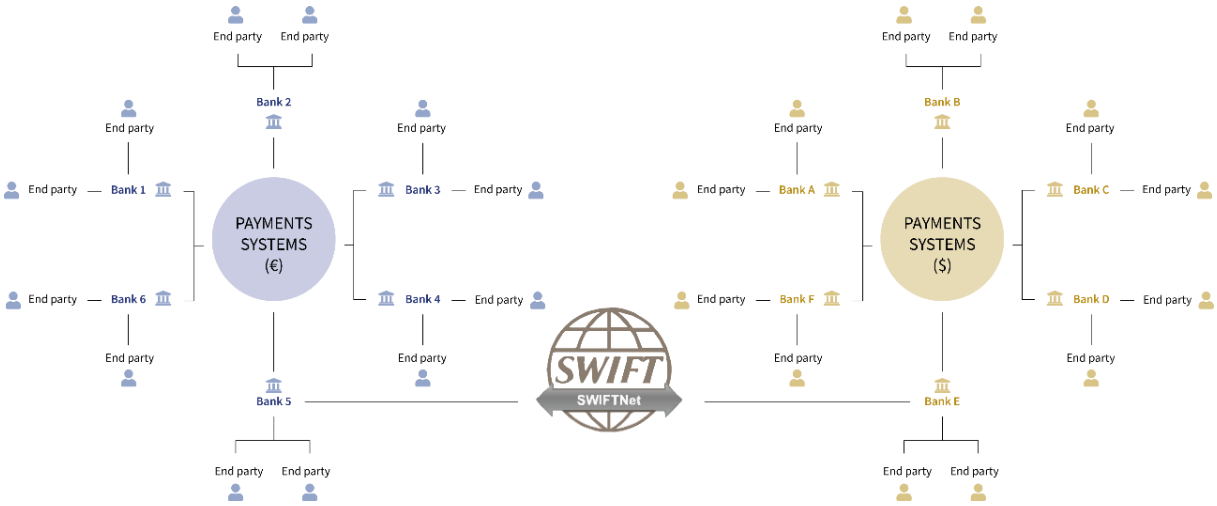

Figure 4 Crossboarder wire transfer sheme

4.2. Payment card

Common Payment card systems are the most widely used commercial non-cash payment method and it is a well-consolidated market which relies on multiple established stakeholders.

Card Association or Card Networks represent the central sponsor and provides access to the whole constellation of financial participants, enabling them to contribute the business.

4.2.1. Historical Background

The practice of allowing common customers to purchase goods and services on credit spread in early 20th century in USA. Small Local Businesses with small amount average receipt like corner bars and groceries allowed customers to keep open tabs, using ledger books to record amounts owed.

The necessity to manage the large amount of customer accounts led to the creation of the primitive form of charge token. This consisted of a small metal medal bearing the customer's identification information [13]. This can be addressed as the first the primordial form of credit card in history.

The former token had several limitations compared to the modern concept of credit card. It allowed single-shop credit and being an informal, not regulated practice, it represented a permissible risk to merchants only for small amounts of money.

The low network effect due to the lack of a token standard represented a cap to the extensive use of the charge token.

To overcome this problem in 1949 a New York businessman, Frank X. McNamara, introduced a card enabling to pay on credit in several New York restaurants and hotels that had previously signed a

convention agreement. The McNamara's Diners Card was the first "general purpose" charge card and consisted in a rectangular shaped rigid paper.

The Value related to the new token standard was still limited as the customer base did not have sufficient "critical mass" to start a diffusion mechanism [14]. Indeed, the Diners Card had very limited diffusion as merchants were not very willing to accept cards owned by only a few customers, while customers had no interest in owning a card that granted him credit in only a few stores.

In 1958 Bank of America started an ambitious innovation diffusion operation trying to establish its credit card, the BankAmericard as a recognized payment method. It selected the peripheral community of Fresno because of 45 percent of adults had an account with Bank of America and sent to most of them a non-requested credit card with a 500$ credit line. Once the operation ensured a sufficient critical mass, merchants started to accept credit card payments [15].

At that time the Cards did not include magnetic chips or bands to provide security checks and process automation. Therefore, the payment system resulted in high fraud risk and expansive processing costs.

To sustain the product diffusion through the network effect, Bank of America deployed the competitor banks distribution power. It licensed the product to other banks, which were drawn to earn both interest and commissions paid by their customers every time they used the cards.

In 1976, all BankAmericard licensees united themselves under the common brand Visa which is today the payment card global leader firm covering 50,1% of the transactions concerning credit cards and 76,9% on debit cards worldwide (excluding China) [16].

In the same period, non-BankAmericard licensees united under an alternative brand giving birth to the today's second biggest player within the payment card industry, MasterCard, covering 33,5% of the transactions concerning credit cards and 18,9% on debit cards worldwide (excluding China) [16].

4.2.2. The Network effect

The Fresno Drop Business case highlights the most important key success factor in every payment system. A medium of exchange is valuable as it is widely accepted, indeed it is subject to positive network externalities. In economics, an externality occurs when an economic operation causes an impact on a party who is not directly taking part in the transaction. In this case the adoption of a payment method or tool that is compatible to the referring standard, creates a positive externality on the entire set of existing user's network, since each of them can now link to the new user.

In mathematical terms the relative increase in value of the network due to a marginal join is expressed as $V(n+1)/V(n) = (n+1)/(n-1)$, where V is the Value of a network as a function of the number n of nodes included. Deeming the value of a network as based on the number of the arches linking the nodes, each time the network gets a new node and this is linked to all the others, the number of arches within the network increases by the total number of nodes of the network minus the last one.

This interpretation suggest the value of a network does not increase linearly with the number of nodes, but its value growth increases as the number of nodes increases.

Given these premises, the concept of "critical mass" and "standard" assumes primary importance since the former represents the threshold qualifying card networks to hold its position on the market and while the latter is the enabling factor to deploy their intrinsically scale-intensive business.

Today, the market of Payment Card network can count few gigantic players with little product/service differentiation. It is plausible that the intrinsic importance of network externalities in this service has influenced the market leading it to "spontaneously" concentrate on few players having enough customers to ensure a practical value.
In this sense, the market, tend to behave like a complex system, responding to exogenous forces in diverse ways depending on its scale. While in the fluid phase it can present microscopic properties, when it reach certain threshold tending toward the global scale it emphasize its macroscopic properties.

Visa and Mastercard are the only two market leaders and they have basically the same commercial offer with slight differences in pricing schemes, making their competition based on distribution channels and strategic partnerships.

4.2.3. Payment card taxonomy

The most popular categorization of payment cards distinguishes them based on the time in which the funds spent or withdrawn at ATM are charged to the cardholder's account. In this sense, there are three types of cards:

- Prepaid card: the funds are debited to the holder of these cards when they are "loaded" into the account linked to the card, therefore even before being spent
- Debit card: the funds spent or withdrawn at ATM are debited to the cardholder's current account immediately at the time of the operation (or at most within a few hours).
- Credit card: the cardholder enjoys of a certain time delay between the time of expense or withdrawal and the moment when its checking account gets charged by the issuing financial institution.
    - Revolving: Properly named Credit cards are those offering a real credit line so that the payment can be divided into installments in various ways, in consideration of the monthly payment of a minimum installment. This type of card is commonly called "revolving" credit card.
    - Charge: another type of credit card charges no interest on the amount spent or withdrawn at ATM but requires the user to pay their balance in full upon receipt of the

statement. Usually the payment is due on a monthly basis. Charge cards are less common, and a limited number of issuers offers this product. They can include a capped spending limit also called “plafond” or, for premium products, illimited expense and generous reward benefits programs for the cardholder in consideration of an expansive annual fee.

4.2.4. Card scheme stakeholders

Diverse stakeholders involved in the payment process are presented below:

1. Cardholder - The holder of a payment card who undertakes to return the amount of the transaction to the card issuer, in the times and in the ways established by the contract signed
2. Issuer - Financial institution authorized by the card network that deals with issuing the payment card to the cardholder and grants authorization for payment
3. Network - It proposes a set of rules, standards and procedures for the execution of international and domestic card payments, separately from any infrastructure that supports transactional operations
4. Acquirer - Financial institution authorized by the circuit that manages payment card transactions and that has relationships with the Merchant
5. Terminal Manager – It assigns a unique ID to the POS (Point of Sale), configure the network for the routing of transactions to the Acquirers and set the rules for accepting the schemes on each physical POS terminal
6. Merchant - Commercial activity that accepts payments through cards belonging to one or more networks

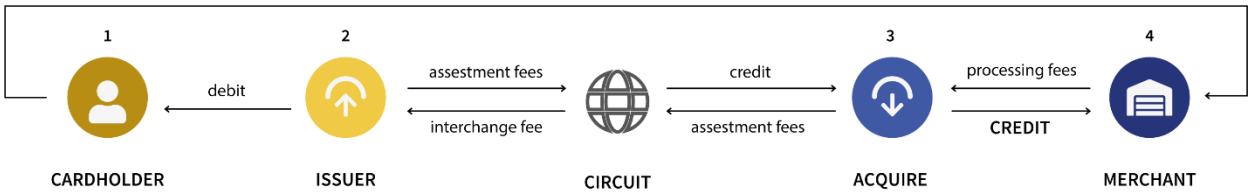

Figure 5 Card payment stakeholders and relationships

4.2.5. Payment card process

The payment card scheme like most payment systems, is based on the “four corner model” also called “four-party scheme”. Here we present the most general case in which cardholder’s bank and the merchant’s bank are different. On the contrary, if both are represented by the same bank, then no interbank network is involved.

When the cardholders pay an amount for products or services provided by the merchant through its payment card the information exchange flow gets triggered between the various actors involved in the system.

It is possible to read the process from a monetary perspective, following the monetary flow and from the information perspective, following the related flow.

When the Cardholder uses his payment card to pay at a merchant POS the latter transmits the card information to the Acquirer bank, the holder of merchant's account. The Acquirer proceeds routing the payment request to the card network which in turns routes the request to the Issuer bank. The issuer verifies the funds availability on the cardholder's account and if this is confirmed then it proceeds debiting the account. When the issuer debits the cardholder, the former retains an "Interchange fee" for its service provision. Then the payment is sent to the card network which in turns retains a fee and pays the remaining amount to the acquirer. At last the acquirer retains its "acquiring fee" and credits the merchant with amount net of fees collected by other actors.

An example of payment card process flow is represented in figure Figure 6.

