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The Italian scenario of mobile wallet:
A census of the active services

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Abstract, English version

The contexts where a large number of transactions take place every day, with or without the involvement of acquisition of goods, financial assets or services, is characterized by changes in the means through which payments are carried out. The world is becoming a cashless society due to cash inefficiency and costly of use. However, credit/debit cards are also affected by issues, such as transaction fees, eligibility and inconvenience of authorizing transactions. The increasing mobility of today's modern society play a key role in this scenario. Mobile Phone has radically transformed telephony market, opening new opportunities to merchants and service providers in the development of new value-added mobile services, and allowing people using mobile phone to Internet/online access or mobile commerce (and payment).

The high demand for smartphone, the fact that people are always in possession of them and their financial card, and the innovation in terms of technologies, processes and services provided like the mobile devices growing capabilities of data acquisition, communication and processing led to consider the digitization of physical wallets into mobile applications (mobile wallet) as a promising trend for payments, personal identification, marketing and digital tickets, allowing users to benefit from both Remote and Proximity Payment solutions. The aim of this growing mobile digital service is to improve usability, convenience, security, control over items and novel disruptive experience to wallet owners.

For these reasons, the thesis is supposed to analyse the Mobile Wallet active in the Italian market, providing an overview and identifying the main trends about the payment and Value-Added services offered, their requirements, characteristics and functionalities, being focused on Remote and Proximity Payment systems, and p2p solutions as well. Since different mobile wallets are based on different technologies and methods and provide different services, the thesis is supposed to also evaluate the service level about payment services and VAS in order to identify the current best proposals.

Abstract, Italian version

I contesti in cui hanno luogo un gran numero di transazioni ogni giorno, riguardanti o meno l'acquisizione di un bene/servizio o di attività finanziarie, sono caratterizzati da cambiamenti in merito ai mezzi attraverso i quali i pagamenti sono effettuati. La società sta utilizzando sempre meno il denaro contante per la sua inefficienza e per il suo costo. Tuttavia, anche l'uso delle carte di credito/debito è condizionato da problemi legati alle commissioni sulle transazioni, idoneità e la scomodità di autorizzare le transazioni. In questo scenario, la crescente mobilità nella moderna società dei nostri giorni ha un ruolo fondamentale. Il telefono mobile ha trasformato radicalmente il mercato della telefonia, offrendo ai commercianti e service provider nuove opportunità di sviluppare nuovi servizi a valore aggiunto per dispositivi mobili, e permettendo agli utenti di accedere a Internet o di fare acquisti e pagamenti tramite telefono mobile.

La elevata richiesta di smartphone, il fatto che le persone lo hanno a disposizione in ogni momento assieme alle carte di pagamento, e le recenti innovazioni in termini di tecnologie, processi e servizi, come le crescenti potenzialità nell'acquisizione dei dati, nella comunicazione e nel loro trattamento, portò a considerare la digitalizzazione dei portafogli fisici all'interno di applicazioni (mobile wallets) per dispositivi mobili come un mercato promettente per quanto riguarda i pagamenti, l'identificazione personale, il marketing e i ticket digitali, permettendo agli utenti di usufruire di soluzioni di pagamento in prossimità o da remoto. L'obiettivo di questo servizio digitale in continua espansione è di migliorare la fruibilità, la convenienza, la sicurezza, il controllo sui singoli elementi e di fornire nuove esperienze a coloro che posseggono un portafoglio.

Per queste ragioni, la tesi ha l'obiettivo di analizzare i mobile wallets attivi nel mercato italiano, fornendo una panoramica e identificando le principali tendenze riguardo i servizi di pagamento e quelli a valore aggiunto, i loro requisiti, le loro caratteristiche e funzionalità, focalizzando l'attenzione sui sistemi di pagamento da remoto, in prossimità e per effettuare transazioni p2p. Inoltre, siccome i vari mobile wallets sono caratterizzati da tecnologie, metodi e servizi differenti, la tesi ha l'obiettivo di valutare il livello del servizio offerto in relazione ai servizi di pagamento e a valore aggiunto (VAS) al fine di identificare le miglior proposte attualmente esistenti.

Executive Summary

Context, Literature & Definition

In every economy, a large number of transactions take place every day, with or without the involvement of acquisition of goods, financial assets or services. In such scenarios, technology innovation plays a crucial role in the payment approach, in terms of instruments and experience.

The traditional cash is being replaced by digital money in the form of payment cards and new digital payment systems (Kazan, Damsgaard, 2013), due to its inefficiency and cost of use, considering theft, fraud, security and costs associated with physical handling, as well as the fact that more and more consumers use mobile devices in day-to-day activities, planning and entertainment.

The Mobile Payment & Commerce Observatory provides a reference frameworks, which will be the base of the empirical analysis of the mobile wallets in this thesis, classifying the different new digital payment systems that are characterizing the payment environment in eight categories according to the purchase opportunities (proximity and remote) and the payment activation device (pc, mobile and card): eCommerce, ePayment, Mobile Payment and Commerce, Contactless Payment and Mobile POS.

In line with the object of this thesis, more attention has been paid to Mobile Payment & Commerce that consider all those purchases and payments for goods and services through mobile phone in both remote and proximity purchase opportunities. Mobile Remote Commerce includes purchases of products or services via Mobile site or app and Mobile Remote Payment are those for prepaid credit phone, bills, parking, transport tickets, car rental, taxi, etc. While, Mobile Proximity Payment regards the in-store payments through proximity technologies like QR code, geolocation, or NFC technology with the direct debit on payment card, e-wallet or bank account and Mobile Proximity Commerce includes all the services supporting in-store customer experience such as the possibility to benefit from coupon and loyalty cards and programs, or the information consultancy services through NFC technology.

In addition, according to the definition proposed by Pope et al. (2011), p2p transactions are to be taken into consideration when talking about Mobile Payment, although Mobile Payment & Commerce Observatory does not include such function in the framework since they do not allow any product or services purchase or payment, but it considers it as part of Mobile Payment applications.

In past years, there have been other several attempts to classify mobile payment system. The most comprehensive framework has been provided by Smart Card Alliance (2011) which incorporated different classification categories, differentiating mobile payments by technology, transaction size, location and funding mechanism.

		Payment technologies		
		SMS	Browser, m-app	Contactless, NFC, Bar code
Payment size	Macro	<ul style="list-style-type: none"> p2p remittance Donations Mobile top-up 	<ul style="list-style-type: none"> M-commerce Bill payment 	<ul style="list-style-type: none"> Retail POS
	Micro	<ul style="list-style-type: none"> Digital content Parking 		<ul style="list-style-type: none"> Coffee shop C-stores Vending Ticketing Parking Transit
		Remote		Proximity
Typical funding mechanism		Payment location		
		Carrier or cash at agent		Bank card or e-wallet

“Mobile Payment can be defined as any type of individual or business activity involving an electronic device with connection to a mobile network enabling the successful completion of an economic transaction” (Francisco Liébana-Cabanillas, Juan Sánchez-Fernández, Francisco Muñoz-Leiva, 2014). Therefore, it mainly consists in using a mobile device to accomplish payments and transactions between two parties in a fast, convenient, safe, and simple way, anytime and anywhere.

In 2018, in Italy the Mobile Remote Commerce accounts for € 8,4 billion, corresponding to a growth of 40% compared to 2017. This value represents the 31% of the total amount of eCommerce expenses. The Mobile Remote Payment, instead, reach the maturity phase with €900 million, increasing of the 10% in the last year, thus confirming a growth downturn already seen in 2017. Mobile Proximity Payment records an explosive growth (+650%) attaining a transaction value of € 530 million in 2018 (against € 70 million in 2017), thanks to also the introduction of the major mobile payment services, such as Apple Pay, Google Pay and Samsung Pay. Indeed,

the high acceptance rate of contactless payment and the pervasive use of the smartphone make Italy one of countries with higher potential in terms of mobile payments. However, the Mobile Proximity Payment component still accounts for only the 1% of the New Digital Proximity Payment. Ayman S. Ashour (2012) argued how NFC would have play a huge role in the ‘war on cash’, that is in the proximity payment scenario, and it is likely to be most successful through micropayments and will be widely used if transaction fees are low. In fact, he showed that one of the reasons why the most of micropayments are still in cash is the issue of transaction fees that the retailers have to pay if consumers carry out a cashless payment. The hypothesis of a higher growth prospects in the Proximity component of New Digital Payment is supported also by the fact that the Proximity Payments (offline channel) account for 91% of the total expenses while the online channel allowing Remote Payments represents the remaining 9%, with yearly high growth rate regarding payments through eCommerce and cheques through Home Banking. Finally, peer to peer transaction have a great and increasing importance in terms of transaction value, which is assessed about 50 million € in 2017 (probably underestimated).

The use of the mobile payment is closely related to the technological developments occurred over the last few years. The new software, hardware and internet technologies which changed the concept of mobile phone leading to smartphone, a smart device with several functionalities enabled by multiple apps, and the increasing of communication and commerce needs over the last 40-50 years, changing dramatically the related industries and their supporting technologies, result in a product that provides new capabilities and the freedom to conduct commerce in ways that would otherwise not be possible, known as mobile payments (Smart card alliance, 2011). Technology and business solutions are merging to provide powerful value propositions. During the early days of the Internet commerce boom, a number of Web sites were launched, and then redesigned to be accessed by smartphone for the Internet banking and eCommerce users, alongside mobile commerce applications (apps). A wide array of financial apps can provide value to the mobile phone owner, regardless of whether the owner is a business or a consumer. Consumers also use their mobile phones for a wide variety of financial functions, including checking various account balances, performing bank transactions, making payments, and completing credit applications. Therefore, the existing mobile financial apps deals with mobile banking, mobile commerce, mobile point-of sale (POS), and mobile payments, including person-to-person payment, remote payment, and proximity payment (Smart Card Alliance, 2011).

Different stakeholders are involved in a transaction through mobile payment: the merchant and the customer are the two actors through which the exchange occurs by means of a transaction, and between them, other stakeholders have a significant role, such as the providers of mobile transaction and content, the developers of the applications and, obviously, the equipment

providers. Mobile payment system presents several advantages for companies and users when compared to alternative payment systems in e-commerce and point of sale. It enhances mobility and ubiquity of payments, facilitating the access to them and their immediacy. On one side, companies and vendors could be facilitated in the sale of products and services thanks to the increased versatility, considering the large number of existing mobile phones, faster transactions, greater convenience, time-saving, and lower costs (lower discount rates). On the other hand, it provides greater security for the users in the interactions derived from economic transaction, improving the customer loyalty.

The increasing mobility of today's modern society play a key role in this scenario and the pervasiveness of digitalization is driving people to make increasing use of more innovative instruments from smartphone, to tablet, to wearable device. Even if Italian people are increasingly moving toward digital payments, Italy is still known as the "country of cash" (Riva Federica, 2018): in 2018 the 52% of money transactions were in cash (Mobile Payment & Commerce Observatory, 2019), however mobile payments are slowly becoming part of Italian people life. The smartphone, introduced in people everyday life, allowed the development and spreading of mobile payment systems becoming the first device able to provide both Remote and Proximity Payment solutions. The smartphone dependency has been increasing over time: in 2018, on average, the 62% of Italian people being 18-74 years old accesses Internet by smartphone everyday spending about 3 hours. In particular, young people are the most involved considering that the 82.5% of people within the age range 18-24 years old, in addition to the 81.5% of people within the age range 25-34 years old, are connected to the Internet at least once a day. Mobile is the main source for every need: people use the mobile to perform several activities related to the messenger (87%), video contents (81%), gaming (49%), banking activities (41%) and mobile maps (76%). Two Italians out of three make online purchases or payments, and the 42% made it through mobile devices. e-wallet are involved in one third of eCommerce transactions and in the 2% of the total in-store payments in the Retail sector. Generally, the 25% of the population carry out mobile payment.