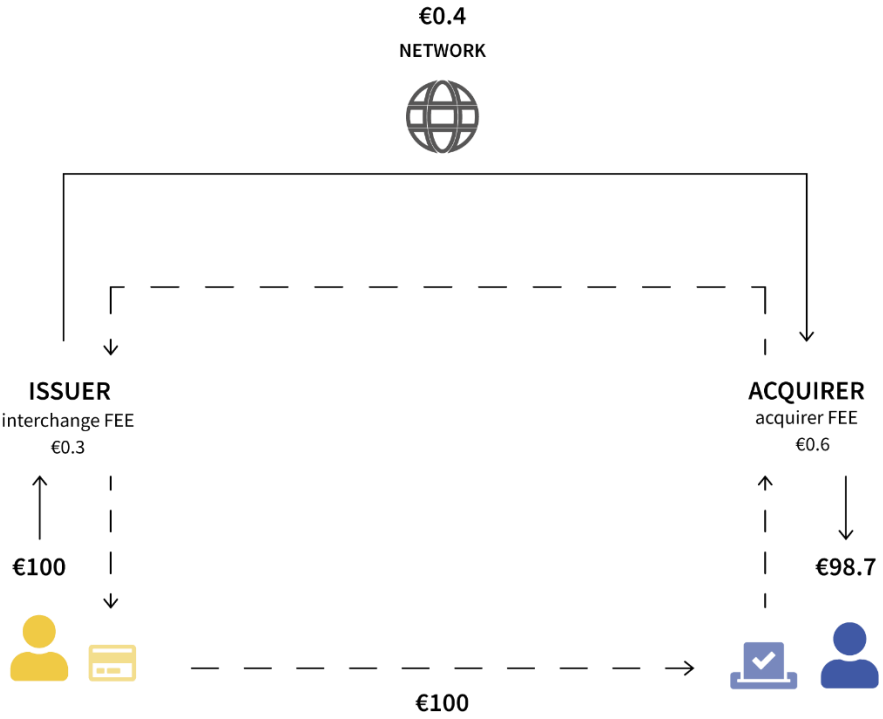

Figure 6 Card payment processing scheme

4.2.6. Growth restraints and drivers

As discussed in 4.2.5, the processing fees paid by a merchant accepting a payment card are composed of three separate contributions:

- Interchange fees: which are non-negotiable and set by the card network, but they are collected by the card issuers
- Assessment fees: which are non-negotiable and collected directly by the card network

- Processing fees: which are both set and collected by the payment processor having the direct relationship with the merchant and are negotiable by the parts

The interchange fees represent by far the largest share of the total processing costs. In United States, where regulatory caps to these fees are less strict with respect to Europe, these amount to 70% – 90% of the total processing fees [17].
Being these fees set by the card networks they publish their interchange rates annually. This does not apply to those networks acting as an issuer and acquirer for transactions involving their card (e.g. American Express and Discover).
The processing fees are the main reason leading merchant to avoid accepting micropayments through payment card. This tendency represent a strong obstacle to the use of card-based payments and for this reason the average value exchanged for each transaction or "average receipt" is commonly considered a KPI for the payment card market.
In 2019 the card-based payment average receipt in Italy has been 54€ with a 5% decrease with respect to 2018 and it confirms the decreasing trend of the last years. This represent a positive indicator for the industry since it suggests the cardholders but especially merchants are starting to practice micropayments. The reason for this trend is reasonably believed to be due to the decrease in process attrition thanks to new technologies such as contactless cards.
As a confirm of this it can be noticed the average receipt for contactless payments in Italy has been 42€ in 2019, with a 7% increase with respect to 2018.
Comparing the growth of the number of traditional card transactions and the number of contactless transactions in Italy it can be inferred that the attrition reduction and the e-commerce are driving of the spread of card-based payments. Indeed, the number of contactless transactions has increased by 67% in 2018 while the traditional ones has increased by around 3.6% [18].

4.2.7. Business models in card services

Today's market includes diverse business models through which financial institutions can fit into the payment card ecosystem. These models can be clustered in three main categories: "Principal", "affiliate" and "licensed" depending on the mutual relationship between the bank and the outsourced service providers

Principal model

In the Principal model the bank acts as "Principal member" as it manages the direct contractual relationship with customers. Moreover, it manages the contractual and regulatory relationship with the card networks, sets up products / services and manages marketing services (Materials, Promotions).

The above mentioned “outsourcer” acts as operational manager of the products / services requested by the Bank and carries out clearing and settlement activities.

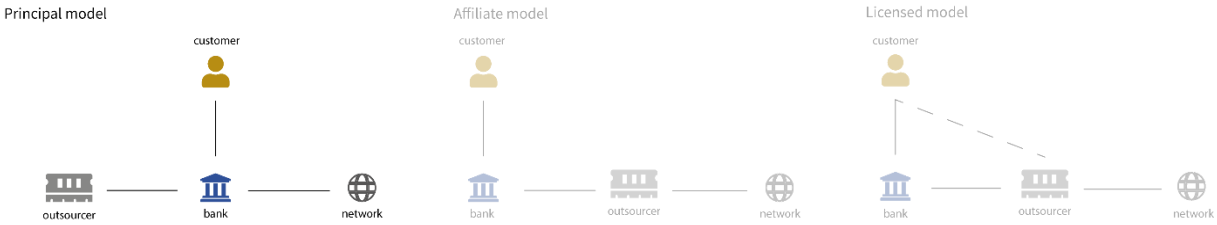

Figure 7 Principal business model scheme

Affiliate model

The affiliate model provides a substantial difference with respect to the principal one in the role of the outsourcer. In this case it acts as Principal member and manages the contractual and regulatory relationship with the card networks beside carrying out clearing and settlement activities.

In this framework the Bank still performs the activities related to the customer relationship, product/service set-up and marketing.

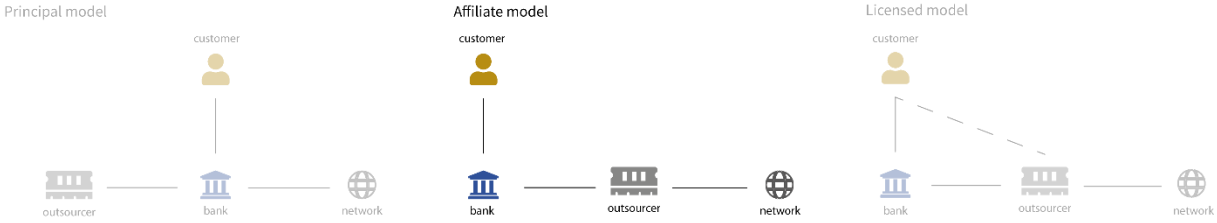

Figure 8 Affiliate business model scheme

Licensed model

In the Licensed model the outsourcer cover a fundamental role. Indeed, it acts as Principal member and is in charge of managing directly the relationship with the card networks and the customers. It is also in charge of managing the products/services set-up, marketing services and clearing and settlement activities. The Bank only deals with distributing the outsourcer’s products and services to its customers. In consideration for benefiting these services the Bank incurs the related fixed and variable costs.

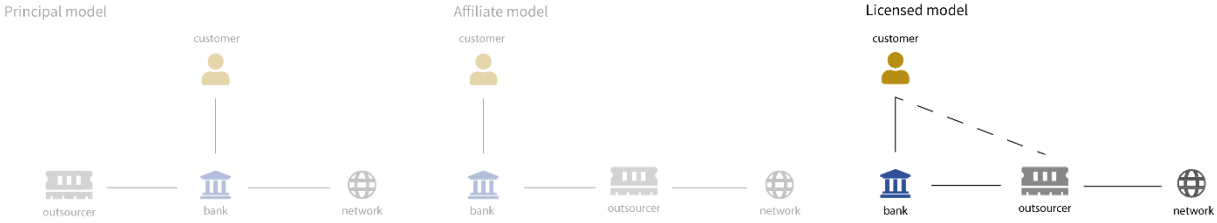

Figure 9 Licensed business model scheme

The three business models presented 4.2.7 are patently characterized by different degrees of vertical integration enjoying the relative benefits and undergoing the drawbacks. A higher level of vertical integration gives tighter control on components both a technical and business perspective. However, it

also requires a much greater commitment in terms of time and amount invested, which can make this choice unfeasible for small companies unless they are sufficiently well-funded.
In the three models, the bank progressively outsource the further back stages of the value chain while retaining the front office activities until giving out the whole process management and limiting its activity to the distribution stage. In this sense this represents a progressive decrease in "backward" or "upstream" vertical integration from the Principal to the Licensed model.
Payment cards are a relatively mature product and with a remarkable level of standardization: the card networks enjoy high market concentration and high entry barriers mainly due to the network externality effect. Indeed, no radical innovation has been introduced for years in the scheme processes. All these features together with the strong regulator control on fees make it difficult to insert a strong market differentiation in issuing/acquiring services. These can be considered as a commodity service since in most cases there is limited occasion for tailoring the service specifically for the bank.
Studies by Clayton M. Christensen, developer of the theory of "disruptive innovation", have shown it is likely to observe a low degree of vertical integration for highly modular products. Modular architecture in products and services provides uncoupled components with little mutual influence. The low specificity of these services allows them to be performed by independent companies, and simply distributed by the bank as final product to its customer base [19].
The studies warns that in case a well-defined dominant design has emerged like in payment card schemes, bigger players with extensive funds availability may tend to vertical integrate their business to increase their control over the value chain, develop new competences and increase their margin.

4.2.8. The Italian framework

To show the interesting trend for vertical integration is noticeable analyzing the positioning of the major banks in the Italian market for card issuing/acquiring since it is not bold to generalize these results to a more global scale.
The investigation has been conducted by PwC Italy in order to depict an outline of Italian card services market, and the business model adopted by its major players.
For sake of simplicity the results are clustered in three card categories within the issuing service: debit cards, prepaid cards and credit cards, while there is no product categories in the acquiring service.
The main results are in line with the theory of vertical integration since the bigger players in Italian framework (e.g. Intesa Sanpaolo, UniCredit, BNL) tend to adopt the Principal model in both issuing and acquiring.
Analyzing from a product category perspective it emerges that, for debt products, the most used model overall is the Principal, especially for national debit cards, while for international debit cards all solutions are present.

For credit and prepaid products, the market of medium-small banks shows a polarization towards the licensed model with total outsourcing in defining products and strategies. As expected, smaller players show tendency to narrow their role as placement agent for outsourcer products.

The results of the inquiry are synthetically depicted in Figure 10.

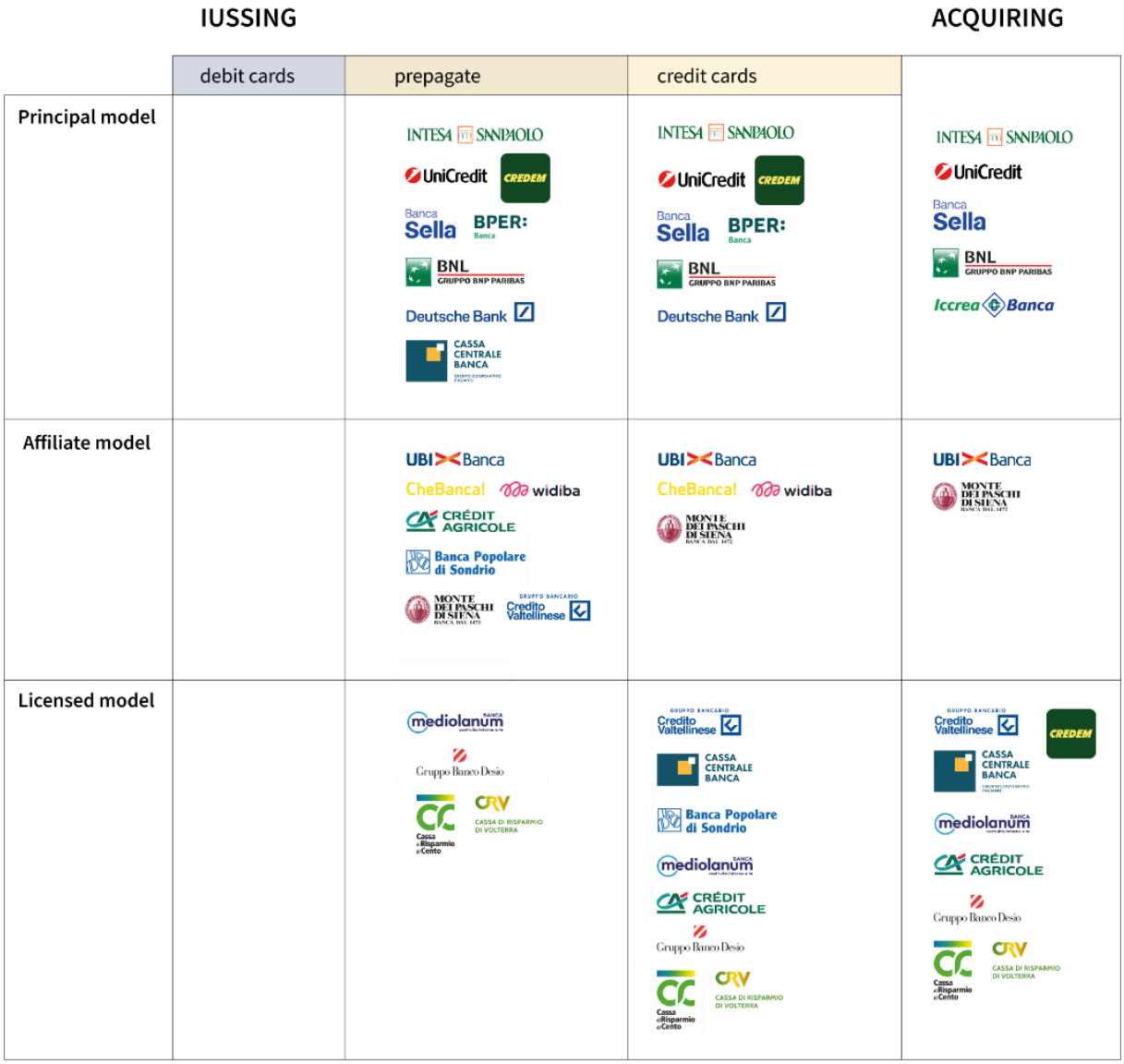

Figure 10 Business models in Italy

There are three major outsourcers for Issuing/acquiring in Italy: Mercury payment services, Nexi and SIA.