Mobile payments have become a hot topic in recent years, with many mobile payment services introduced all over the world and then failed in attracting the critical levels for mass adoption by consumers and merchants (Pousttchi et al., 2008). Bradford (2003) states that the most important component in mobile payments systems is the user: if the solution provides the user with the right kinds of benefits, then it will succeed. Therefore, many researches have been conducted to understand why mobile payment is not as common as a credit/debit card, finding out several factors influencing the adoption like security, economic cost, convenience, ease of use, attitude, usefulness and trust.

The high demand for smartphone, the fact that people are always in possession of them and their financial card, and the mobile devices growing capabilities of data acquisition, communication and processing (Forrester Research, 2015) led to consider the digitization of physical wallets into mobile applications as a promising trend for payments, personal identification, marketing and digital tickets. A mobile wallet is a digital payment instrument which enables the users/consumers to carry out payments electronically through a mobile device, both online and offline and to benefit from the value-added services. In fact, the VASs have the role of enriching the customer experience during the usage of the application, as well as of acting as an incentive for users in adopting mobile wallet solutions. Mobile wallets represent a growth engine in the present and future mobility and payments landscape which represents the main innovation component in the payment ecosystem, also thanks to its features, which have been summarized by Francisco Liébana-Cabanillas, Francisco Muñoz-Leiva and Juan Sánchez-Fernández (2014) into five categories. Mobile payment is only one functionality among others like m-transaction, m-delivery, m-authentication and m-banking. The aim of this growing mobile digital service is to improve usability, convenience, security, control over items and novel disruptive experience to wallet owners.

For these reasons, the thesis is supposed to analyse the Mobile Wallet active in the Italian market.

Methodology

The methodological note aims to describe in detail the modality through which the thesis is developed, therefore, the objectives of the thesis work, its structure and the material used during its development will be illustrated. The thesis has been developed as part of a wider research context carried out by the Mobile Payment & Commerce Observatory of Politecnico di Milano, which studies innovative mobile payment systems.

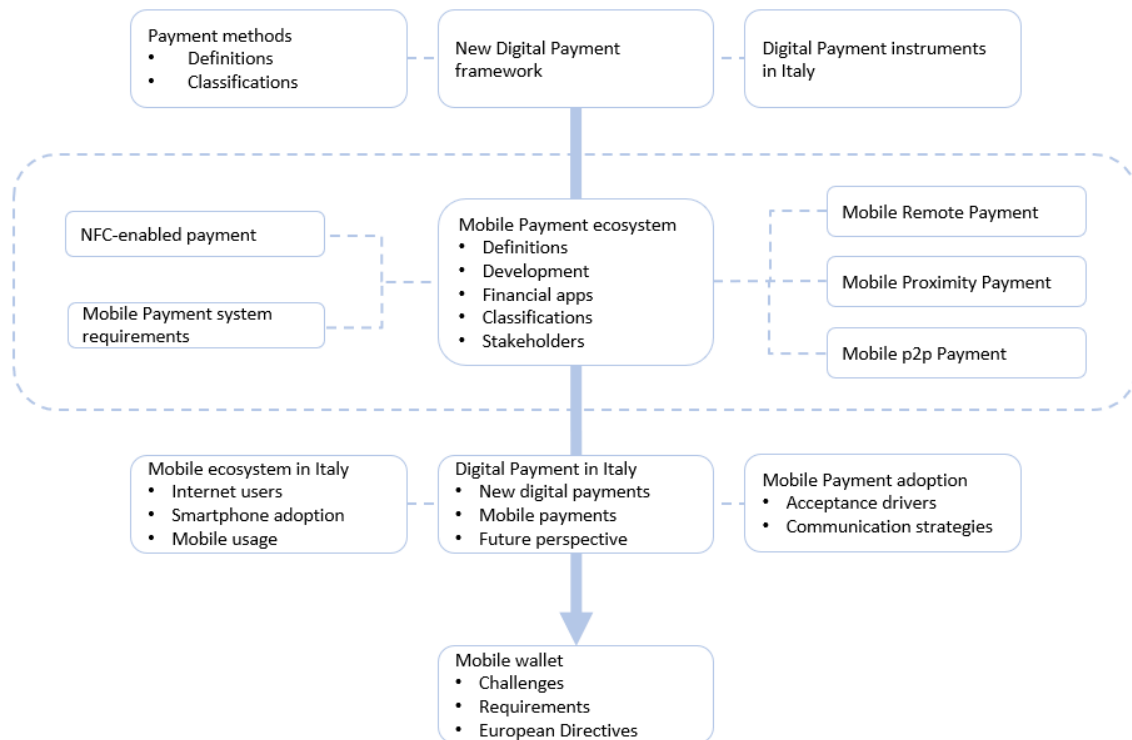
The research has been carried out with the aim to provide information about the market and context, the demand and the offering.

Firstly, the thesis aims at providing general information about the Digital and Mobile Payment market, the characteristics affecting them like legislation, the Mobile Wallet features and the barriers to adoption of the most innovative payment systems.

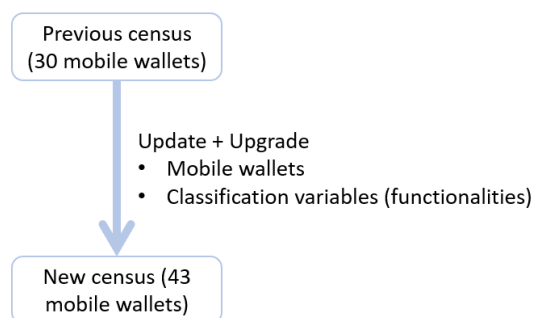
Secondly, the aim of the research of the mobile wallet is to update the previous census in order to identify the new proposals and the failed ones, as well as the payment systems available on the market, Value-Added Services and their features.

Finally, the thesis aims at evaluating the pervasiveness, the usability, the service level and possible constraints affecting the effectiveness and the mobile wallet adoption.

The first chapter is dedicated to theoretical concepts and literature analysis in order to outline the context of the research, according to the following workflow.



The empirical analysis of the Mobile Wallet services has been developed starting from a preliminary census of the previous year (2017), going through the following workflow.

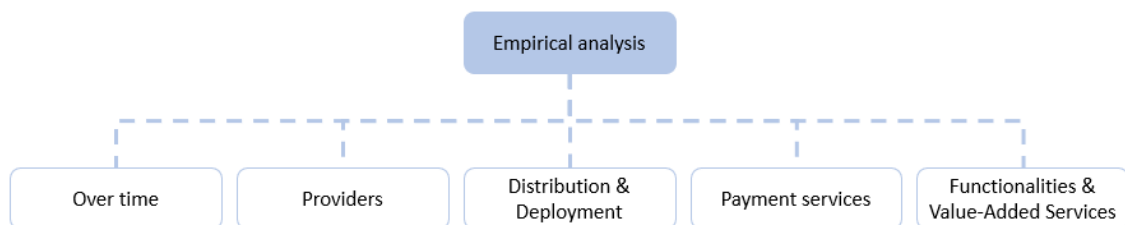


In particular, for achieving the aim of this work and for running the empirical analysis, the old census has been enriched with additional classification variables, split in macro-categories:

- Application & Provider
- Benefits & Constraints;
- Registration phase;
- Authentication methods

- Payment instruments virtualization;
- Top up payment instrument;
- Interface and browser;
- Mobile Remote Payment solutions
- P2P solutions
- Mobile Proximity Payment solutions
- Distribution and deployment;
- Value-Added Services.

The census has allowed to study the availability of mobile wallets at a national level. Therefore, next step consists in discovering the current trend about distribution, player involved, used technologies, etc., highlighting the best practices, according to the following workflow.



Over time chapter analyses the services of the previous census and compares them with the new one in order to discover the failed mobile wallets and the new proposals, as well as the the new functionalities and value-added services.

Providers chapter analyses the category of service providers as well as the number of proposals by each category, focusing on the accessibility affected by the accepted payment cards and the Operation Systems.

Distribution and deployment chapter analyses the infrastructure accepting mobile payment systems in cases of online, offline and p2p solutions.

Then, payment services chapter analyses the availability of mobile wallets in terms of number of mobile payment solutions for online and offline purchases as well as for p2p transactions, and their usability in terms of number of steps required in order to carry out a payment process. Special attention has been put on the Big Tech services, in order to figure out the impacts on mobile wallets. Then, the analysis of the mobile wallets has been carried out one by one in order to estimate the average service level, considering the pervasiveness, the usability, the constraints and the other specific factors influencing the effectiveness of the services as relevant indicators of the service level.

Finally, the functionalities and Value-Added Services chapter analyses the information gathered during the census related to the VAS, in order to figure out how the providers act in offering them enriching their mobile wallets value proposition and to identify the best practices.

Empirical analysis

The aim of the empirical analysis is to investigate the offers of mobile wallet in Italy, their characteristics and their development and distribution, in terms of infrastructures accepting mobile payments systems, in order to understand the main trends, the value creation and the improvement of the customer experience as well as the constraints affecting the user adoption.

As explained in the methodology chapter, the empirical analysis has been developed starting from a preliminary census, then updated with new functionalities and new services. As a result, many services have been added to the list and some of the existing services, launched during the previous years, have been removed from the census database, such as YouPay Mobile, SEQR, Vodafone Pay and Vuolly. As a result, 43 mobile wallet have been considered in the census as active applications. Also, the range of functionalities differs and grows compared to the previous solutions. The main innovation regards the integration of Bancomat Pay, Google Pay, Samsung Pay and Apple Pay with others mobile payment services, as methods to pay in proximity (p2b), in line with the explosive growth in the adoption of mobile proximity payments solutions.

The analysis of providers figured out the actors which are putting their effort in providing the best and the most innovative Mobile Payment solutions. However, they limits the access and the usage of mobile wallet through requirements about the payment tool allowed to be virtualized and the supporting operation system, like Banks are used to act.

The distribution analysis figured out the ability of different providers in offering efficient payment services in terms of opportunities to use them, as additional constraint to the mobile wallet adoption, and the advantages brought by the solutions based on specific technologies or methods. The assessment has been carried out according to the payment services usage opportunities, that is by remote, in proximity and for instant payments (p2p).

In addition, an estimation of their usability in terms of steps needed to carry out a payment could provide an evaluation of the quality, efficiency and service level of mobile wallets, as well as potential drivers. The analysis has been carried out according to the three typologies of service, that is mobile remote payment, mobile proximity payment and p2p payment service, as usual.

Since a mobile wallet should include the greatest possible number of payment solutions and those functionalities fulfilled by physical wallet with the aim to offer an effective and suitable service and a complete and enhanced customer experience as well, the several aspects of the mobile

payment solutions have been taken into account in order to evaluate the general level of payment services and identify the best combination of the practices currently offered. The analysis considers the pervasiveness, the usability, the constraints and the other specific factors influencing the effectiveness of the services previously analysed, which do not encourage potential users to adopt the mobile wallet, as relevant indicators of the service level. The three payment services (by remote, in proximity and p2p) have been individually evaluated, then combined to assess the overall service level provided by each mobile wallet, by weighting each factor.

Particular attention has been paid on the Big Tech, which developed and launched their own mobile wallets, offering online and offline payment solutions and affecting the mobile wallet performance, mainly in terms of accepting infrastructure and usability, and service level thanks to the several partnerships. In fact, on one side, allow mobile wallet solutions to benefit from the contactless payment services developed by the Big Tech and, on the other side, to integrate more and more payment tools to be virtualized into the three X-Pay mobile wallets.