The first is a leading company in the Italian market for Acquiring services and manages over 370,000 POS terminals (both traditional and mobile) and more than 15 million cards. It is characterized by the internal management of the vast majority of core e-money activities. Mercury has a big major bank in its customer portfolio, Intesa Sanpaolo which is also the first Italian bank for market share and branches.

Nexi is a leading company in the Italian market for all services related to the world of payments and e-money. It has a market share of approximately 65% in the Issuing market and is the main licensee for

this service for Italian banks. Its focus concerns innovative solutions on the market, indeed is partner with Apple Pay, Samsung Pay and Sofort.

These two companies belong to the same group and in the last year the leadership declare the will to integrate them in a single company to avoid cannibalization and deploy synergies.

SIA is an Italian company leader in Europe in the design, construction and management of infrastructures and services dedicated to financial institutions. It is specialized in the processing of payment and e-money services.

SIA is a provider for UniCredit, the second biggest Italian bank group and for Poste Italiane, the Italian postal services public company

It also manages approximately 13.5 million cards over 206,000 POS and 11,000 ATMs, through its subsidiary firm P4cards.

OUTSOURCER	MAIN COSTUMERS
mercury payment services	INTESA SANPAOLO
nexi	CRÉDIT AGRICOLE BPER: Banca MONTE DEI PASCHI DI SIENA BANCA DAL 1472 UBI Banca BANCO BPM GRUPPO BANCARIO Credito Valtellinese Deutsche Bank
SIA	UniCredit

Figure 11 Main Italian outsourcers

5. The Open Banking

Open banking refers to the opening of internal bank data and processes to external parties via digital channels. The development and publishing of open Application Programming Interfaces (APIs) to build a range of products and services around financial institutions by sharing customer data with third party providers is the basic concept of Open Banking ecosystem.

A rigorous and exhaustive definition of such concept is still emerging. A largely accepted definition of what Open Banking phenomenon has been proposed by the global consulting firm PriceWaterhouseCoopers: "Open Banking is a collaboration model among several players - banking and non-banking - that, using open technological platforms, sharing knowledge, work environments, data and customer bases, creates services and products" (Open Banking, PwC definition).

5.1. The Drivers of Open Banking

Regulatory Push

Open banking frameworks continue to evolve globally driven by regulations. It is the case of EU's Second Payment Services Directive (PSD2) which, as reported in Chapter 5.1, Requires that banks provide customer data to third party providers through open APIs.

Other remarkable cases worldwide are the action of the Monetary Authority of Singapore to continue driving financial services innovation through the availability of banking licenses for FinTech firms, with a focus on exploring the opportunities for APIs or the Australian Competition and

Consumer Commission (ACCC) early formal release of the Consumer Data Right (CDR) rules setting the stage for Open Banking in the country, which will take effect on July 1, 2020.

Technology Push

The US's case is particular because of the nature of its drivers. Here the National Automated Clearing House Association (NACHA) is entitled with the purpose of promoting and manage the electronic payment solutions for the benefit of its members and their customers.

The API Standardization Industry Group (ASIG), sponsored by the NACHA Identified 16 specific APIs for development through its white paper "API Standardization – Shaping the Financial Services Industry" release outlining Group's approach, progress and future efforts toward advancing API standardization across the financial services ecosystem [20]. Together with the Standardization effort there are examples of unregulated data opening of banks, identifying an early entry in Open Banking environment an opportunity to gain competitive advantage over reactionary banks [21].

Competitive Push

The traditional players of the banking sector have always been reactionary towards change. banking services have been considered as settled and with poor need for improvement. Some minor innovations were introduced over the years, such as mobile banking applications or technologies for contactless payments while the major services and business models have been substantially unchanged. The reasons for the monolithic banking perspectives has been identified in the indirect lack of competition driven innovation. The armored regulatory environment dismantled by Open Banking gave birth to innovative competitors questioning the status quo, forcing traditional players to adapt for survival and, in some cases, dragging them to the new industrial framework through partnerships, mergers and acquisitions.

The United Kingdom's case represents a remarkable example of competitive chain reaction. After the nine biggest Banks adopted the Open Banking model publishing their APIs, other banks acted as "fast followers" implementing similar models not to fall behind in the rush for offering the most customized user experience and to retain their market share.

Another push factor has been identified in the category of Digital Banks entering the market with innovative digital-based offer. The new customers generation approaching financial services for the first time are much more likely to be attracted by the offer of Digital Banks with respect to the traditional branch-based "brick and mortar" institutions.

Today, incumbents perceive the need to comprehend and adapt to this ever-changing competitive scenario.

Customer Push

In the last years a customer-centric trend emerged in banking services. Therefore, customer's expectations are moving toward higher service standards, including tailored offers and instant solutions to their problems.

The new entrants disruptive action highlighted the necessity for banks to pursue adaptation to maintain a primary role in the financial services value network.

Incumbents perceive the need to understand new customer needs, being them explicit or implicit, to retain their customer base and attract the still unbanked new generation of customers.

China's case represents a remarkable example of customer-centric ecosystem for digital payments.

Since 2014 the Chinese multi-purpose app "WeChat" incorporated a digital wallet service, "WeChat Pay", allowing its user base to perform mobile payments and peer-to-peer money transfer between contacts, vastly expand the app's use cases. WeChat users rely on the WeChat Pay services to pay bills, e-commerce, in-store payments and others.

The innovation introduced by Tencent, WeChat's developer, aimed to deploy the network potential detained by its application, a chat-messaging and social-network giant in China, to penetrate market distributing financial and payment services through the already established infrastructure and user base.

Such a customer-driven development lays its foundation on the awareness of the new customers' expectation in the fruition of services has changed: the same level of speed and ease they experience in any other sector is now expected in banking as well.

5.2. The Regulator Intervention in EU

5.2.1. The PSD2

The "fluid phase" features of Western FinTech industry showed in Chapter 4 highlighted the need for intervention by the Regulators.

In response to the requirements of safeguarding consumer safety, albeit by promoting the rise within the adoption of innovative digital products and services, the European Union established the "Revised Payment Services Directive" also known as "PSD2", Directive (EU) 2015/2366, relating to payment services in the internal market and which repeals the previous PSD Directive 2007/64 / EC.

The aim of European legislator in the latter intervention is to strengthen security system and ensuring a high level of competition and transparency towards consumers, solve the open points left by the antecedent PSD of 2007.

Among the main benefits pursued with the PSD2 can be counted [22]:

- Greater consumer protection
- Development of new payment solutions
- Regulation of new market players
- Uniform fees for card payments in line with the MIF
- Increase in the level of competition within the industry
- Overcoming differences between the disciplines of European States
- General increase in efficiency through the infrastructure standardization

Concerning security and consumer protection, the PSD2 introduced more rigid verification for payments in "card-not-present" mode, named "Strong customer authentication" (SCA).

It requires users to provide two or more information from these factor classes:

- A knowledge factor (something you know, such as a password)
- A possession factor (something you have, such as a payment card)
- An inherent factor (something you are, such as a fingerprint scan)

The strong authentication is a fundamental element to enable FinTechs providers to offer services requiring access to customer's bank account and information.

The payment market, although still under development, shows some predominant directions pursued by the Banks. To analyze them, a matrix was built with the different approaches dictated by the main experiences observed.
For the evaluation of the different approaches to PSD2, the following reference axes were used:

- Approach to the "Offer System" - aimed at identifying the way in which a Bank proposes itself on the payments market, with particular focus on the strategic choice of creating possible collaborations with external players;
- Approach to the type of services offered - aimed at identifying the strategy with which a Bank relates to the market, with attention to innovation and the development of its commercial proposition in order to differentiate itself, offering value added services related, but not limited, to the Directive.

Since regulatory compliance is the starting point for continuing to operate within the market, if a Bank has developed value added services in addition to the regulatory compliance initiatives, it will be represented in the section of the matrix characterized by "development of value-added services ".

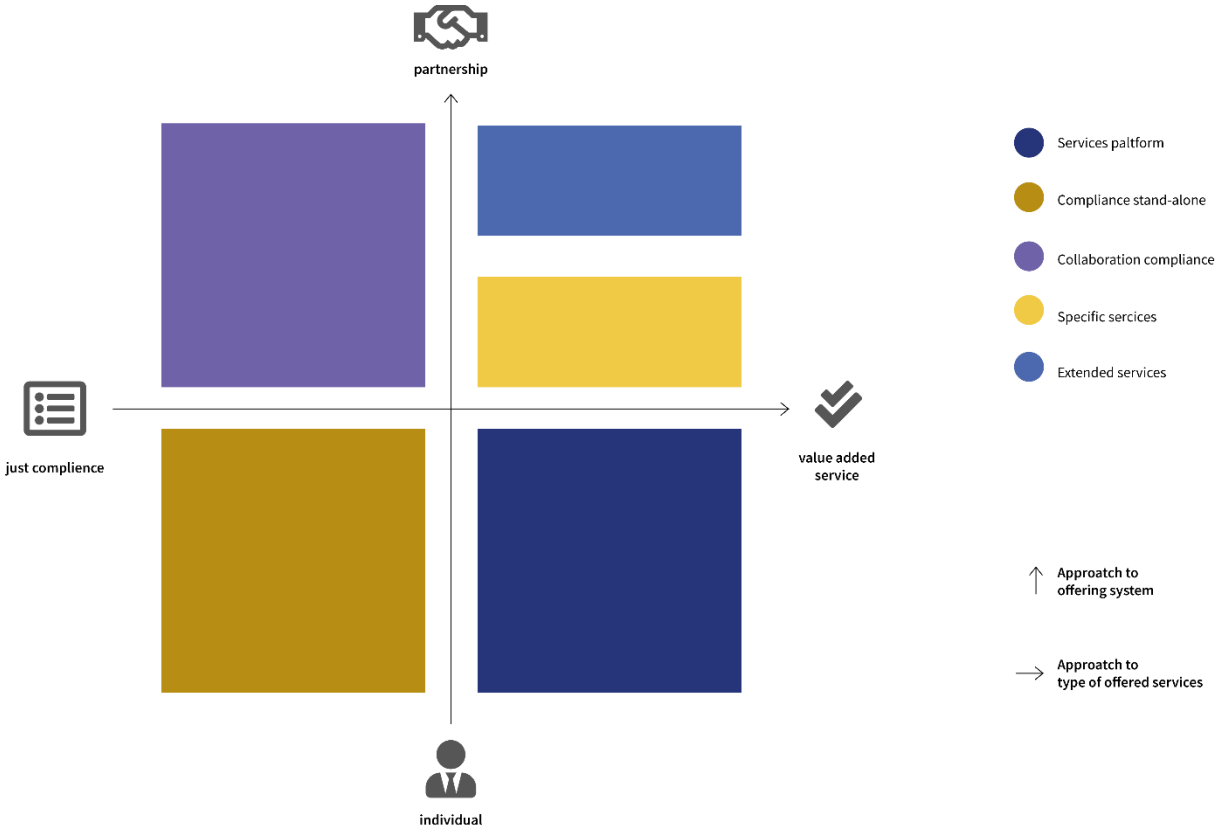

Figure 12 Bank postioning scenarios in Open Banking

The five identified positioning scenarios are listed below:

- Stand-alone compliance - the approach provides for the investment by the Bank in interventions aimed exclusively at achieving regulatory compliance, from a contractual, organizational and

technological point of view. Partnerships are not envisaged since internal solutions are preferred. Such internal development is in some cases assisted by external suppliers (consultancy companies) providing market awareness and competence in advice on the regulatory evolution;

- Collaboration compliance – this approach is joined by the Banks that, at least initially, seek exclusively for regulatory compliance through the adoption of market solutions and adhesions to consortium solutions. In Italy, various solutions have been developed, including the CBI Globe of the CBI consortium or the PSD2 platform offered by the SIA. These solutions are represented as enabling factors that allow a sort of "de facto" standardization within the market;
- Services platform - Banks, strong in their knowledge of the market and their internal capabilities in terms of innovation and processes, want to create a platform for sharing (and monetizing) the data in their ownership, in order to collaborate and realize synergies in development of value-added services for end customers. In this scenario, the Bank cover a primary role in the ecosystem created, consisting of players of different nature, ensuring compliance with the rules, values and regulations in force. Among the first significant ecosystems in this scenario, the BBVA API Platform (one of the main Spanish Banks) was born in 2017, followed later by the creation of Fabrick (in collaboration with Banca Sella).This topic will be further discussed in 5.4;
- Specific services - the offer proposed by banks, in collaboration with specialized companies (e.g. FinTech) of personalized services and innovative features, defined by the Directive: AISP, PISP and CISP (which will be further discussed in 5.2.2. Among the various partnerships on the market, ING Direct's YOLT represent a remarkable solution, with both AISP and PISP characteristics;
- Extended services - Banks and third parties, which can even be not strictly banking, agree to develop value-added services that can generate benefits for both parties. A noticeable exemple for this scenario is the collaboration between Intesa Sanpaolo and Vodafone on the verification of the IBAN during the opening of a new contract with the telecommunication company or the collaboration of the German online bank Fidor with O2 Telefonica and Van Laschot.

5.2.2. The Third Party Providers

The PSD2 legislator has recognized and disciplined Fintech service models based on third-party access to customer accounts. PSD2 also allows payment services on the bank account to be provided to different lenders (TPP) from the one where the account is rooted (ASPSP). This phenomenon is only a variation of the new conformation of payment services, unavoidably linked to the growing rigor of the rules governing the exercise of banking and financial activities.

In fact, the tightening of capital requirements and the consequent contraction of the profitability margin met with the availability of new technologies and, according to some authors, the concurrence of these circumstances would have triggered a centrifugal force of banking, financial, and payment services to new subjects, creating new market opportunities, new needs for customer protection and control of new risk factors. The variety of innovative business lines creates added value in the ecosystem of payment services but also makes incredibly complex to ensure the customer security.

The new business subjects, called Third Party Providers or "TPP", now regulated by the PSD2, offer value added financial services. This represents an enabling factor for the Open Banking phenomenon. The main subjects identified by the directive are:

- the Account Information Service Provider (AISP), an entity providing information services about the payment accounts
- the Payment Initiation Service Provider (PISP), an entity providing the user with the service to "initiate" (i.e. set up) payment transactions [23].
- the Card Issuing Service Provider (CISP), an entity providing information about the funds availability on payment cards based transactions [23].

These regulated subjects can offer innovative User Experience (UX) and new value added services as well. In order to explore the new opportunities offered by the PSD2 a further discussion on the TPPs business models will follow.

CISP

The CISP performs a fund check on payer's bank account to ensure it contains enough funds to honor a card based payment operation.

This is a peculiar subject born from a precise business case occurred in Germany with the French supermarket and hypermarket chain Carrefour willing to offer its specific card based payment method.

AISP

The AISP collects data from diverse check accounts, not necessarily from a unique financial institution, to provide in the form of intuitive dashboards with aggregated information to provide a complete overview of the personal financial status. To ensure access to the data of diverse bank accounts the TPP needs the user's authorization and they can only use the customer's data or access the related payment accounts for purposes for which the customer has given consent.

The result is a simplification of the user effort in monitoring his entire set of bank accounts, his expenses and therefore, the enhancement of consciousness in his consumes.

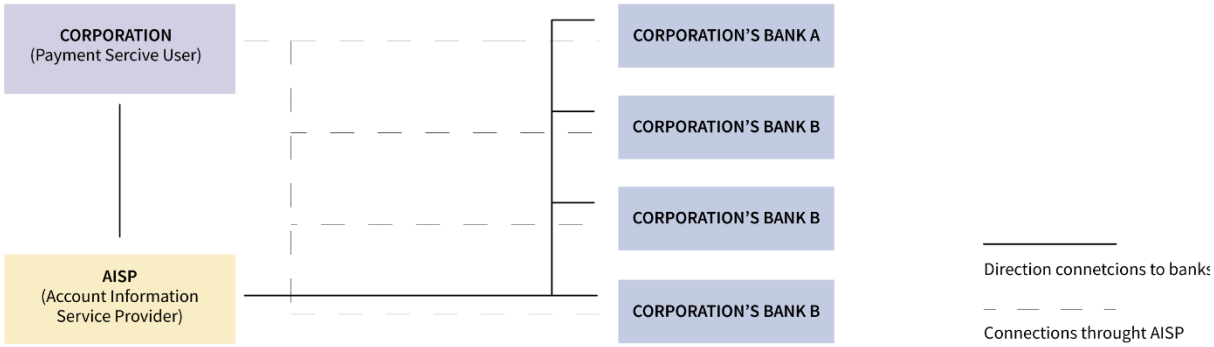

Figure 13 The AISP functional scheme

PISP

The PISP intermediates between the customer ordering a payment initiation and the referring financial institution. While performing the payment initiation the TPP does not hold user's money, instead instructs the payer's bank with all information necessary to perform the payment. Indeed, these providers can leverage Open Banking API connections to initiate payments, directly from the bank accounts in question. This enables these players to bypass traditional payment methods, such as cards.

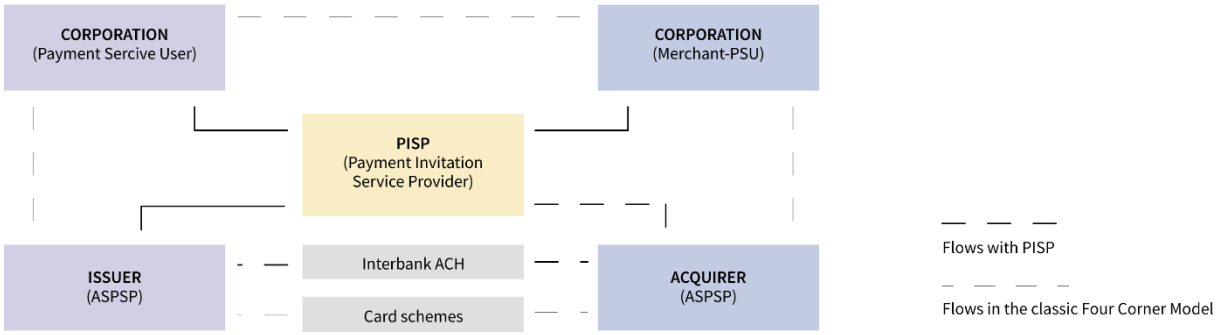

Figure 14 The PISP functional scheme

The PISP can offer valuable opportunities to corporates in two senses. First, it implies a significant reduction in payments fees since it allows initiating a credit transfer debiting the customer's bank account and crediting the merchant's bank account, it avoids the expensive card based transaction fees in online purchases. The costs related to online credit transfer represent a fraction of the online card payments and the amount of value recovered from this process switch can be shared between the merchant and the PISP depending on the appropriability regimes enforced by the parties. In a well-balanced equilibrium scenario, the PISP should be able to generate enough revenues to cover its costs and retain a profit margin while the merchant should be able to increase its own margin through online card processing fees and costs reduction.

A second benefit the PISP payment initiation can provide to merchants is faster cashing and increased liquidity with respect to card-based payments.

Today cash collection by merchants occurs two or more days after the online card transaction initiation, while a PISP-based transaction can credit the merchant's account instantaneously relying on core banking infrastructures for instant wire transfer (e.g. SEPA Credit Transfer Instant) or at most in one business day relying on the classic wire transfer infrastructure (SEPA Credit Transfer).

An emblematic example for a BigTech offering payment initiation services is Amazon which, since 2019, allows customers to pay on its marketplace via SEPA Direct Debit for EUR payments.

Figure 15 Amazon Italy commercial SDD presentation screen

5.2.3. The International Regulatory Landscape

To provide a holistic representation for the evolution of the Open Banking regulatory landscape, herein we report the state of the art for the primary non-EU economic players.

United Kingdom

The UK has substantially converged to the standard Open Banking framework: in February 2016: the UK Treasury published a set Guidelines with a focus on the use of data for the management of money by end customers and, in January 2018, it occurred the exhibition of standardized APIs, due to market competition and Market Authority, which started the creation of a data ecosystem.

United States of America

In the USA, the approach to Open banking has been driven by the customer protection principles: in October 2017, the API standard program and of the Consumer Protection Principles (CFPB), which outline the principles for data sharing and aggregation, were published.

Today, the business initiatives are stimulated by the unregulated opening of data and non-binding guidelines.

Australia

In May 2018, the Australian government announced the formal establishment of a consumer data law which provides for the regulatory obligation to display account access services.

Today, the identification by the Treasury of a company for the definition of a shared technical framework is still ongoing

Canada

The introduction of this of Open Banking framework in Canada has started in September 2018 with the establishment of a dedicated consultation commission. Later in January 2019 a public consultation was called for the evaluation on the creation of a regulatory framework for Open Banking, with a focus on transaction security, protection of consumer privacy and industry stability

Singapore

In Singapore, the adoption of Open Banking has been promoted and not superimposed, leaving the market competition to trigger the phenomenon autonomously. In November 2016 the Monetary Authority of Singapore (MAS) published the Playbook API, a collection of over 400 recommended APIs.

Today, the major national banks have adopted a proactive approach to innovation, being among the first to experiment with Open API technology. As an example, DBS already provides developers with access to over 200 APIs.