Beside the payment services, mobile wallet should be characterized by the broadest set of functionalities and VAS allowing the user to manage all the payment and related activities from the smartphone. Therefore, the analysis figured out how the providers act in offering additional functionalities and value-added services in order to enrich the mobile wallets value proposition, thus encouraging potential users in adopting the solutions and improving the customer experience, by evaluating the overall level of the additional services in terms of availability and effectiveness. In addition, a deeper analysis found out the most common functionalities to be considered as the must have services, even though it emerged how different provider categories are focused on different services.

Conclusion

The conclusion part of the thesis summarizes the result of the research with general consideration, highlighting the critical point of the analysis and suggesting improvement in the related following researches. The mobile wallet instruments belong to a dynamic scenario, where functionalities and solutions provided are continuously evolving, in terms of number and methods, allowing users to carry out several daily activities. In particular, the number of offerings has more than doubled during the last years, attracting mainly Retailers and providers of solution for vending machines (offering the 42% of the application active on the Italian market), as well as Banks, Fintech, Big Tech companies and Telco. However, the adoption of such solutions is still limited by different constraints, figured out by the empirical analysis, related to the pervasiveness required to enable users to benefit from the payment services (by Remote, in Proximity and p2p), the technology fragmentation and the device and payment tool features compatibility with the

mobile wallets. The analysis figured out both the current constraints for the adoption of the solutions and the best practices in terms of technologies and methods appearing to be the most promising trend. For this reason, potential emerging solutions have been identified thanks to technologies changes, new methods and new services.

The analysis emerged how mobile wallets could be a payment instrument for the users and an additional tool/services developed to enhance the customer experience of the provider's clients. For instance, most of Banks, PostePay, NexiPay and BancomatPay have been developing mobile wallets dedicated to their clients, requiring payment card or bank account belonging to specific financial institutions, and Retailers, which offer a large number of mobile wallets for the only in-store payment at the own point of sales, with few more additional payment-related services. For this reason, Rossopomodoro appears to be the lower-quality mobile proximity solution. In this regard, the high pervasiveness of Retailers, and Service Providers as well, in offering offline payment solutions, also in terms of absolute number of available solutions, support and feed the growing mobile proximity payment scenario assessed in the literature analysis: the 86% of the mobile wallets provides services to pay offline. In addition, accessibility constraints regards the Operation System. The providers are underinvesting in the development phase to make available their application to Windows users which are frequently excluded from the target of the offerings, limiting their choice in selecting the right mobile wallet.

In spite of some accessibility constraints, among the current proposals, emerging mobile wallets and best practices have been identified to be based on technologies and systems able to ensure a wide infrastructure and therefore encouraging people to adopt such solutions. In particular, MasterPass service integrated as a remote payment method allow to cover the widest usage opportunity (90% of online stores): however, only Banks, in addition to PostePay and NexiPay, tend to integrate such system within their wallets.

NFC technologies allow users to pay whenever a point of sale is equipped with a contactless POS: few Service Providers (YAP, NexiPay and PostePay), Telco and all Banks tend to be based on such technologies, sometimes enabled by the integration with the Big Tech solutions. Indeed, a widespread adoption and integration of these solutions within the mobile wallets allows to entirely cover the potential customer base composed by NFC-enabled smartphone holders (more than 25 million), resulting in efficient systems to obtain the highest pervasiveness and effective solutions in terms of usability, as alternative solution to the widget and own 'Tap&Pay' function. For these reasons, Google Pay appears to be the higher-quality mobile proximity solutions.

These are the most effective systems based on existing infrastructures. However, those alternative solutions based on the integration with online and offline partners require high investments to

establish partnerships to enlarge the accepting infrastructure and in marketing campaign to enhance the awareness and the customer base. Therefore, the success is affected by the commitment and ability to involve the most efficient and right stakeholders. In particular, Satispay has to be monitored in the following years for their exponential growth in the proximity payment scenario, being currently present in 1.8 million Points of Sale and 1,400 taxi services in Milan. Also, Bancomat Pay appears to have a great potential for future growth, due to the new collaboration between SIA and Bancomat enlarging the opportunities to use the service from about 5 million current users to 37 million debit card owners involving over 440 banks using its services, with the aim to also increase the adhering Points of Sale. Such system is mainly integrated with Banks as p2p service and appear to be the most promising solution, with a catchment area significantly higher than solutions based on own systems. Obviously, if combined with another system such as PayPal with an existing comparable customer base, the result is those offered by Mediolanum Wallet. However, even in this case, Satispay is an emerging solution to be monitored, which is exponentially enlarging the catchment area, moving to offer a high number of p2p usage opportunities.

So far, Banks appear to be probably adopting the most efficient solution. However, Hype is one of the most attracting current solutions, which is not providing remote solutions, and able to attract customer thanks to the investments to create the infrastructure and spread the 'Pay with Hype' solution as proximity payment system, in addition to other functionalities. Moreover, the evaluation of each service level (of remote, proximity and p2p solutions) emerged how Banks do not provide a complete customer experience, offering payment services which are not enriched with additional functionalities.

Finally, the analysis of VAS emerged how some mobile wallets such as YAP (one of the mobile wallet offering a high-quality payment service level), Circle Pay, Breasy and Eataly Pay are completely payment-oriented application, providing no Value-Added Services, while the combination of multiple functionalities and Value-Added Services lead PostePay to offer an enhanced customer experience beside the high-quality service level of the remote payment solution.

In conclusion, a mobile wallet based on the already existing infrastructure and most common systems do not necessarily provide a better service level. The mobile wallet needs a high commitment and investment to involve more and more online/offline stores and spread the solution as a payment method, as well as to offer additional functionalities and payment-related and unrelated services to increase the opportunities to use them and assure a high adoption rate.

Chapter 1

Context, Literature & Definition

In every economy, a large number of transactions take place every day, with or without the involvement of acquisition of goods, financial assets or services.

Kokkola (2010) defines a payment as a process of transferring money from payer to payee that involves payment instruments, payment processing and payment settlement.

Cash has always been the main mean in worldwide business transactions, but recently everything has changed. Currently, cash is being replaced by digital money in the form of credit cards and new digital payment systems (Kazan, Damsgaard, 2013).

The world is becoming a cashless society due to cash inefficiency and costly of use, considering theft, fraud, security and costs associated with physical handling, as well as the fact that more and more consumers use mobile devices in day-to-day activities, planning and entertainment. Nevertheless, also credit/debit cards are affected by issues, such as transaction fees, eligibility and inconvenience of authorizing transactions.

Even if Italian people are increasingly moving toward digital payments, Italy is still known as the “country of cash” (Riva Federica, 2018): in 2018 the 52% of money transactions were in cash (Mobile Payment & Commerce Observatory, 2019). Mobile payments are slowly becoming part of Italian people life, but it will take time to be adopted by everyone.

A literature review was conducted so as to provide clear and complete definitions of digital payment methods, to identify research contribution areas and to understand the evolution of technologies.

1.1 Payment systems

Kokkola (2010) defines the term “payment system” as a complete set of instruments, intermediaries, rules, procedures, processes and interbank funds transfer systems which facilitate the circulation of money in a country or currency area.

A typical centralized payment system relies on a structure where a central bank acts as a clearing bank with a central ledger. Each participant, typically a commercial financial institution, holds a balance at the central bank, recorded in the central ledger and reflected in the participant bank’s own ledger. Individual customers, branches, or even other banks would then hold balances at the participant bank, which would again be reflected in their own ledger (Robleh Ali, John Barrdear, Roger Clews, James Southgate, 2014).

In the processing of payment transactions, the information needed are exchanged between the various parties involved in the payment chain, e.g. sent from customers to their banks, involving intermediaries, processed within banks and exchanged between banks participating in clearing and settlement systems (Kokkola, 2010). Today, however, information is generally exchanged electronically, allowing the automation of many parts of the clearing and settlement process for payments.

1.1.1 Innovation in payment systems

Over the past 50 years, the payment systems have been influenced by technological developments in two ways. The records and ledgers have been converted from paper to electronic form, increasing the speed of completing transactions and reducing operational risks. Furthermore, the emergence of low-cost technology has allowed new payment schemes to emerge, such as mobile money schemes (Robleh Ali, John Barrdear, Roger Clews, James Southgate, 2014).

A variety of developments in payment technologies and alternative currencies have emerged in recent years. Some of these innovations still rely on a trusted central entity, focusing on making payments more accessible to a wider range of users, such as mobile phone payments, while more recent innovations relying on cryptography rather than a central authority, introducing a decentralised structure to payment systems.

The researchers describe four categories of recent innovations and their characteristics, splitting them according to whether they establish a new payment system, a new currency, neither, nor both.

Category	New payment system	New currency
Wrappers		
Mobile money	✓	
Credits and local currencies		✓
Digital currencies	✓	✓

Table 1 - Types of innovation

Google Pay and Apple Pay are examples of Wrappers. They represent neither a new currency nor a new payments system. This innovation focus on improvement of the user interface and accessibility of existing payment systems architecture, enabling users to link their mobile phone number to their bank account. They are used to capture a new segment of the market or to improve market share and reduce consumer use of other more expensive payment systems.

Mobile Money represent new payment systems, which allow storing money as credits on a smart card or a system provider's books, continuing to use national currencies. Jake Kendall, Bill Maurer, Phillip Machoka, and Clara Veniard (2012) define mobile money, often described as a money-transfer product, as "a network infrastructure for storing and moving money that facilitates the exchange of cash and electronic value between various actors, including clients, businesses, the government, and financial service providers". One example is M-Pesa, a popular service in Kenya that grants access to financial services, including payments, to anybody with a mobile phone where the access to traditional banking infrastructure is limited.

Credits and Local Currency rely on users trusting a new currency. Credits are schemes in which private companies accept money from the existing payment systems in exchange for an alternative unit of account which can be spent on a specific platform, such as within an online game. Local currencies are similar, but people exchange national currencies for a local equivalent which can be spent in a specific geographical area. Examples are UK local currencies such as the Bristol Pound, adopted to promote spending at, and between, participants of the scheme in order to boost economic activity in a specific region, support local sustainability and shorten supply chains

Cryptocurrency is an example of Digital Currency. The scheme incorporates both a new decentralised payment system and a new currency. The ledger is publicly visible, it is shared

across a computing network and the users come to agree on changes to its ledger, that is, on which transactions to accept as valid.

1.1.2 Payment instrument

Kokkola (2010) defined a payment instrument as a tool or a set of procedures enabling the transfer of funds from the payer to the payee, as a mean of authorizing payments. There is a variety of different payment instruments. The most common distinction is between cash and non-cash payment instruments.

Cash payment, that is payment made by using banknotes and coins, usually associated with immediate face-to-face transaction of low value and, if the parties do not exchange information on their identity, it is said to be “anonymous”.

Non-cash payments, by contrast, involve the transfer of funds between accounts, even held with different banks. It is therefore the means by which a payer gives its bank authorisation for funds to be transferred and by which a payee gives its bank instructions for funds to be collected from a payer.

Kokkola (2010) also defined another mean of payment, known as electronic money, or e-money. It is a monetary value, a right on the issuer, stored on an electronic device and accepted as a payment instrument by undertakings other than the issuer, by contrast with single-purpose prepaid instruments, where the issuer and acceptor are one and the same. It can be either hardware-based, stored on a device, typically a card, or software-based, stored on a computer server. In both cases, the creation or reimbursement of e-money is realized by using one of the core payment instruments – cash, payment cards, direct debits or credit transfers.

1.1.3 Digital payments

Mobile Payment & Commerce Observatory provides some definition and a specific framework to classify the digital payment systems, which will be the base of the empirical analysis of the mobile wallets in this thesis.

A Digital Payment is a payment carried out through an electronic payment instrument, like mobile phone credit, payment card, wallet or a direct debit to the account, not involving Home/Mobile Banking, for product or service purchases, excluding digital contents.

Specifically, the Old Digital Payments are referred to the use of payment card in a store with traditional POS, while the New Digital Payments are the most innovative solutions involving payment cards or e-wallets. This last category includes systems classified by the purchase opportunities - remote or proximity -, by payment activation device - PC and Tablet, Mobile, card or POS -. In addition, two components provide a deeper classification: Commerce, if the whole buying process is considered as part of the payment process, and Payment, if we consider the single step or the case in which the whole buying process coincides with the payment process.

Therefore, they monitor eCommerce, ePayment, Mobile Payment and Commerce, Contactless Payment, Mobile POS.



Figure 1 - New digital payment

In order to better understand the different solutions, relative importance and impact, and their development along the time, clear definitions about different categories have been provided along with their trends.

eCommerce encompasses the online purchases of products or services through pc or tablet, while ePayment regards online recharge payment – like subscription, prepaid credit phone, game wallet – , bills, tax and fines.

Contactless Payments are carried out thanks to cards equipped with a contactless RFID tag. This system will soon be considered an Old Digital Payment given its wide adoption and saturation reached in the past few years and the emerging and growing new solutions.

The Mobile POS are hardware and software systems that turn smartphone into a device able to accept payment with card.

More attention has to be paid to Mobile Payment & Commerce that consider all those purchases and payments for goods and services through mobile phone in both remote and proximity purchase opportunities.

On one side, Mobile Remote Commerce includes purchases of products or services via Mobile site or app and Mobile Remote Payment are those for prepaid credit phone, bills, parking, transport tickets, car rental, taxi, etc.

On the other side Mobile Proximity Payment regards the in-store payments through proximity technologies like QR code, geolocation, or NFC technology with the direct debit on payment card, e-wallet or bank account and Mobile Proximity Commerce includes all the services supporting in-store customer experience such as the possibility to benefit from coupon and loyalty cards and programs, or the information consultancy services through NFC technology.

1.1.4 Italian payment instruments and channels

The Observatory in collaboration with SisalPay investigated about payment behaviours in terms of instruments and channels used by Italian consumers in 2017. The total expense for products and services was about €654 billion. In particular, the 54% of this amount for products, the 37% for services and the 9% for other payments like tax and fines.

The most used payment instrument is nowadays cash, representing the 52% of total expenses with an average ticket transaction value of €16. Payment card has a penetration of more than 80% and records one third of the total expense with an average ticket transaction value of €60,5, meaning that Italians use not frequently cards for small and everyday purchases. The remaining 15% of the total expense has to be assigned to other payment instrument, such as direct debit to bank accounts, bank checks, cheques, meal vouchers. It is noticeable that the direct debit to bank account and cheque are more and more used, thanks to the direct debit of households and the development and deployment of Internet and Mobile Banking, at the expense of especially bank checks.

Considering the channels through which Italians carry out their payment, in 2017, the Proximity Payments (offline channel) account for 91% of the total expenses, and it will remain the most important channel in the next five years. The online channel allowing Remote Payments represents the remaining 9%, with yearly high growth rate regarding payments through eCommerce and cheques through Home Banking.

These data support the hypothesis of a higher growth prospects in the Proximity component of New Digital Payment.

1.2 Mobile payment

The use of the mobile payment is closely related to the technological developments occurred over the last few years. The communication and commerce needs have increased over the last 40-50 years, changing dramatically the related industries and their supporting technologies. Mobile phone and e-commerce industries have evolved and combined, to result in a product that provides new capabilities and the freedom to conduct commerce in ways that would otherwise not be possible, known as mobile payments (Smart card alliance, 2011).

In this way, a mobile payment is simply a payment through mobile phones or mobile devices, but there are existing more detailed definitions.

1.2.1 Mobile payment definitions

Tomi Dahlberg, Niina Mallat, Jan Ondrus and Agnieszka Zmijewska (2007) define Mobile Payment as a “payments for goods, services, and bills with a mobile device, such as a mobile phone, smart-phone, or personal digital assistant (PDA), by taking advantage of wireless and other communication technologies”.

Mobile Payment can be defined as “any transaction on a mobile handset where ownership of money changes hands” (Pope et al., 2011) or “a transfer of funds for goods or services in which a mobile device is functionally involved in executing and confirming payment” (Smart Card Alliance, 2011).

More specifically, “Mobile Payment can be defined as any type of individual or business activity involving an electronic device with connection to a mobile network enabling the successful completion of an economic transaction” (Francisco Liébana-Cabanillas, Juan Sánchez-Fernández, Francisco Muñoz-Leiva, 2014). Therefore, it mainly consists in using a mobile device to accomplish payments and transactions between two parties in a fast, convenient, safe, and simple way, anytime and anywhere.

1.2.2 Emergence and development of mobile payment

There are only a few journal papers about mobile payment because it is a relatively recent phenomenon and in its early stage in the market. The increasing mobility of today’s modern society play a key role in this scenario.

Mobile Phone has radically transformed telephony market, opening new opportunities to merchants and service providers in the development of new value-added mobile services, which allow people using mobile phone to access Internet/online or mobile commerce (and payment). To date, mobile marketing was mainly limited to analysing advertising on the mobile phone, the SMS, MMS, etc., but it did not analyse the complete online purchase process. This brings the need for companies to rethink their business models and to adapt themselves to the new economic and technological environment.

Mobile payment originates from SMS text messaging supported by the 2G mobile technology, requiring a communication protocol enabling the exchange of short text messages between two mobile devices. In this way, the user's cellular phone became a payment tool, through which mobile users make SMS mobile payment by sending a payment request through the SMS messaging and the premium charge is applied to their phone bill (Seungjae Shin, Won-jun Lee, 2014). Traditionally, the use of the SMS as a payment tool has been limited to small purchases (Francisco Liébana-Cabanillas, Francisco Muñoz-Leiva, Juan Sánchez-Fernández, 2014) due to the low security inspired by this method. Indeed, considering the SMS as a payment system entails some disadvantages, such as: no coding involved and no delivery confirmation, few information can be transmitted since it only allows 160 characters and the storage on the recipient's terminal is carried out once the message sending is completed.

Then, the combination of two factors led mobile payment adoption at the first stage through mobile remote payment methods. On one side, the mobility and then the adoption of smartphones, with the 3G technology, has led banks and online merchants to redesign their websites to be accessible by mobile devices and then users of Internet banking and eCommerce (carried out through pc) to use their smartphone for these transactions, by using wireless Internet access for their payment. On the other side, the explosion of eCommerce, and then m-commerce, enables to radical changes in the conception of payment, since more and more smartphone users pay more attention to mobile payment methods (Seungjae Shin, Won-jun Lee, Dustin Odom, 2014).

In addition, nowadays, the majority of companies support the continuation of NFC developments, which are at an expansion phase, alongside the other types of technologies currently implemented, such as SMS, WAP/Internet and QR-code.

1.2.3 Mobile payment financial apps

During the early days of the Internet commerce boom, a number of Web sites were launched alongside mobile commerce applications (apps) and other app types. A wide array of financial

apps can provide value to the mobile phone owner, regardless of whether the owner is a business or a consumer.

Consumers also use their mobile phones for a wide variety of financial functions, including checking various account balances, performing bank transactions, making payments, and completing credit applications. Technology and business solutions are merging to provide powerful value propositions.

The existing mobile financial apps deals with mobile banking, mobile commerce, mobile point-of sale (POS), and mobile payments, including person-to-person payment, remote payment, and proximity payment (Smart Card Alliance, 2011).

Generally, one of the main concern society faces is the confusion between mobile payment and mobile banking.

Mobile banking can be defined as the use of a mobile device to access and manage financial services provided by a bank, credit union, brokerage, or other financial services provider, for example, the balance check, the movement of funds, transfers, the payment of bills, etc. Yet, it is not considered in the classification provided by Mobile Payment & Commerce Observatory since it does not include transactions and payment processes for goods and services.

Mobile commerce (also known as *m-commerce*) refers to the use of a mobile phone, smartphone, or other mobile device to support a commercial transaction, which involves searching or paying for goods or services using a mobile phone's Web browser, a specialized app, or a text message. That is, m-commerce is not restricted to selling and paying for products, but it encompasses many of the activities involved in shopping, like research products, recommend products to friends on social network sites, and compare online product prices to the prices in brick-and-mortar stores, and in establishing relationships between retailers and customers.

Mobile POS refers to the use of a mobile device connected via Bluetooth or audio input to the merchant's smartphone to replace a traditional merchant POS terminal or system. It can support different types of payment devices, from traditional magnetic stripe cards to contactless bank cards to mobile proximity payment with a smartphone and can also be an NFC-enabled device configured for POS acceptance. The mobile POS are increasing in terms of number of terminals and transactions, as well as the presence of the new devices, mainly based on Android system, known as smart POS. They are typically used for electronic payment but can be also equipped with apps for inventory management and queue busting, which are made available on proper marketplaces. In practice, these kinds of applications allow to deliver a restaurant order to the kitchen in an instant, allow riders to pay a taxi fare by credit card, and let shoppers scan their

groceries as they place them in their carts. Some retailers are replacing centralized checkout facilities with smartphones, providing store associates with the ability to roam the store. Clear example are Apple stores, which have removed cash registers and equipped each representative with an iPhone or iPad to answer customer questions, check stock, and finalize sales. In addition, the smart POS can be connected to a tax receipt printer in order to replace the cash register. Although there is some concern in the payments industry about the security of wireless transactions, smartphones and mobile commerce have made a significant impact on mobile POS, and smart POS, providing convenience for both merchants and consumers. Retailers and service companies can realize improved employee productivity and lower labour costs while improving customer service and ensuring quicker payment for goods and services rendered.

Mobile payment refers to the situation where a payer equipped with a mobile device can be standing at a POS or be interacting with a merchant located somewhere else. It entails movement of funds. Consumers can use a mobile device to pay for goods and services such as:

- music, videos, ringtones, online game subscriptions, wallpapers, and other digital goods;
- transportation-related items, like bus, subway, or train fares and parking at meters;
- any merchandise in a physical merchant location, for example in store or at vending machine.

It is to be noted as Mobile Payment & Commerce Observatory does not monitor transactions for digital contents.

1.2.4 Mobile payment classification

In past years, there has also been several attempts to classify mobile payment systems. Agnieszka Zmijewska, Elaine Lawrence and Robert Steele (2004) summarized some recent classification proposal, for instance the split into devices with payment applications and devices without payment applications, or the division by value of payments, settlement method, and content type, or just focusing on one dimension like the location of the customer's money. With a more detailed analysis, the proposed categories were based on four variables: transaction settlement (pre-paid or post-paid), transaction type (pay per view, per unit, subscription), content type (ticketing, voting, digital goods, hard goods), and content value (micro or macro).

A more comprehensive view of the mobile payments market and its many dimensions dividing systems by means, size, seller/buyer origin, type of purchase, place of purchase, clearing or

settlement method, type or transaction, time of payment, geography, and location of payer's account's details.

Since the previous categories were too restrictive, Ondrus (2003) proposes a new multidimensional table based on m-payment solution type (client-based, server-based, or hybrid), solution provider (Mobile Network Operator, financial, newcomer), relationship (B2C, P2P), location (proximity, remote), and payment time (pre, direct, or post).