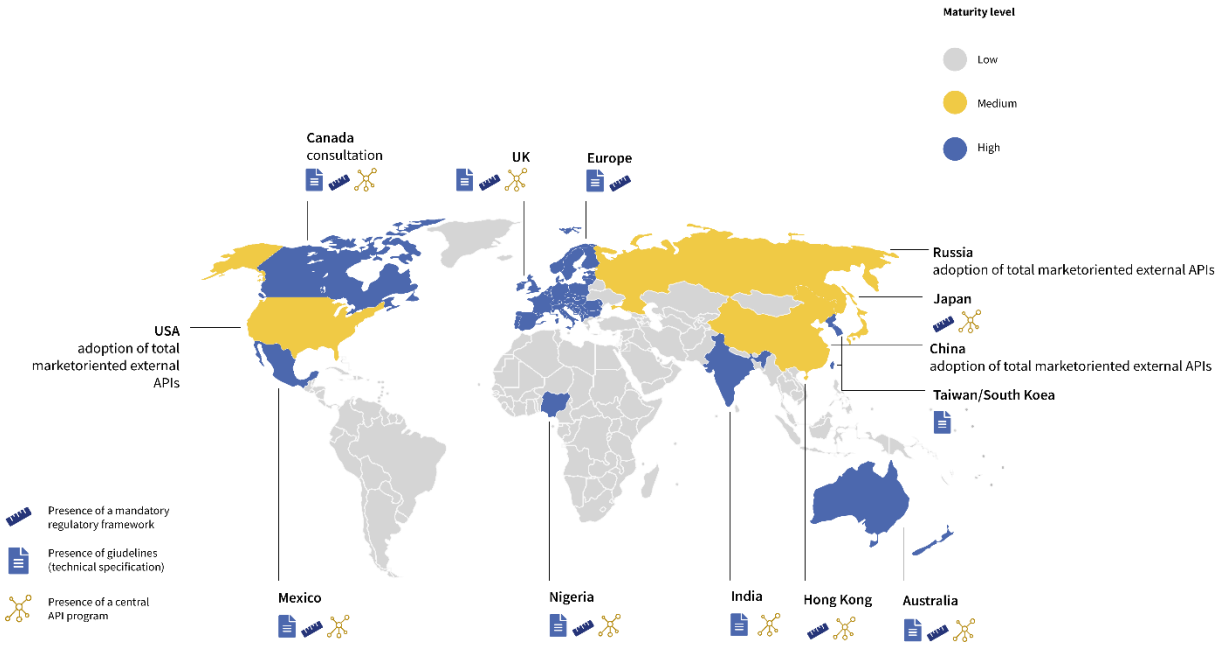

Figure 16 International Open Banking landscape

5.3. The Application Programming Interface

On high abstraction level, an Application Programming Interface or "API" is a are sets of requirements that govern how one application can talk to another [24]. It represents a channel through which an external application can access data stored in the source application database. When the channel is made public it offers business opportunities to create specific applications referring to a unique underlying dataset. They represent an architectural approach that guarantees code scalability, security and reusability. This interface is increasingly used, even in contexts that are not concerning banking, thanks to the ability to optimize and streamline processes and procedures, also allowing the integration of systems from outside.

In the payment sector, the legislation required the preparation of a dedicated interface (or alternatively a customer-facing) to allow secure communication with the PSD2 TPPs, ensuring the use of the services of the new players. As a response to this regulatory need, the APIs could represent the basis for building an interface not for compliance purposes only, but also to enable future developments related to the proposition of value-added services on the market.

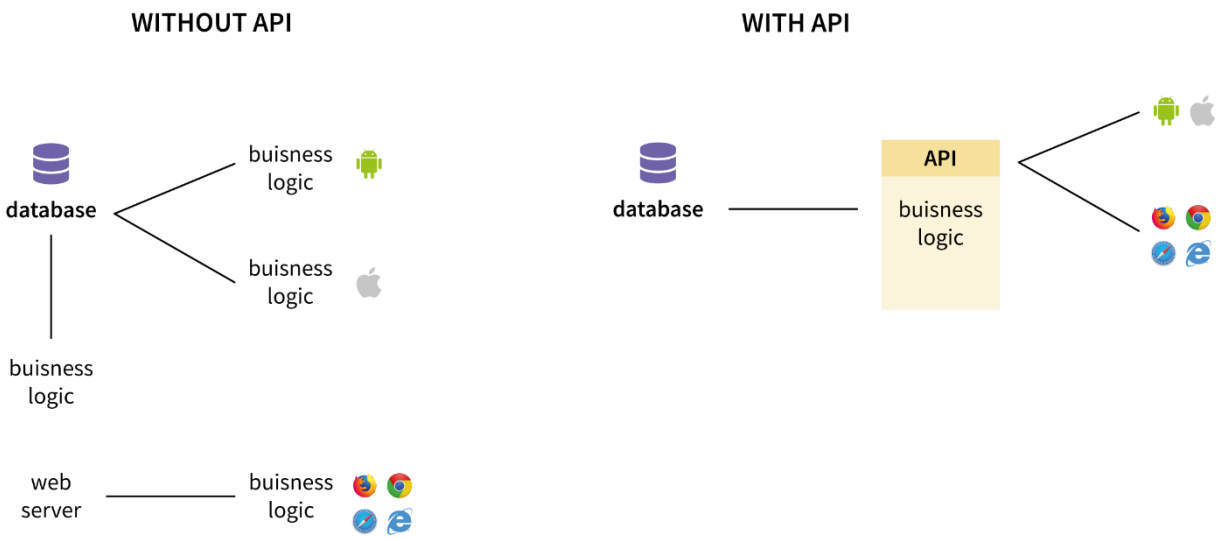

Figure 17 The Application Programming Interface

1.1.1. Release Policies

A useful taxonomy of the API release policy distinguishes:

- Private API – to be used internally within the organization to facilitate integration of different applications and systems in it. This type of interface brings several advantages such as the cost reduction due to the rationalization of the infrastructure and the increase of flexibility especially in real-time businesses
- Partner API – to be used to establish communication and integration of software between a company and its business partners. These interfaces are useful for companies to exercise quality control deciding which apps can access to the API and to generate an additional revenue stream.
- Open API – to be used in order to allow companies exposing information and functionalities to third parties not necessarily having a business relationship with them.

5.3.1. The advantages of Open API

The Open API represent an appealing opportunity to enhance the market reaching new customer pools through alternative business strategies.

To provide access to internal information via open API can trigger a complex competition process between startups striving to build innovative business models based on that information.

Such a process allows companies to gain competitive advantage over their competitors leveraging on diverse strategic streams:

- Direct Revenue: The direct monetization of "productized" API by the company
- Distribution Channel: The deployment of partner businesses as a distribution channel for the company's products and services

- Marketing Channel: The deployment of partner businesses as a marketing channel for the company's products and services
- 3rd Party Innovation: The leverage on the partner business innovation to add value on the company's core offer

5.3.2. Monetization models

APIs are substituting service-oriented software architectures and shaping a new unbundled network of connected business entities. The use of API for broader purposes than the mere operational one is slowly converging toward the Open API framework where companies allows third parties to build value proposition over the stable consume of such APIs.

In this sense APIs are turning from simple business process enabler into discrete consumable entities, following goods-alike business logics and entering the marketplace as products.

The productization of APIs is a reverse phenomenon with respect to the servitization trend occurring in other sectors. This highlights the increasingly blurred nature of the perimeters between products and services industries [25].

As a result of the value chain unbundling and the productization discussed above companies can pursue specialization strategies focusing on their core competence and deploying their culture while dismissing non-core segments implying unjustified costs, effort and low flexibility.

Such productization of APIs provide businesses with the possibility to enhance their markets reach faster with lower investment, avoiding sunk costs related to the creation of inflexible infrastructures in contemporary turbulent and liquid market. It also allows to capitalize over their dataset monetizing the permissions to access their channels in diverse ways. Among the main revenue model addressable can be counted:

- Data model - the Bank receives data as a consideration each time a third party uses its API;
- Transaction model - the Bank receives an economic consideration for each API-based transaction performed by the user
- Per call model - the Bank monetizes every time the API is called by a third party whether it involves a transaction completion or not
- Subscription model - the Bank receives a fixed economic consideration. Diverse subscription structures may be implemented (e.g. a monthly fixed charge applied to the TPP or a dynamic one as a function of the use extent of the API)
- Freemium model - the Bank offers a free set of standard features and an optional set of premium chargeable services;
- Balance sheet growth model – with the creation of core financial infrastructure for new products and services provided by TPP using API, the bank enjoys increase of financial assets and deposits under management.

- Revenue-sharing model - sharing of the revenues resulting from the partnership with the TPPs
- Rebate model - preparation of discounts or cashback, in case of use of a specific API, as an incentive to increase operations in case of competition based on volumes.

5.4. The Open Banking Platforms

Developing APIs as communication channel with the banks is expansive both in terms of time and economic investment especially in terms of fixed costs. Indeed, designing a useful and complete set of APIs while ensuring a high level of efficiency and security is a key challenge for all players adopting the Open Banking approach both for compliance and for strategic reasons.
For these reasons Open Banking platforms have born as a spontaneous aggregation of FinTech and banking partners or as assets with clear business direction. Indeed, in lack of a "de iure" standard established by the regulator, the emergence of a "de facto" standard is a major strategic topic.
In this sense the participation in a dominant standard acquires further importance.
The interconnection of these diverse parties require an initial phase concerning strategic design of the interfaces, business model design and the identification of the possible business partners.
After the preliminary activities have been consolidate, a delicate phase concerning operational and technological integration is required.

To cover the vast set of diversified technological solutions involving stakeholder such as banks, insurance companies, FinTechs and the new products and services is not in scope for this work. Aim of this chapter is to highlight the importance of developing effective architectures and governance models relying on innovative technologies to support open and collaborative ecosystems in which financial institutions and third parties interact with each other.
The Open Banking Platforms accelerate the integration of APIs, thanks to the conversion, normalization and sandboxing functions that allow abstraction from the communication details. The Objective is to reach interoperability between FS and non-FS players such as FinTech, partners, TPP, banks and insurance companies in cases where they adopt different standards.
The PSD2 Directive imposes the obligation to share data relating to payment accounts to authorized Third Parties, upon request based on the consent of the end customer; however, some players have exploited this obligation to open data to create value-added services, not strictly related to those defined within the Directive.

At the European level, BBVA has taken the road to develop an ecosystem that could encourage the creation of innovative products aimed at anticipating customer needs through the convergence and collaboration of the various players. Beside the enhanced evolution speed provided by this ecosystem, the bank also ensure itself having a clear vision on a large mass of projects, at the same time playing a

governance role in monitoring the possible evolution of the various products, services and processes existing today and an active role in the production of new products and services.
This represent a major strategic action through which incumbent banking players increase their position in the market over the industry restructuring.
The platform is accessible from any type of subject: FinTech, Third Parties, developers and even merchants

In this scenario, BBVA acted with an individual approach to the offer system since, with a proactive role, it created the platform, sharing (in compliance with the regulations) customer data and offering knowledge and technological infrastructure (for test and development of API services) in order to create an ecosystem for the collection of subjects, skills and ideas.

The platform aims to create new experiences by integrating the most innovative ideas with the ultimate aim of supporting customers in filling their needs (e.g. having the possibility of accepting payments through Alipay); in this sense, the subjects who intend to be part of the solution offered by BBVA can interface with the following environments: "sandbox" to design and test applications with non-real data, "pre-production" where it is possible to develop their own applications in an environment similar to "production" for a short period of time and, finally, "production" with access to the BBVA database and offered to end customers.
Through APIs, third-party companies can integrate part of BBVA's processes in order to offer real-time services to their customers, based on their needs.

The BBVA APIs, currently live on the API Market, are divided into three types according to the target segment for which they were designed: retail accounts, business and data. For example, the "Payments" API allows you to send money from a BBVA customer checking account to any other account in national or cross border banks, while the "Alipay" API allows you to connect the business of an activity with Alipay, the method of main payment for customers from China.