Since they are based on technological solutions, some dimensions, such as the location of customer's e-money, the provider of settlement and clearing, technologies used, or involved parties, is repurposed in more than one classification.

Niina Mallat, Matti Rossi and Virpi Kristiina Tuunainen (2004) studied the possible alternative mobile payment solutions in terms of different services and different key players. The analysis led to categorize payment into micro- and macro-payments, with the distinction between the two occurring at approximately 10 euros, and into Remote and Proximity Payment, depending on whether the purchase takes place at the point of sale (POS) or remotely via an electronic network. Nowadays, the threshold under which payment is considered a micro-payment is presumed to be 25 €, since over this amount PIN input is required.

They defined remote mobile micropayment as the mobile content and services purchases such as for news, games, tickets, and location-based services, and potentially also the purchases through eCommerce. A successful mobile payment service was the use of SMS to buy a subway/tram ticket for Helsinki City Transport. Mobile Proximity micropayments at unmanned POS include applications such as purchase of soft drinks or items from vending machines. Mobile Proximity micropayments at manned POS include small purchases at shops, kiosks, and fast food restaurants.

They defined Mobile MacroPayments as payment for larger purchases both electronically, remotely on eCommerce, for mobile ticketing or gaming, and on manned and unmanned POS in the restaurants, for retail shopping, and so forth.

Seungjae Shin, Won-jun Lee and Dustin Odom (2014) considered a classification of Mobile Payment based on two categories: mobile remote payment and mobile proximity payment. Mobile remote payment included several forms: mobile banking, like bill payments, mobile shopping, intended as buying through a retailer's website and paying to remote retailers, and mobile p2p defined as an instant person to person payments for an item a friend is selling, or just allowing he/she to borrow money. Mobile proximity payment, instead, was classified by mobile POS, in

terms of technology availability, such as NFC technology or QR/Bar code to be scanned with a Smartphone.

According to Smart Card Alliance (2011), mobile payments are typically differentiated by technology, transaction size, location and funding mechanism, as shown in *Figure 2*. Basically, we can see the categories we have already identified to be incorporated into a single framework.

		Payment technologies		
		SMS	Browser, m-app	Contactless, NFC, Bar code
Payment size	Macro	<ul style="list-style-type: none"> • p2p remittance • Donations • Mobile top-up 	<ul style="list-style-type: none"> • M-commerce • Bill payment 	<ul style="list-style-type: none"> • Retail POS
	Micro	<ul style="list-style-type: none"> • Digital content • Parking 		<ul style="list-style-type: none"> • Coffee shop • C-stores • Vending • Ticketing • Parking • Transit
		Remote		Proximity
		Payment location		
Typical funding mechanism		Carrier or cash at agent	Bank card or e-wallet	

Figure 2 - Mobile payment differentiation

The technology dimension refers to the different technologies used by mobile payment to perform a transaction. Remote payments typically rely on text messaging (short message service, or SMS), a mobile browser, or a mobile app. Proximity payments rely on either bar codes, qr-codes or a contactless interface to chip-enabled payment technology, such as NFC-enabled mobile phones, contactless stickers, tags, or fobs.

Mobile payments typically fit into one of two transaction size categories, which affects the choice of mobile payment technology and approach. Micropayments, which refer to payment lower than \$10-\$25, are typical for paying for ring tones, music, parking, transit, coffee, and items in convenience stores. Instead, macropayments, over \$25, are typical for all other transactions, such as person-to-person, charitable donations, Web site purchases, bill payment and retail POS.

The location of the mobile handset in relation to the merchant’s POS, as well as by payment account information and the payment acceptance device or service, may lead to two situations: mobile remote payment and mobile proximity payment. In the next paragraphs they will be described in more detail.

The last dimension is based on the multiple funding mechanisms a mobile payment can rely on. Transactions can be included on a telephone bill or funded by a prepaid account associated with the phone, typically used for text-message-based payments. Alternatively, cash can be loaded into

a virtual account at an agent location. Another source of funds is a traditional bank account or credit/debit/prepaid card, accessed through a virtual wallet by using the mobile phone's browser or a mobile app. The e-wallet may provide access to one or more of the above funding sources, which are loaded into the wallet.

1.2.5 Mobile Remote Payment

The term mobile remote payment refers to transactions in which payers use a smartphone or mobile phone to make purchases without interacting directly with the merchant's physical POS system.

Mobile phones, mainly smartphones, are equipped with the functionality required to support remote mobile payments, including SMS, secure mobile browser sessions, and mobile apps.

Practical use cases for remote mobile payments include making purchases from a Web merchant, paying a merchant who does not have traditional acceptance capabilities for physical goods, paying a merchant for the purchase of digital goods, or sending money to another individual, known as p2p transaction.

Remote mobile payment represents a convenience for consumers as well as merchants. Some examples provided by Smart Card Alliance (2011) shows as the transportation payment options can involve car parking, bicycle rental and taxi fare payment in one single solution, allowing the company to process more than 2-3 transactions per second, every day. In the same way, even retailers, like Foot Locker, can take advantage of remote mobile payment, allowing customers to access any store's sites anywhere, to view products, check availability and purchase products, as well as other value-added services such as find the nearest store and monitor the loyalty account and programs.

1.2.6 Mobile Proximity Payment

The term mobile proximity payment refers to a transaction through which the mobile phone interacts in some way with a physical POS device to transfer the consumer's payment information and perform the transaction, that is, when a consumer uses a mobile device to pay for goods or services at a physical POS. This type of solution is feasible at attended POS locations, such as stores, and unattended locations, such as vending machines. The consumer uses a mobile phone to interact with the merchant's POS system, based on potential different technologies: NFC

technology, promoted by banks, stand alone or in collaboration with the Big Tech, and other solutions such as bar codes, qr-codes, geolocation or infrasound, promoted by startup, banks and merchants.

For example, the implementation of NFC technology implies that the enabled phone has to be provisioned with a version of a payment application, then personalized with a payment account, that is credit/debit/prepaid, issued by the consumer's financial institution. At this point, the phone can use NFC technology to communicate with a merchant's contactless payment-capable POS system, sending consumer's account information to the contactless POS reader via radio frequency. In 2011 Google announced Google Wallet, through which consumer could use an NFC-enabled phone and a Mastercard payPass or Google prepaid cards to pay for purchases at merchants who accepted them.

Another form of proximity mobile payment is based on the use of bar codes. A two-dimensional (2D) bar code is displayed on a smartphone screen and read by an optical scanner at a retail POS, or the smartphone's camera is used as an optical scanner to read a bar code displayed on a POS terminal. Starbucks rolled out mobile payment using this kind of technology to its company owned stores in the United States. Consumers could download the Starbucks Card mobile app to a variety of smartphones, that displayed the bar code then used as a Starbucks Card. When the bar code was scanned at the POS, Starbucks deducted the amount of the purchase from the customer's Starbucks Card account.

1.2.7 P2P Mobile Payment

It is noticeable that, according to the definition proposed by Pope et al. (2011), p2p transactions are to be taken into consideration when talking about Mobile Payment. On the other hand, Mobile Payment & Commerce Observatory does not include such function in the framework, but it is considered as part of Mobile Payment applications.

Person-to-person or peer-to-peer (p2p) payment allows individuals to pay one another, and also business owners to transfer money to a customer or supplier account, and vice versa, using an e-mail address or mobile phone number. Users can conduct transactions through a third party, such as banks and third parties, using funds from a bank, credit, debit or prepaid account, or the payment can be funded through the mobile phone bill.

Smart Card Alliance (2011) provided some examples of p2p mobile payment solutions including PayPal, that allows consumers to send and request money using an e-mail address or phone

number and a service based on SMS and it had just announced a solution for Android NFC phones that allows money to be transferred by tapping two NFC phones together. Other examples are MasterCard MoneySend that uses the mobile browser, SMS, or a mobile app to enable customers to transfer money from person to person, and Visa service that gives its U.S. customers the ability to receive and send money from their Visa accounts. The banks involved determine the sender's fee, with a suggested fee of 50 cents.

1.2.8 Mobile payment actors and stakeholders

Mehra (2010) identified different stakeholders involved in a transaction through mobile payment: the merchant and the customer are the two actors through which the exchange occurs by means of a transaction. Between them, other stakeholders have a significant role, such as the providers of mobile transaction and content, the developers of the applications and, obviously, the equipment providers. Smart Card Alliance (2011) identify these actors, not considering mobile manufacturers, naming them, respectively, as a payee, a payer, a Financial Service Provider (FSP), a Payment Service Provider (PSP) and a Mobile Network Operator (MNO). The FSP is a bank or a credit card issuing company, the PSP is a company taking care of communications between the FSP and the payer/payee and the MNO is wireless carrier.

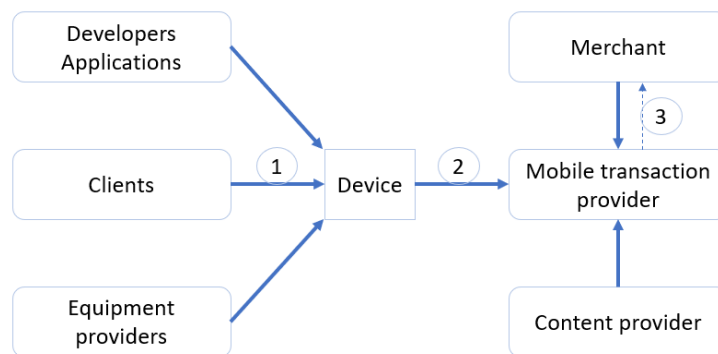


Figure 3 - Mobile payment players

To understand the involvement in the processes, Seungjae Shin, Won-jun Lee (2014) provide a rough distinction between Remote and Proximity solutions by taking into consideration the role of different players. The remote mobile payment is supported by the traditional wireless broadband technology, involving customer in sending a payment request to the PSP through wireless network. The proximity mobile payment is carried out by a relatively new short-range wireless technology, for instance allowing customer to directly send a payment request to the payee's POS terminal through NFC technology.

Mobile payment methods will probably be the next standard form of payment as a practical, convenient and easy-to-use alternative to cash and payment card. However, Cognet (2010) pointed out that people are waiting to see who takes the lead in providing this service between the finance institutions and the communication companies. In 2014, there was still a no clear leader in offering the service with a dominating method. According to Seungjae Shin, Won-jun Lee, Dustin Odom (2014) there is a problem in pushing society to carry out cashless transactions. The suggestion was to establish some cooperation among banking/credit card issuing industry, telecommunications industry, and mobile phone manufacturing industry.

1.2.9 Mobile payment system requirements and benefits

New payment methods typically face an uphill battle. The new method must be faster, more convenient, less expensive, or more secure than the current method, or it must provide some new benefit, such as rewards, enhanced record-keeping, or even a “coolness” factor. The benefits must be great enough to overcome barriers to adoption, which include upgrade costs, training and support requirements, the pain of changing behaviours, or the value of any business being replaced, also known as cannibalization.

Mobile payment system presents several advantages for companies and users when compared to alternative payment systems in e-commerce and point of sale. It enhances mobility and ubiquity of payments, facilitating the access to them and their immediacy. Thus, it increases the added value of products and services offered by companies. On one side, companies and vendors could be facilitated in the sale of products and services thanks to the increased versatility, considering the large number of existing mobile phones, faster transactions, greater convenience, time-saving, and lower costs (lower discount rates). On the other hand, it provides greater security for the users in the interactions derived from economic transaction, improving the customer loyalty (Francisco Liébana-Cabanillas, Juan Sánchez-Fernández, Francisco Muñoz-Leiva, 2014).

C. Toma (2007) provides some explanation about conditions a mobile payment service have to meet in order to be trustworthy within the markets.

- Simplicity & Usability: Graphical User Interface of the application should have a small learning curve to the customer and could increase the end-user satisfaction through the personalization.
- Universality: the service should allow both low value micropayments and high value macropayments and include domestic, regional and global environments.

- Interoperability: the service should be able to interact with other systems, based on open standards and technologies.
- Security, Privacy & Trust: the service has to be anonymous as cash transactions. If the mobile payments system is not anonymous, then customers must be able to understand how his/her private information is protected and be sure that is hard to expose this information (e.g. credit or debit card) to other entity from the payment system (other than the client, merchant or bank). Also, when mobile payment transactions are recorded, the customer privacy should not be openly available for the public access, like the credit histories or spending pattern. The system should be “bullet-proof”, resistant to inside or outside attacks, for instance using public key infrastructure (PKI) security, specialized cryptochips (embedded or external to the mobile device), biometrics and passwords integrated into the mobile payment solution architecture.

In general, if they provide greater security, they will improve reliability, increase the product offering for companies, save time spent in establishment and reduce the incidence of errors.

- Cost: the costs of the usability and deployment for the new mobile payment system should be lower than the existing payment mechanisms.
- Speed: it should be acceptable to customers and merchants.
- Cross border payments: the application and transactions should be available globally, in order to be widely accepted, regional or worldwide.

1.2.10 NFC mobile payment

Ayman S. Ashour (2012) argued that NFC play a huge role in the ‘war on cash’, that is in the proximity payment scenario, and it is likely to be most successful through micropayments and will be widely used if transaction fees are low. In fact, he showed that one of the reasons why the most of micropayments are still in cash is the issue of transaction fees that the retailers have to pay if consumers carry out a cashless payment.

According to Smart Card Alliance (2011) NFC mobile proximity payment must satisfy basic requirements which stakeholders, such as consumers, merchants, issuers and mobile operators, can benefit on and which can drive behavioural change overcoming structural inertia. Basically, an NFC mobile payment have these main advantages:

- Reliability at POS, through transactions working every time with fast and robust performance;

- Security of storage, by storing payment information in a secure element, security of processing of payment credentials and transaction data, by requiring the user to activate it manually or to get close to the receiver to perform the payment, and ability to suspend payment apps in case of fraud;
- Ease-of-use and convenient transactions with an easy, intuitive interface for consumers and store staff, with no training required;
- Functionality to reliably and easily load payment cards into the wallet, transfer the wallet to a replacement phone, vary payment defaults by merchant, encourage preferred payment instruments;
- Broad merchant acceptance: contactless payments and ticketing using NFC devices can be enable with no significant POS or business process changes and coexistence with the existing systems;
- Device deployment/availability: NFC has the potential of being also implemented in all existing mobile phone, by integrating the chip *a posteriori*, thus supporting a wide variety of handsets with broad customer availability, bringing a wide range of new services for users;
- Ability to support value added applications and services: NFC allows users to access certain VAS that cannot be facilitated by other payment systems, for example, automatically linking retail loyalty accounts, supporting retail promotions and couponing, presenting customer offers in-store, and sending secure payment messages.

In line with these key points, Meijer and Bye (2011) stated that an NFC mobile payment is more convenient than of using contactless smart cards, equipped with NFC technology, because it can be used without a PIN or a signature or issuing a paper receipt, which will reduce a waiting time in checkout lines.

Sometimes, the NFC technology is mistaken for RFID or Bluetooth technology (wireless technology which interconnects mobile devices at a distance of around ten meters), due to some similarities between them. The difference is that the *NFC* technology provides a faster connection, thus avoiding eventual interferences and providing higher security in crowded places, allowing its use even when the device is switched off (Francisco Liébana-Cabanillas, Francisco Muñoz-Leiva, Juan Sánchez-Fernández, 2014)

In addition to the mentioned advantages, NFC technology, as standards-based wireless communication technology, allows data to be exchanged between devices located a few centimetres away, therefore it can be used for a wide variety of mobile applications, including:

- Making payments with a wave or a touch of a device anywhere contactless POS readers have been deployed;
- Securely storing tickets for transportation, parking access, or events and enabling fast transactions at the entry/exit point;
- Securely storing information that allows secure building access;
- Reading information and picking up special offers, coupons, and discounts from posters or billboards on which an RF tag has been embedded.

1.3 Digital payment in Italy

In recent years, many actors put their effort in providing the best and the most innovative Mobile Payment service and now there are the first good results, meaning that Italy is getting ready to be hit by an innovative wave and accept new challenges.

Mobile Payment & Commerce carried out researches, from a quantitative viewpoint, in order to describe the current scenario in Italy and future trends over the next three years. The data have been collected and gathered from the main actors of the market and then matched with data from Banca d'Italia to compare the payments with traditional cards.

In 2018, the payments with card reach € 240 billion (+9% than 2017), equal to 37% of the Italian family expenses. The payment cards are more and more used by Italian, thus increasing the number of per capita transactions from 60 in 2017 to 69,6 in 2018, but this entails to a reduction of the average ticket transaction value (€60,5 in 2017 and €57 in 2018), keeping their declining trend already shown in the past years.

This growth, even though higher than the European average, it is not enough to improve the positioning within the European ranking (24° position) before only to Bulgaria, Romania, Greece and Germany, while the most performing countries record more than 300 yearly per capita transactions.

1.3.1 New digital payment in Italy

It is remarkable that the New Digital Payments are growing at a high pace (+56%) achieving €49 billion and, in 2018, they represent the 33% of the digital payment made with card (23% in 2017) and the 12% of the Italian family expenses. Driving force behind this growth is mainly the

Proximity component of the New Digital Payment, doubled compared to 2017 thus reaching €49 billion, while the Remote component increase of just the 15% reaching €31 billion in 2018.

Looking at the different purchasing opportunities, on one side, considering all the systems that can be used to carry out a Remote Payment, therefore also Home Banking and cheque, about 45% of the total amount of payments is represented by the Remote component of New Digital Payment. They are composed by eCommerce and ePayment (70%), Mobile Remote Commerce (27%) and Mobile Remote Payment (3%).

On the other side, Proximity Payments are carried out by cash, traditional cards, and New Digital Payments which represent less than the 10% of the total amount of payments. They consist of mostly in-store Contactless Payment (96%), payment on Mobile POS (3%) and Mobile Proximity Payment (1%).

This means that the most growth potential concerns this last category, since the most innovative component can scratch the old ones like cash and traditional cards.

In 2018, one billion transactions with contactless cards have been carried out for a total amount of € 47 billion (twice in respect to 2017). Definitely, after nine years, people are familiar with this technology, thanks also to a wide spread of contactless cards and enabling POS (at least one in two cards and three out of four POS are contactless). The so called 'tap&go' transactions have an average value of 45€, lower than those made by traditional card (57€/transaction), meaning that people started in using it for 'micro-transactions', but with a low impact as regular users probably carry out micro and macro transaction without distinction. The involvement of public transport with this type of technology has had an important role in the familiarization and in leading people to use it even for the smaller daily expenses.

Over the next few years, the New Digital Payment will overcome €125 billion in 2021, thanks mainly to Contactless Payment and Mobile Proximity Payment which will overcome €80 billion.

1.3.2 Mobile payment in Italy

Special attention should be paid to the Mobile Payment, able to offer both Remote and Proximity experience.

In 2018, in Italy the Mobile Remote Commerce accounts for € 8,4 billion, corresponding to a growth of 40% compared to 2017. Such value represents the 31% of the total amount of eCommerce expenses with higher penetration in the Food&Grocery (32%) and Clothing (45%) sectors, while lower in the Insurance (9%) and Tourism and Transport (18%) sectors.

The Mobile Remote Payment, instead, reach the maturity phase with €900 million, increasing of the 10% in the last year, thus confirming a growth downturn already seen in 2017. However, the market can grow even more in number of uses as well as number of engaged municipalities. Indeed, among the payment components there are prepaid phone credit and bills, both stable in terms of transaction value (€570 million and € 130 million, respectively), but also services related to the mobility (€180 million of worth), such as parking payment, public transport ticket, taxi, car sharing and bike sharing, that are increasingly used being present in 460 municipalities (5.8% of the total) and reaching the 39% of the Italian population (37% in 2017).

Car & bike sharing	Parking	Local public transportation	Taxi
90 mln € (+49%)	35 mln € (+29%)	15 mln € (+11%)	40 mln € (+100%)
>16 mln rides	>10 mln parking	>8 mln rides	>2 mln rides
58 & 77 municipalities	361 municipalities	129 municipalities	73 municipalities

Table 2 - Mobility services: value and n. of transaction and involved municipalities

Particularly important are the car and bike sharing services (transaction value of €90 million, +49% than 2017) even though in several small cities some bike sharing based on fixed location have been divested. Mobile Payment for taxi is double compared to 2017, reaching €40 million of worth. Parking Payment via app, that allows to pay only for the actual minutes of the stop, is the most widespread service in 360 municipalities and a transaction value of €35 million. Ultimately, the public transport payment via app or SMS values almost €15 million, growing of the 11%.

Definitively, Mobile Proximity Payment records an explosive growth (+650%) attaining a transaction value of € 530 million in 2018 (against € 70 million in 2017), thanks to 1 million active users, doubled compared to 2017, and the average annual expenditure, higher than 500€ per person.

As stated by Mobile Payment & Commerce Observatory (2019), in 2018, Italy became one of the countries adopting the major mobile payment services, such as Apple Pay, Google Pay and Samsung Pay. Indeed, the high acceptance rate of contactless payment and the pervasive use of the smartphone make Italy one of countries with higher potential in terms of mobile payments. However, the adoption of these solutions led to the disposal of the own ones based on HCE (Host Card Emulation) technology. The researchers realised that most of the service providers and retailers offering NFC-based payments within their mobile wallet decided to give up this technology, in favour of the major services.

Peer to peer transactions are not taken into consideration by the framework provided by Mobile Payment & Commerce since they do not allow any product or services purchase or payment, but they have a great and increasing importance in terms of transaction value, which is assessed about 50 million € in 2017 (probably underestimated).

1.3.3 Future of mobile payment in Italy

In the next years the smartphone will become more and more important, assuming a central role in people everyday life. On one hand, many companies are working in a mobile-first logic, like Privalia, Just Eat, Deliveroo, providing mobile sites or apps that firstly optimize smartphone performance and then they get readjusted for a desktop enjoyment. On the other hand, the smartphone pervasiveness in consumers life, constantly connected and in the pocket, makes Italians inclined to use the smartphone to surf the Internet (80,5% of the time spent online) as well as to make mobile purchases.

In the next three years it is expected to reach a penetration of the 50% of eCommerce transaction value, more than doubling the worth of Mobile Remote Commerce to € 17-20 billion.

Bearing in mind the development of several Mobile Remote Payment components, it is estimated that in 2021 it will be worth between € 1,2 and € 1,6 million.

Most of all, Mobile Proximity Payment is expected to continuously grow to reach a transaction value of between € 5 and € 10 million in 2021.

1.4 Mobile ecosystem in Italy

The mobile phone has led to a profound revolution in our society because of its social and economic impact (Ghezzi et al., 2010; Guo, Zhao, Jin, & Zhang, 2010; Manvi, Bhajantri, & Vijayakumar, 2009; National Retail Federation, 2011), although it is also considered to be a business in expansion (Karnouskos & Vilmos, 2004).