Regarding the Italian Open Banking context, it has greatly benefited from the PSD2 regulation, but the response from financial institutions has often been limited to the compliance purpose and seldom addressed to a strategic adoption of Open Banking business models.
Today the offer of integration platforms for Open API in Italy counts 6 key platforms:

- CBI Globe: The biggest platform in the Italian context, it counts around 300 bank joiners, which represent approximately 80% of the Italian banking market. The CBI Globe platform

allow the exchange of data in a simple and fast mode ensuring compliance with the PSD2 regulation

- Nexi: One of the card-issuing leaders in Italian market, often acting as service provider for banks and financial institutions, is also considered the Italian PayTech leader. In January 2020 it has started a partnership with CBI to develop new features for the improvement of the CBI Globe platform
- Fabrick: It represents an emblematic example of the Italian strategic response to PSD2. It is an open financial ecosystem enabling and promoting the interaction between players in a collaborative environment. The joiners are stimulated to exchange information ad foster collaboration in the development of innovative Open API solutions. After six months from the start of the PSD2, Fabrick's direct customers amount to 200 and 23,000 and the services born on the platform are used by 23,000 end customers
- SIA: Another Italian leader in card issuing, has developed an Open banking platform allowing diversified financial institution and stake to collaborate in its digital ecosystem. This includes 80 banks and many other subjects (e.g. private and insurance companies, FinTechs and public administration)
- Cabel: An Open banking platform acting as outsourcer for its 20 banking joiners in complying with the PSD2 regulation. It supports banks in making APIs available to TPPs allowing these third parties to access the banks data pool using home and corporate banking services
- Cedacri: In June 2019 Cedacri created an Open banking platform named Cedacri's API Gateway as a participative action to the PSD2 initiative. It counts 30 banking joiners and allows TPPs to access and exchange data with these.

Among the Italian platforms presented, Fabrick is the one coming from a banking player initiative as a response to the regulatory evolution and it can be positioned in the "service platform" approach discussed in 5.2.1 as well as the Spanish BBVA Open Platform.
Despite the PSD2 compliance requirements include to provide the exposure of just 10 APIs, on the platform are present 473 APIs resulting in 12,000,000 API calls per month.
The platform also counts aa remarkable number use cases implemented (16 use cases in 2020).
These reasons allowed Fabrick to reach the critical mass leading it to cover over 95% of the Italian-PSD2 market. Indeed, more than 5,000 professionals from 20 banks are working on API development within the platform.

Banca Sella, in line with BBVA achievement, albeit with some operational differences (for example through the offer of modules relating to Core Banking), launched Fabrick on the market: an ecosystem, open to all, mainly composed of players in the financial market , including FinTech, a company with a

desire to innovate, developers, in order to share skills, technologies and services with the sole objective of cooperating to generate new value-added services and products for end customers.

Based on the assumption that the Bank, individually, will not be able to offer all the services, guaranteeing the excellent quality in each of them to the end customer, who remains the target of all operators, Fabrick does not offer only an IT infrastructure for compliance legislation, but rather a series of processes, skills, in order to want to "control" innovation and make it available to anyone who wants to access the ecosystem.
The solution, therefore, in addition to the adjustments of pure regulatory compliance to PSD2, offers systems for managing online payments, electronic invoices and supply financing chain, solutions to support online crowdfunding operations, as well as white-label functionality to build innovative banking services.

Like BBVA Open Platform, the role of the ecosystem is to become a point of reference for each actor, to guide change through a collaborative and not just competitive logic, despite belonging to the same business.
Banca Sella, through the preparation of this technological infrastructure, wanted to become a protagonist within the Italian market, as promoter, not only of digitization and innovation of the payment market, but of all sectors of the market, not limiting access to financial players only.

The ecosystem, B2B2C in nature, supports joiner players to identify and cross-match the solutions that best fit their customers' needs, guaranteeing skills, technological infrastructures and services in order to increase the value perceived by the customer: support consists in offering modules that can be integrated into proprietary systems, adding value.
In this case, the services offered by Fabrick differ according to the type of user: Banks, FinTech, Corporate. As anticipated, in addition to the services defined by PSD2 - such as the "Account integration" service, "Accounting solutions for SMEs" - "supply chain finance platform" and "KYC services" services are also offered to the market (flexible solution , through API, Know Your Customer which allows you to build a customer base and manage requests in real time, regardless of the financial product).

One of the most interesting collaborations, is the one announced between Bper Banca and Fabrick in order to promote a streamlined version of the Bank on the market, targeting younger customers less likely to use traditional banking interfaces, through the offer of a service, for mobile devices, quick and simple [26].

Despite the differences in terms of interaction with the players participating in the solution, the individual offer model aimed at developing value added services currently most represented on the market places the Bank directly (case of BBVA) or indirectly (case of for Banca Sella) as an enabling agent that, through skills, services and technological infrastructures, promotes a new relationship environment, where through cooperation, data opening and the integration of modular processes and services through APIs, it is possible to offer innovative user experiences.

5.4.1. Visa's Plaid Acquisition Case

Several technology platforms for Open Banking are flourishing around the world to provide interconnection between financial institutions and FinTechs.

Card networks are aware that Open Banking is triggering a new call into question for their privileged position within the industry. An emblematic example of this phenomenon surfaced in January 2020 when Visa announced its purchase of a financial services API startup for $5.3 B.

Plaid, the startup in question, was founded in 2013 with the original attempted to build consumer financial management products. When the difficulties in connecting bank accounts, required for these tools, emerged the company took the chance to shift their core business focus to a unified banking API. Today Plaid develops financial services APIs enabling consumers and businesses to interact with their bank accounts, check balances, and initiate payments through financial technology applications.

What is really interesting of this business case is the amount offered by Visa, which represent an incumbent player of the industry, for a startup representing an enabling module for substitute payment services. The offer was indeed double of Plaid's final private valuation.

At the time of this announcement it was also disclosed that both the two giants of card network industry Visa and Mastercard had quietly participated in a previous funding round in 2018.

Market observers like venture capitals, investment banks and strategy consulting firms have published diverse comments for this emblematic transaction.

It is undoubtful there is a clear strategic vision over the acquisition. Its plausible interpretation is that Plaid, as well as other API platforms, is experimenting a business which Visa is aware is destined to reinvent the world in which it operates. at the early funding rounds, it participated with its main competitor to ensure information rights on the startup's operations. When Visa realized the magnitude of threat it was assisting decided buying Plaid as an insurance against disruption.

The whole operation can be considered a hedging practice through horizontal integration. Since the investment has increased the financial interest of the incumbent in the Open Banking field, it can be inferred that Visa is trying to take a position in this market to offset and balance against the risk adopted by assuming a position in its core market.

This represent the first event that revealed to observers that the card scheme is about to be challenged for the first time since its birth.
What is reasonable to expect in the next years is that card scheme lifecycle will turn to an unavoidable declining phase after decades of maturity. Until this eventual turning point, it is undoubtful that card schemes will be continuedly exploited as a “cash-cow” business providing the necessary liquidity to fund innovative investment projects.

5.5. PwC’s Value Proposition

Within PwC it has been established the Payments Center of Excellence (CoE) which is a virtual network coordinated by PwC Italy form the Milan headquarter that includes FS experts from the main European countries.
This multidisciplinary experience across the several lines of service allows to have a complete understanding of payments and Open Banking initiatives in Europe.
The Payments CoE develops international benchmarks to study the main players in the field of payments and Open Banking, in particular to study innovative services and new possible roles in the market for Banks, FinTechs and "Over the top".
The deep knowledge in these areas allows PwC to frequently discuss the results with the banks and with the main players in the sector.

PwC is committed to deploy the most recent trends in the creation and evolution of Open Banking services which can be synthetized in three clusters.
The creation of VAS and enhancement of information assets consisting in:

- Construction of new API services portfolio through the identification of features that can be delivered to customer segments defined by return / go to market priority
- Use of the data set linked to areas not tied to the payments sector which are accessible with APIs to enhance the information assets

The establishment of partnerships with software/solution provider:

- Co-creation with external suppliers of tailor-made value-added services and packages developed with API in mind
- Enlargement of the customer base through the distribution of the Open Banking service through strategic partners

Activities enabling the active role of third part providers:

- Offer of account aggregator and payment initiation services (e.g. as technological partner of a set of client institutes) from own accounts and from other players

- Enhancement of information assets thanks to the largest set of data related to the payments sector available and the VAS that can be activated on top of the AIS and PIS services

The PwC's technology consulting line of service is aware of the possible technological challenges for the realization of an efficient solution from an Open Banking perspective. These are mainly due to the lack of a proven standard design since the technology still hangs in a fluid phase.
The need to define API guidelines and an architectural model to facilitate dialogue with FinTech and third-party players, as well as the need to have technologies that can simplify access to legacy systems, are some of the main challenges for market operators:

API guidelines
The need for simplification and standardization arose in the context of the creation of applications and solutions that increasingly need to interact with the internet or with new external online channels. Moreover, it acquires primary importance to overcome the concept of silos in order to create reusable integration components from all channels.

Management of data access
Challenges for the data-access management consist in the increase of external channels and players with the need to access data. Indeed, this provides for an increase in the number of calls to legacy systems, which can be mitigated through decoupling components that minimize access to verticals. In order to ensure the correct sizing of the technological infrastructure mechanisms of analytics, KPI monitoring and performance evaluation must be evolved.

API governance
Concerning the governance of the API portfolio it arose the necessity of evolving the change management processes in order to guarantee the correct API versioning / distribution, as well as to guarantee the troubleshooting management and to identify a centralized API billing / billing tools capable of responding to the different revenue models of the API Economy.

The PwC Italy's Technology consulting is the leader within the European cluster of the network in the field of Open banking and presides the role of European center of excellence.
It leads the vanguard of the sector offering a vast value proposition including:

- Assessment of technological requirements,
- Formalization of functional / technical analyzes
- Internal regulation update (policy, procedures)
- Project governance and interpretation support

- Support in verifying the feasibility of new VAS and benchmarking to identify the most innovative trends
- Partner selection (e.g. solution, FinTech) for the creation of open banking services, with a focus on technological aspects
- API dictionary definition, technical interview flow and BR formalization / analysis for API services realization

6. A Strategic perspective for Europe

Digital Payments industry is evolving globally, promoting the progress toward the cashless society but European cluster, is falling behind with respect to the Western and the Eastern.
Indeed, despite Europe is still the leader in payment standards and especially in customer privacy, its rush in the global environment is being prevented by fragmentation of payment landscape, structural obstructions to revenue-generation potential for financial institutions, intensive emphasis on data privacy and scarce industrial innovation push.
European financial institutions and FinTechs, being them aware or not, have the major urgency to increase their revenue-generation capabilities from digital payments.
Such an action is even more imperative since the BigTechs, which are mostly American and Asian are threatening European players reaching payment licenses in Europe, entering its market.
As discussed in 3.4.3 the threating payment solutions proposed by the BigTechs are not limited to the card-based ones which represent a set of "incremental innovation" but they also involve the cryptocurrency concept introduction which represent a "radical innovation" that may have severe disrupting effects if associated with the capillary network distribution through social media like in the case of Facebook's Libra.

Another major obstacle for the European players in is the obstinate and extensive usage of cash ingrained in society. This is particularly intensive in in some European countries rather than others.
A survey performed by PwC in 2018 on 2,500 consumers across 10 European countries showed that 47% of respondents expressed a preference for using cash. This phenomenon has resulted affecting the German culture countries like Germany, Austria and Switzerland more than Latin countries like Italy and Spain, while the best result concerns United Kingdom, Netherlands and Sweden.
Data are exposed in Figure 18.