The introduction of smartphone in people everyday life allowed the development and spreading of mobile payment systems. Thus, the smartphone became the first device able to provide both Remote and Proximity Payment solutions. In order to understand the potential market, the mobile ecosystem has been investigated in terms of adoption rate of technologies.

1.4.1 Internet users

Audiweb estimated on a daily, weekly and monthly base the digital audience and Internet penetration of Italian people, according to the used device and the operating system.

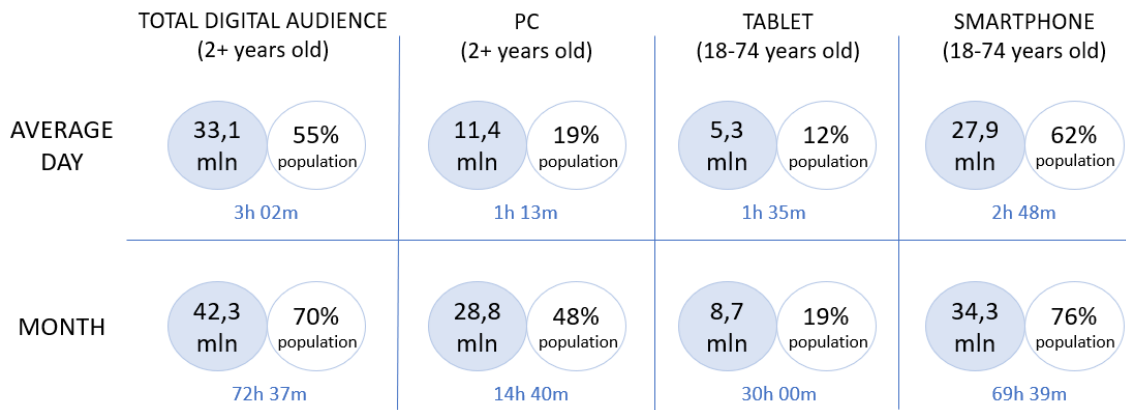


Figure 4 - Internet users

The total digital audience represent the number of reached people after deduction of overlaps due to different detected devices. In January 2019, Audiweb published data about total digital audience recorded in the second half of 2018 and in December 2018, from which some relevant data has been caught.

In the second half of 2018, the montly average is estimated to be 42.3 million, equal to the 70% of the population being at least two years old. More specifically, on average, 33.1 million people surf the Internet every day for about 3 hours. Analysing devices used to access online, italian people prefer to use smartphone that accounts for 27.9 million users (62% of the population) remaining online on average for 2 hours and 48 minutes, confirming ones again the pervasiveness of smartphone in people everyday life and activities. The users surfing the Internet by, also or only, computer are 11.4 million, while 5.3 million by tablet.

If we look at the Internet audience in December 2018, more detailed data has been provided. After having verified that the monthly audience and daily averages recorded in December are in line with the ones in the second half of 2018, we can consider the following data as a rough estimate for all the months in the second half of the year.

Young people are the most involved, with the 82.5% of people within the age range 18-24 years old connected to the Internet at least once a day and the 81.5% of people within the age range 25-34 years old.

All the legal people are uniformly involved in the use of Internet through mobile devices, in a consolidate way, with similar use frequencies, except for over 64 years old people, involved in only the 25.3% of the cases. However, the women show a significant preference for smartphone (63.8%), against men who use smatphone in the 59.9% of the cases, as well as young people.

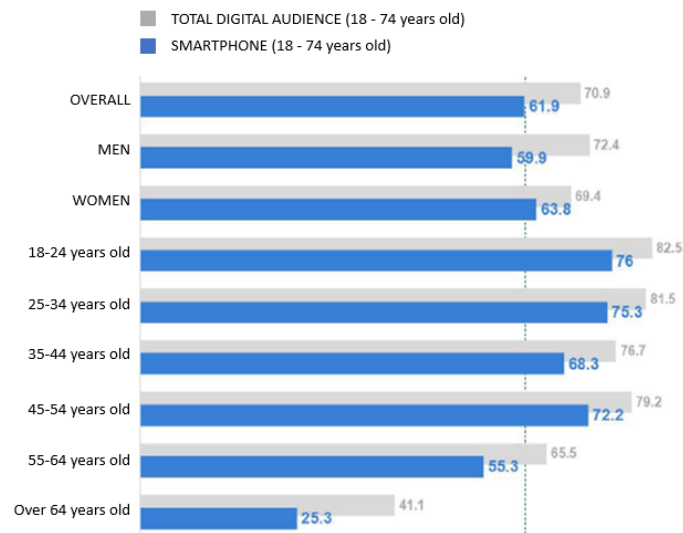


Figure 5 - Internet users by smartphone

Another important factor is the time distribution. Since people use mostly smartphone to be online, they will spend more time using this device. The 80.5% of time spent online is recorded through smartphone. In the same way, women and young people spend, respectively, 82% and 85.2% - of age range 18-24 - and 83% - of age range 25-34 - of the time online through smartphone.

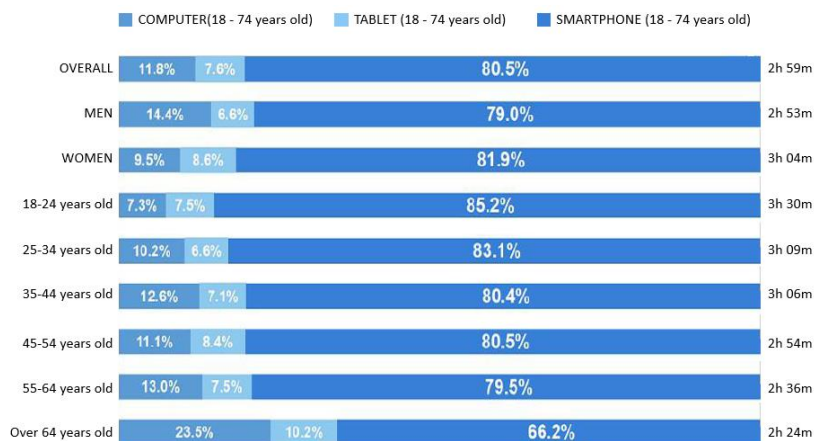


Figure 6 - Time distribution

A substantial contribution is provided by the annual research carried out by We Are Social in collaboration with Hootsuite. They analyse the annual digital scenario, in Italy and in the world, focusing on internet, mobile, social media and eCommerce use. They examine several sources

like GSMA Intelligence to get information about mobile ecosystem, Eurostat to get data on Internet penetration, and GlobalWebIndex to gather results of the survey on a target population aged between 16 and 64 years old, interviewed about how they spend the time online. The following data reflect the situation at the end of 2018.

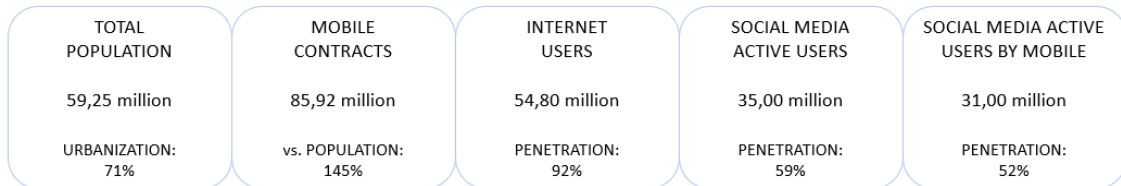


Figure 7 - Mobile ecosystem

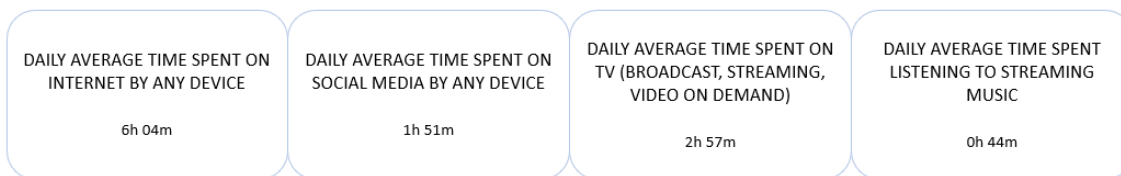


Figure 8 - Time spent online

The most important result is that almost 55 million Italian people get on the Internet (92% - about 9 out of 10 people, +27% over 2018), spending online 6 hours a day on average. Slightly below is the share of people using Internet connection every single day (88%), while the number of active users of social media is slightly growing, as well as the number of those accessing them through mobile device (31 million).

1.4.2 Smartphone adoption

The mobile phone was one of the most remarkable technology of the last decades and its spread across the developing world allow hundreds of millions of people having purchased the first telephones of their lives to stay in touch, by voice call or simple SMS, overcoming distance. Cellular phones and related services have become a crucial part in daily life. But, since Apple introduced in 2007 the first iPhone, mobile phones have been replaced by smartphones. A smartphone is a good example of digital convergence as it is an integrated mobile device of calling features and internet access. With an introduction of mobile TV service in Korea in 2005 (Shim, Shin, & Weiss, 2006), such as Digital Mobile Broadcasting, a smartphone became a mobile version of triple convergence of voice, TV and internet services. Recent new functions are mobile banking and shopping enabled by the development of wireless broadband technologies such as

3G/4G, WiMAX, and WiFi, thus moving smartphone users from internet banking/shopping to mobile banking/shopping.

While smartphones ubiquity means they remain the focal point of the consumers internet economy, the range of connected devices, and therefore internet access channels, is greater than ever. In the most advanced countries, today's digital consumers who are using PCs and smartphones, will tomorrow likely to adopt emerging technologies such as Artificial Intelligence, via smart speakers, and immersive reality (GSMA, 2019).

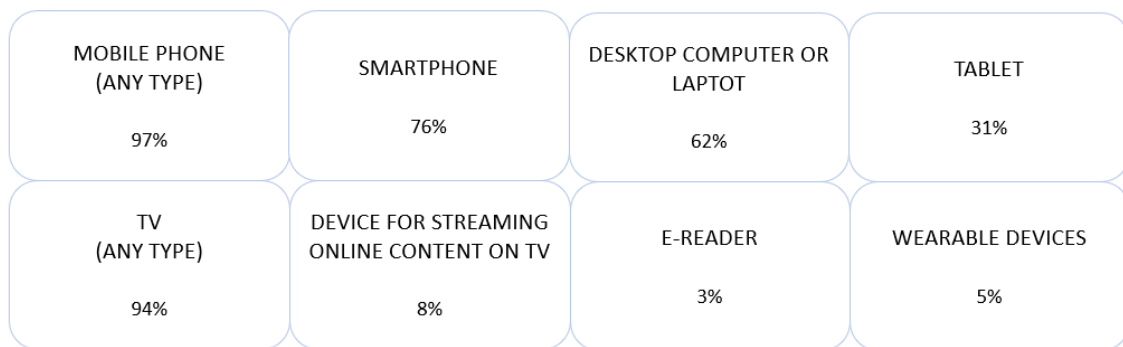


Figure 9 - Devices adoption rate

This is a quick overview on the digital device adoption rate in Italy to be aware how pervasiveness of digitalization is driving people to make increasing use of more innovative instruments from smartphone, to tablet, to wearable device.

1.4.3 Mobile usage

Digital 2019 Report released by We Are Social provides data also regarding the mobile penetration, in terms of subscriptions and different uses. In particular, Mobile Internet connections, in terms of subscriptions, are 86 million, equal to one and a half per person, but in terms of number of active users they are 50 million (penetration of 85%).

Over the next few years, as the enablers of mobile internet adoption (infrastructure, affordability, consumer readiness and content/services) continue to improve, millions of people will start using the mobile internet for the first time. By 2025, 5 billion people across the globe (more than 60% of the population) will be mobile internet subscribers (GSMA, 2019).