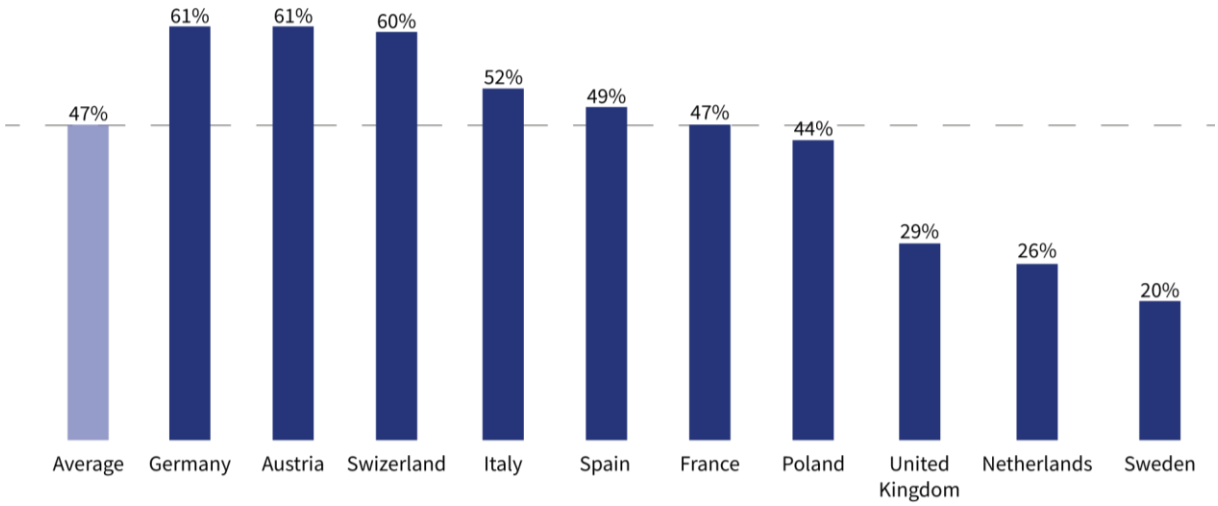

Figure 18 Percentage of European consumers preferring cash, by contry

Besides being an obstruction to the customer participation to a European digital payment market, the persistence of cash embeds all the direct and indirect costs already discussed in 3.1.
Diverse solutions may be implemented in order to reduce this harmful phenomenon.

The first step would be to reduce the need for people to carry high amount cash. This objective can be pursued by reducing or abolishing the fees related to ATM withdrawal.
The effectiveness of such actions has been validated in the European countries like United Kingdom and Sweden which applied this method.
A simple interpretation for this causal effect is the psychological bias leading people to withdraw high amount of cash to avoid the effort for visiting the ATM multiple times and the fixed costs related to ATM withdrawals.
The effect is also observable in the difference between the average of €3,372 in 40 annual withdrawals per capita in United Kingdom and the €4,675 in 26 withdrawals registered in Germany by the European Central Bank.

A joint initiative at European level would be a desirable solution to achieve the reduction of ATM management cost deploying the synergies across member states. The creation of a pan-European network of shared utilities would allow Banks to reduce the related costs and fees, then triggering the positive process of cash abandonment by their customers.

The technology-push toward the use of non-cash payments is also a remarkable element to leverage on. According to a new study from Juniper Research the total number of Open Banking users will double between 2019 and 2021. This will reach 40 million in 2021 from 18 million in 2019 [27].

The ongoing Coronavirus pandemic is having significant impact on payments industry, increasing the need for consumers to aggregate accounts and gain insight on their financial health; boosting momentum in Open Banking adoption [27].
Europe is holding a leadership role in this extraordinary growth as a result of its regulator-led approach to Open Banking aimed at lowering the market entry barriers.

The Open Banking enabled payment initiation service represent a valuable alternative to the more common card-based payment solutions.
The use of card schemes implies a value consumption for each transaction and its weight is carried by merchants. These are therefore reluctant to incentivize the use of payment cards with respect to cash.
As a first approach to face this problem a model was conceived to overturn part of the value saving deriving from the use of PISP solutions to the customer in the form of cashback or discount, letting him enjoy the convenience of such technologies and making him actively participate to the change.
This proposal revealed to be actually not viable since the price discrimination based on the used payment method is not allowed by the PSD2.
The role of the customers in this value creation mechanism must be limited to their perceived convenience in terms of reduced attrition and enhanced user experience and cannot overflow in the economic theme.
It must also be considered that, in the case a customer undergo a transaction fee for payments through its online banking, it is likely he/she will be subject to the same transaction fee when initiating a check payment through the PISP.

Besides the industrial effort to introduce digital instruments enhancing the user experience, the role of European Union in pursuing the emergence of a European API standard and the upgrade of its payment infrastructure cannot be neglected.
Moreover, the underlying payment infrastructure concerning for the payment processing after the PISP initiation should be sufficiently efficient and cheap not to burden the cost for the parts involved in the transaction

On 29 June 2020, the European Banking Authority (EBA) published its response to the European Commission's consultation on a brand new Digital Finance Strategy for Europe [28].
According to the correspondence, EBA is committed to guaranteeing the fundamental principle of "technology neutrality" in regulatory and supervisory approaches. Moreover, it strongly supports the Commission's initiative towards a replacement Digital Finance Strategy.
Several possible EU-level actions have been identified by EBA to support the scaling of innovative technology cross-border ensuring high standards of consumer protection and financial sector resilience.

6.1. Solution Proposal

In light of the industry and framework analysis and after comparing the diverse geography-specific environments, we have conceived a solution proposal with the purpose to design an efficient and robust paradigm for payments in Europe.

The architecture is based on the very current trend for unbundling of financial services value chain.
Indeed, it is composed by a reliable and efficient interbank wire transfer system resulting from the upgrade of the current one plus the modular appliance of the customer-specific front-end represented by the Third Party Providers pool which will participate to the global innovation rush, maintaining its intrinsic dynamism despite being incentivized to participate to a common European standardization project.

In order to effectively present our reasoned model, it is highly important to explain the causes for exclusion of an alternative data transfer technology: the blockchain.
The blockchain is a technology allowing the transfer of data within a network of nodes without requiring a central hub a distributed ledger but rather managing the propagation of a "distributed ledger" on a peer-to-peer basis.
The distributed ledger is replicated, shared and synchronized across the nodes of this network as a compounded chain of information blocks through leveraging encryption to prevent users from manipulating it [29].
The core peculiarity of this technology is that no central administrator or centralized data storage, such as a Central Bank or a RTGS is required to perform Clearing and Settlement activities.
This technology can provide several benefits due to its features and cryptocurrencies are increasingly deployed for specific – sometimes controversial – purposes.
BigTech are currently betting on cryptocurrencies especially for P2P transactions, especially those relying on a vast customer pool such as social networks.
Facebook, inc. is working on creating its own cryptocurrency, named Libra, to enable the exchange of money between the users of its social network: Facebook, Whatsapp and Instagram.
This perspective would represent a potentially successful payment method especially in segments like "low value payments".
The blockchain is expected to be progressively used as a complement for several businesses but, in its current form, it does not represent a valid alternative to the wire transactions.
Here below a set of reasons for this statement is presented starting from the most important topic.

Value destruction

As discussed, the blockchain uses cryptographic encryption to ensure its functioning and security.

Every time a user is willing to perform a transaction, he/she uses a personal key-code that will serve as an input to the algorithm to prove the user is authorized to append information to the chain.
This operation require large amounts of computing power when performed across the whole network and no scalability of costs is so far reached.
The Cambridge Bitcoin Electricity Consumption Index (CBECI) is the system developed by the University of Cambridge providing accurate estimates with theoretical lower and upper bounds for the Bitcoin network annual power consumption. The system is live and updated every 30 seconds [30].
According to the data, the estimation in mid-May 2020 of the annualized power consumption for Bitcoin is around 82 TWh, the same as a 212M population country like Pakistan [31].
Considering that Bitcoin is not the only cryptocurrency available today and possibly will not have the biggest cryptocurrency network in the future, it can be easily appreciated the value-destruction embedded in this technology and the deriving environmental and economic costs.

Lack of regulation

Being this technology relatively new and controversial, it generates a particularly volatile environment where the lack of regulatory oversight leads to market manipulation and speculation.
Legislators have so far failed in keeping up with the evolution rapidity of this technology and in some cases, they hindered it as an enabling factor for illegal activities and governmental sanction avoidance.

No radical service innovation

It is undoubtful that the blockchain applied to cryptocurrencies is somewhat revolutionary, the service provided through this technology is other than innovative. The aim of the cryptocurrencies is to replace the financial institutions network in the provision of clearing services but do not provide benefits in terms of costs and speed. The interbank wire network provides this service adequately well at relatively low cost to the end user.
The real perceived premium benefit associated with the block-chain is not the efficiency of the transaction itself but rather the concept of exiting from the control of public institutions for controversial scopes or for a lack of trust. Indeed, the first cryptocurrency (Bitcoin), became popular just after the financial crisis of 2008 in a period where mass-media and the public opinion were expressing distrust and disappointment toward Banks and financial institutions in general.

Burdensomeness and slowness

The complex system of encryption which enables the blockchains transaction to be attached on the distributed ledger imply a relatively long elapsed comparing to the traditional payment systems. Indeed, a transaction in Bitcoin cryptocurrency require several hours to be performed after the order instruction.

6.2. A two-stage model

According to Strategy&, the strategy consulting firm part of the PwC network, one of the main pillars for building a commercially viable European payments model is to rationalize Europe's payment infrastructure through a simplification and upgrade of Europe's payments backbone for instant payments.

Today Europe suffers from the presence of multiple, often overlapping technical and service layers which have stratified over time and have never undergone a rationalization action in a coherent system. This is due to the tendency of European countries to retain legacy systems for several years even after innovative technologies are introduced.

A Radical simplification of European payment infrastructure would lead to a remarkable reduction in transaction costs. Since bank account-based and card-based transactions rely on the interbank payment system, both would benefit from an improvement in terms of performance and efficiency of such system.

Today, in European the framework, there are four stratified infrastructural layers, each concerning a specific payment service:

- SEPA Credit Transfer: A standardized system across Europe regarding bank account based services. The SCT is accessible via mobile/home banking besides the on-site payment instruction and it allows P2P payments from a checking account to another. It provides a cheap reliable way to perform payments but embeds several limitations. (…)
- SEPA Direct Debit: The infrastructural layer concerning the direct debit on customer account by merchants having already received a formal consent. The SDD is primarily important for any business interested in recurring billing. This is also a standardized system across Europe, but it is not used in all countries. It is used in France, Germany, Spain, Belgium, Netherlands, Luxembourg, Italy, Portugal, Austria, Ireland. In order to debit an account, businesses must collect their customer's name and bank account number in IBAN format. As part of their payment confirmation, customers must accept a mandate that gives the business an authorization to debit the account.
- SEPA Card Clearing: The birth of the SCC, in line with the spirit of SEPA overall, depends on the seek for a harmonized market also for card based transactions. This represent an important element providing merchants in Europe with the possibility to accept a variety of SEPA-compliant card brands and products. It would also allow to choose from a variety of acquirers without being artificially constrained by legal, technical or procedural aspects associated with the respective card schemes [32].
- SEPA Instant Credit Transfer: The SCT inst. was introduced to provide a pan-European infrastructure for instant payments. It took place in 2017 from a voluntary industry initiative

but a high level body chaired by the European Central Bank, the Euro Retail Payments Board already addressed the need for a pan-European euro instant payment solution.

The opportunity is to use the most recent and advanced system in SEPA's portfolio, namely SCT inst., completing its set of features allowing it to perform all the functions which currently have a whole dedicated infrastructure.

The SCT Inst enables the transfer of funds in the SEPA area within 10 operating seconds and implies low processing costs.

The resulting system will include diverse service layers such as deferred settlement and bulk payments running in single technical layer for all Europe.

The benefits of such rationalization would allow banks and their customers to access low cost instantaneous payments across Europe with a consequent value creation which could trigger a massive migration to checking-account based payment solutions at the expense of card payment networks which drain a substantial share of value from intra-European transactions toward United States.

Indeed, the possibility for the banks to process payments with high efficiency would reduce their fixed and variable costs allowing them to reduce the overturned cost to the final consumer while protecting their margins.

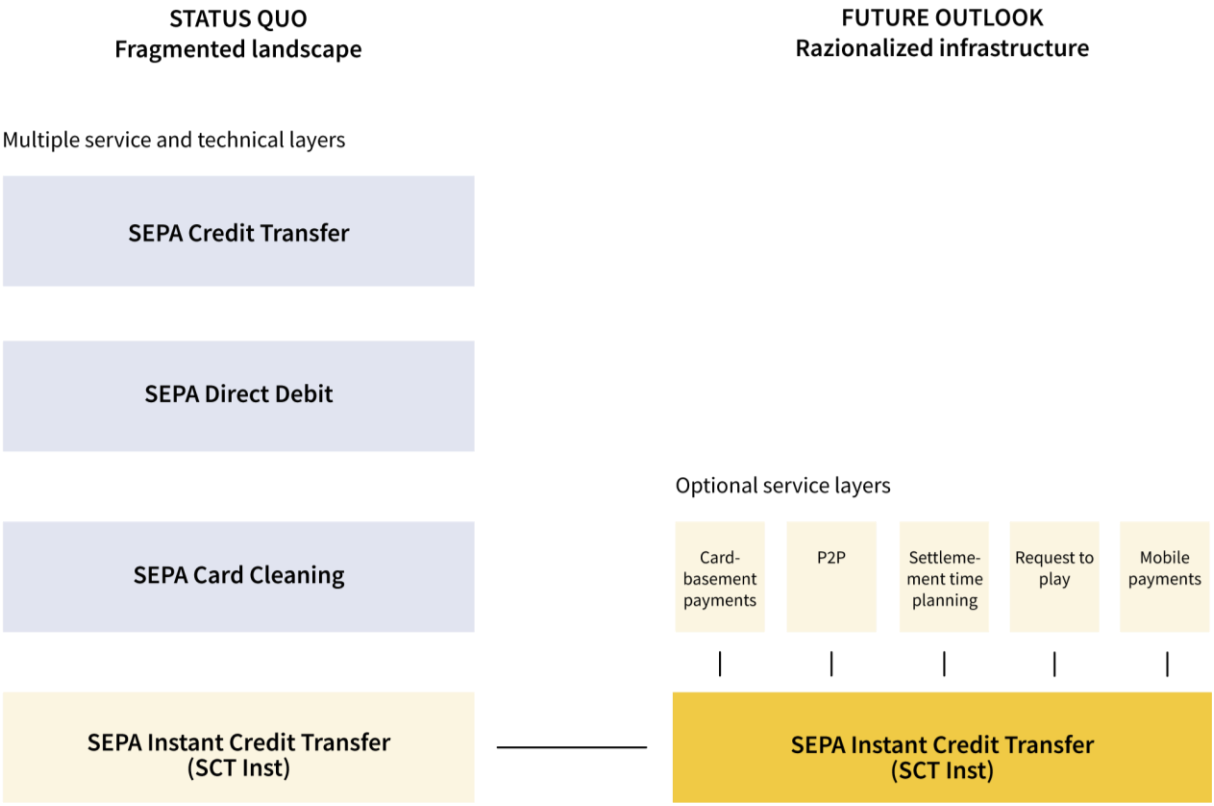

Figure 19 Rationalization of the SCT platform

The complementary action to the wire transfer system renovation is to increase the emergence of a pan-European standard for Open Banking APIs.
As discussed in 5.4 Open banking platforms are the primary hub for standardization and fostering of API innovation but the flourishing of multiple clusters and diverse agglomerations for Open banking participants which is physiological at this stage of the innovation lifecycle can slow down the emergence of an exhaustive European network Open banking network.
The concept of critical mass in network externalities is a key pillar for payments therefore, the importance of an early establishment of a common standard is a major concern and cannot be neglected.
While defending these considerations it must also be considered the danger embedded in the imposition of a "de iure" standard in the Open APIs development. Indeed, this might compromise the spontaneous evolution of innovation process for this sector, disconnecting it form the global market.
Here a trade-off between the competitive push and the network effect gets outlined.
The continuous monitoring of the global market comparing with the European one is imperative to forecast the evolution of the innovation curve in order to address a proper incentive for market concentration.
At the detection of the flattening of the innovation curve, which is associated to the emergence of a dominant design, a public campaign for progressive standard codification would desirable in order to re-connect all the separate partnership clusters into a unique European network of interoperability.

When connecting the two links of the chain a valuable combination occurs.
With the introduction of the PSD2, as discussed in 5.2.2, the role of payment initiation service provider (PISP) has been regulated. It offers to customers an easy and secure user experience for accessing funds in their checking accounts and instruct a payment toward a merchant's account or a peer to peer payment.

It represent the linking bridge to the wire transfer payment infrastructure which ensure a much lower cost with respect to the use of card schemes. The wire transfer, which have so far been limited to B2B or to some specific cases such as the "high value payments" would become a mass payment method acting as substitute to the current common C2B, C2C payment solutions both traditional (i.e. card-based, and innovative (i.e. digital wallets, cryptocurrencies etc.).
While so far PISP solutions have been essentially focused on e-commerce, it is credible that innovative evolution will eventually lead to on-site PISP services in a reasonable time elapse.
In cases regarding digital wallet solutions, on-site payment availability is being pursued since it represent the long tail for mass transactions. As an example, the in-cloud digital wallet provider PayPal is working to enable in-store payments deploying a combination of merchant and customer's app solution.

The result of connecting the two stages of UX and Core infrastructure is a reliable and extremely efficient model providing low cost instantaneous money transactions within the SEPA.

This is represented in Figure 20, where the end parties use their preferred FinTech to connect the interbank wired payment infrastructure.

The model reproduce the current market trend presenting groups of financial institutions and FinTechs to collaboratively develop their set of standardized interfaces through Open Banking platforms. Moreover, it reproduces the current wired payment infrastructure and its network in which the single financial institutions connect directly to a central system or indirectly through other interbank systems such as Automated Clearing Houses.

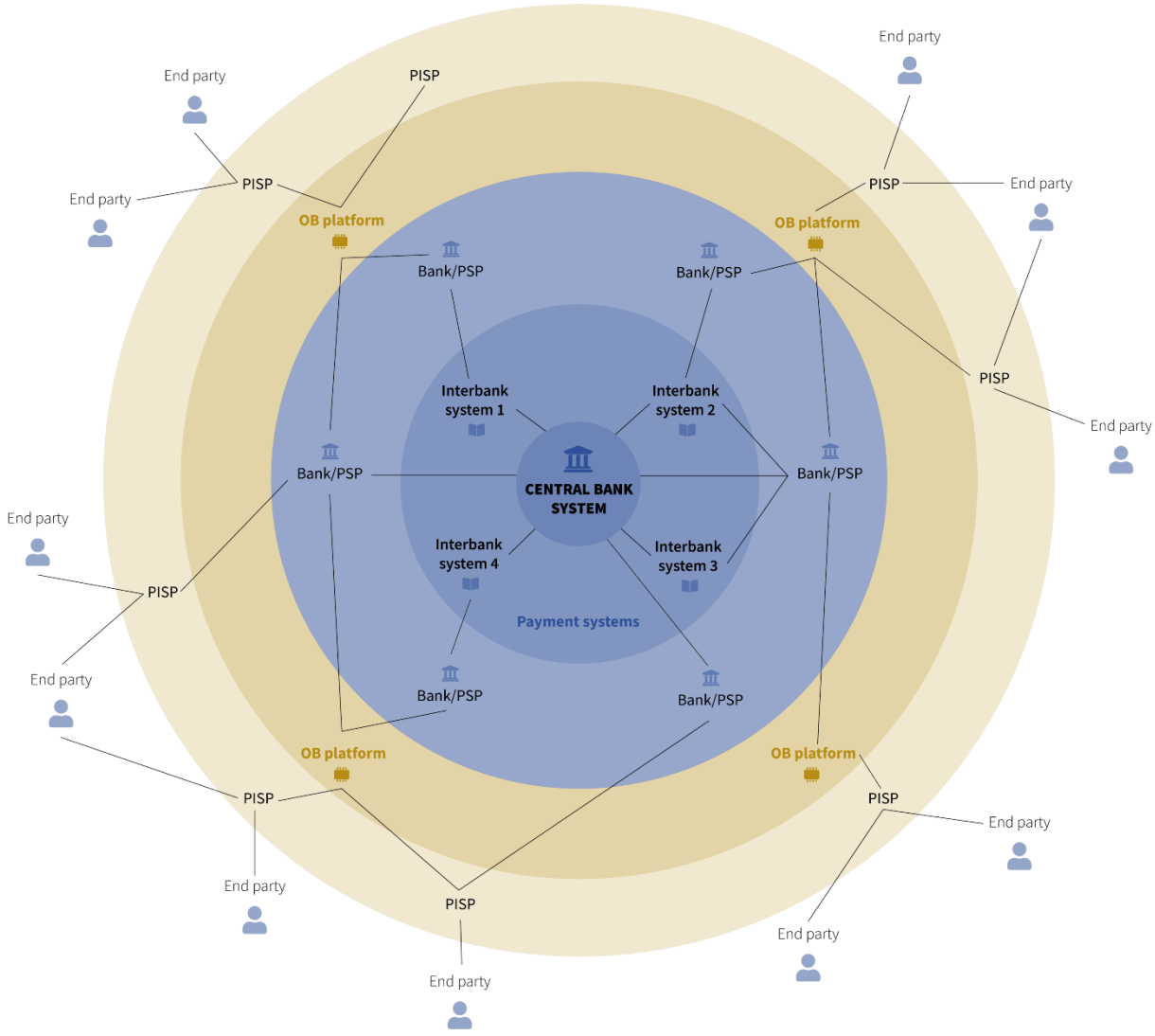

Figure 20 The two-stage model payment system

7. Conclusions

In the next years the digital payments industry is going to face a transition phase where the technology and business models is likely to consolidate and enter in the “specific phase”. Moreover, the pool of fintech players will reduce due to mergers, acquisitions and failures leading to a fast market concentration.

Within this transition phase of the paradigm switch, the emergence of a dominant design will provide significant benefits to the industrial cluster which will have a leading role in this evolution. Indeed, the network effect which is crucial to the emergence of a “de facto” standard, will reward the leaders for their strategic choices.

Within this framework, geopolitical clusters will be among the protagonists of this critical transition since governments and industrial associations are able to promote a standard with respect to others through regulations and guidelines publishing.

European Union has already started a wise interventionist policy with the enforcement of the PSD2 pushing the European payments industry to be one of the leading and most dynamic worldwide.

To fully deploy a central role in the new paradigm shift, EU must increase his effort to accelerate the emergence of a European-specific standard for Open Banking through the endorsement of development platforms and, at the same time, rationalize its legacy infrastructures to strengthen the core-system of the new payment model.

From this thesis it emerges a warning point to European institutions to take the chance act in the interest of its citizens but also the vision of establishing a global payment system that allows the open, instant and low-cost movement of money and thereby enables a more inclusive global financial system

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