People use the mobile to perform several activities, classified in five categories: messenger (87%), video contents (81%), gaming (49%), banking activities (41%) and mobile maps (76%).

But it is interesting to have a look to information on eCommerce: two Italians out of three make online purchases or payments, and the 42% made it through mobile devices.

PEOPLE HAVING ACCOUNT WITH A FINANCIAL INSTITUTION 94%	PEOPLE HOLDING A CREDIT CARD 42%	PEOPLE HAVING A MOBILE BANK ACCOUNT N/D	PEOPLE MAKING ONLINE PURCHASES AND/OR BILL PAYMENT 65%
WOMEN HOLDING CREDIT CARD 34%	MEN HOLDING CREDIT CARD 52%	WOMEN MAKING ONLINE TRANSACTIONS 3%	MEN MAKING ONLINE TRANSACTIONS 5%

Figure 10 – Financial factors influencing mobile usage

The categories for which people are spending more and more through mobile device are Food & Personal Care (+18%) and Furnishing & Household Appliances (+16%). The worth of eCommerce over the total value of Retail is estimated to be about the 4%, with an involvement of e-wallet in one third of eCommerce transactions and in the 2% of the total in-store payments in the Retail sector.

Ultimately, a summary of financial activities carried out through mobile device shows how many people is used to carry out transactions with a mobile device. So, the digital payments have been divided in bank transaction (accounting for 41% of the population), mobile payment (25%), online purchases (42%) and availability and use of criptocurrency (2.9%).

1.5 Mobile payment adoption challenges

The payment by mobile phone is one of the most recent payment options. It appeared thanks to the importance of wireless devices in the current society, the accessibility of this method to users and the technological advances that are being constantly affect both the online, mainly Internet and social networks, and the offline environment, such as card readers, POS, etc. (Francisco Liébana-Cabanillas, Juan Sánchez-Fernández, Francisco Muñoz-Leiva, 2014).

Mobile payments have become a hot topic in recent years, with many mobile payment services introduced all over the world and then failed in attracting the critical levels for mass adoption by consumers and merchants (Pousttchi et al., 2008). Bradford (2003) states that the most important component in mobile payments systems is the user: if the solution provides the user with the right kinds of benefits, then it will succeed. Thus, a guidance on how managers can effectively boost

the number of customers is needed, to make them choose the offered form of payment as an alternative to the more traditional payment services, like cash or credit cards (Paul Gerhardt Schierz, Oliver Schilke, Bernd W. Wirtz, 2009).

Zhu (2010) argued that the mobile phone could be considered as one of the future payment tools with greater level of social acceptance. However, at the moment, on one side, the merchants are unwilling to invest in new systems needed to enable the mobile payments, and on the other side, consumers will not use mobile payment systems unless merchants accept them (Mr.R.Sambaiah, Dr.M. SivaKoti Reddy, 2019).

1.5.1 Factors influencing acceptance

Since these new systems are not very widespread, with a low adoption rate, and the number of mobile device users is more than enough to offer a successful market for mobile payment solutions, with a high adoption rate, many researches have been conducted to understand why this method is not as common as a credit/debit card.

In the researches on e-banking already emerged a low adoption rate in remote technologies. Jang et al. (2009) studied the e-banking usage in the U.S. and China. The result was that there are different usage reasons. A low awareness and knowledge of technology, mainly about the security system since they deal with bank account, led the U.S. consumers to prefer traditional methods of banking rather than trying new technology (Seungjae Shin, Won-jun Lee, Dustin Odom, 2014).

Shin, S. et al. (2009) stated that technology adoption is a factor that needs to be taken into consideration when studying consumers' perceptions of mobile payment services. Kim et al. (2010) shows that the mobile payment adoption is mainly influenced by personal innovativeness and knowledge on mobile payment. Chen (2008) pointed out that the most important factor is compatibility in the consumer's lifestyle, defining the compatibility as the integration of mobile payment in the user's lifestyle and purchasing behaviors, able to enhance the buying experience and to benefit the consumer's image.

The existing literature towards the mobile payments shows that Technology Acceptance Model (TAM) is considered one of the most accepted frameworks. It explains a new technology use and the factors affecting the usage intention toward a new technology system based on users' motivations.

A more detailed research, found out as external influences, ease of use, attitude, usefulness, trust and perceived risk are all factors influencing adoption of a new mobile payment system (Francisco

Liébana-Cabanillas, Juan Sánchez-Fernández, Francisco Muñoz-Leiva, 2014). In addition, the age of the user plays a key role on technological acceptance. Indeed, older users are likely to adopt simple and easy-to-use tools than young users (Chung et al., 2010), probably due to a lower technological propensity and greater need of external influence.

According to Paul Gerhardt Schierz, Oliver Schilke, Bernd W. Wirtz (2009) compatibility, individual mobility, subjective norm, perceived usefulness, security and ease of use are the six factors that managers have to include in their solutions in order to effectively boost the number of users. Important finding is the influence of the perceived compatibility, since it is not part of the original TAM and thus is often not considered by researchers.

However, a lot of papers describe security, economic cost, and convenience as the three most important factors that consumers take into consideration before adopting new technological products, and even before making a mobile payment. Security and convenience are two main motivations to explain the adoption of mobile banking (Herzberg, 2003) and mobile payments (Jang, 2009). Shin, D. (2009) stated that security and convenience along with economical cost are three determinants of the success of online banking.

When people talk about security issues, they deal with confidentiality (only those involved in a transaction should know what was purchased and the payment mode), authentication (all merchants and mobile customers must be able to trust claimed identities), integrity (outside parties should not be able to modify transaction data), authorization (procedures must be in place to verify that the user can make the requested purchase), and nonrepudiation (users should not be able to claim that a transaction occurred without their knowledge) (Upkar Varshney, 2002).

Furthermore, a clarification about what convenience means has been provided by Seungjae Shin, Won-jun Lee, Dustin Odom (2014), with some examples. When online banking became an option for banking customers thanks to the Internet connection, one of the benefits has been that account holders do not need to visit the physical bank in order to perform banking transactions. Similarly, the availability of mobile payment thanks to smartphones, it is like having a branch of the bank in the hand of customers. And about even more recent innovation, mobile POS payment methods allow consumers to experience a fast check out process while shopping, enabling the users to keep all their loyalty program cards, gift cards, coupons, bank cards, and credit cards on one mobile device.

In a deeper analysis on customer satisfaction, Mr.R.Sambaiah and Dr.M.SivaKoti Reddy (2019) took into consideration recent past research done on several critical areas of mobile wallet usage such as, adoption, simplicity and usability, security, privacy and trust and cost effectiveness, and then they provided a complementary analysis revealing about customer satisfaction and loyalty

towards the mobile wallet usage. The result is that customer loyalty is influenced, through customer satisfaction, by factors, such as perceived value, ease of use, trust, perceived security and self-efficacy.

As part of past researches about factors leading to customers' acceptance of mobile payment systems, Agnieszka Zmijewska, Elaine Lawrence and Robert Steele (2004) attempted to develop a model to classify them from a user's perspective. As result, multiple dimensions are derived: Change of phone requirement, Registration requirement, Available phone operating company to which the user has to subscribe, Available applications, Communication of consumer's number to start transaction, Communication of transaction details to user, Acceptance of transaction by customer, Confirmation to customer, Payment occurrence, Brand visible to consumer, Value of payment, Registration fee (yearly), Transaction cost for consumer, Time of transaction. The final objective of this user-centric classification was to help manager in figuring out which solution appeal to users, which make them accept the system, what their preferences are, which characteristics do not matter and what should be avoided.

As confirmed in more than one paper, Korea has a well-developed mobile payment ecosystem so as it plays a crucial role being a leading country for mobile payments usage (Ezell, 2009). In fact, global mobile industries pay attention to the Korean mobile user acceptance of the new payment service, so that to take the right actions.

A comparative study between Korea and U.S. figures out as mobile security is the factor of strongest influence on mobile payment frequency in both countries. Therefore, establishing more secure transaction of mobile payment is the best way in each country to increase the usage. The research pointed out that, given the importance of the security, U.S. customers are even willing to pay higher fees (Seungjae Shin, Won-jun Lee, Dustin Odom, 2014).

With regard to the disadvantages related to the use of NFC mobile payment, from the perspective of the end user, the perceived lack of security acts as an inhibitor and decrease its potential use (Chen et al., 2011), as well as the authentication issues. These are two key elements which inhibit the use of this technology.

The security issues related to the NFC are based on eventual attacks directed to the initiator (label) and the receiver (reader or mobile phone). On the other hand, the attacks to the reader entail the modification of the mobile device, which means that eventual fraudster could access the device. Moreover, we have the attacks to the label or the initiator of the communication. The lack of security can be caused by information spying during the communication, in the moment the transaction is performed, as well as by data corruption (denial of service) or modification of data

entry during the transaction. In order to solve the eventual security-related issues, the QR technology appears, among other advances.

By contrast, a specific NFC mobile payment-related study has been conducted in Korea, suggests that a successful NFC mobile payment service has to be much more focused on the usefulness against other alternative payment methods, probably due to the fact that proximity payment was at the early stages (Seungjae Shin, Won-jun Lee, 2014).

1.5.2 Communication strategies

Francisco Liébana-Cabanillas, Juan Sánchez-Fernández and Francisco Muñoz-Leiva (2014) studied how companies could enhance the adoption rate of mobile payment systems in order to benefit from them, mainly in terms of speed and efficiency payment process. The high level of acceptance of mobile phone and the increase in the access to social networks led researchers to assume that making communication effort to spread the advantages of the tools by establishing a collaboration with social networks could improve the perception and general opinion of customers regarding the purchases on the Internet. In fact, as for older people, also behaviour of Internet users as customers is highly influenced by the opinions of people belonging to their social environment.

In conclusion, companies should differentiate the promotional messages in order to properly satisfy customers and enhance their loyalty, according to their perceived factors as important influencing their behaviour and to the age.

Some example has been provided: if the promotion targets young users, company should focus on security and privacy issues as a way of improving trust and, therefore, attitude towards the service. If the promotion targets older users, mouth marketing could be an interesting tool, since they have a lower technological propensity and are more easily influenced by third parties.

Also, Yaobin Lu, Shuiqing Yang, Patrick Y.K. Chau and Yuzhi ao (2011) analysed how mobile payment service providers could improve customers' trust in mobile payment service. Firstly, they take care about compatibility to ensure that their offering meets their customers' current values, needs, and lifestyles. Then, they should consider using tactics to increase the perceived relative advantage and develop campaigns that leverage the power of image with relative demographic groups. The same has to be done to reduce the perception of risk and cost with 'trust-building' practices such as training and trial activities, disclosure of security and privacy assurances, and satisfaction guarantee policies. Finally, service providers should understand the

different behaviors among different groups of customers in mobile payment services adoption and take different measures to manage them. For instance, in the case of workers, they should reinforce customers' compatibility perceptions between adopting mobile payment services and their existing behavioural patterns and habits.

In conclusion, mobile payment service providers should segment customers and employ tailored strategies to promote their mobile payment services to targeted customers groups.

1.6 Mobile wallet

The use of the mobile phone has brought about a deep revolution in our society, with both social and economic repercussions. Mobile wallets represent a growth engine in the present and future mobility and payments landscape, enabled by the mobile phone, which represents the main innovation component in the payment ecosystem, also thanks to its features, which are summarize by Francisco Liébana-Cabanillas, Francisco Muñoz-Leiva and Juan Sánchez-Fernández (2014) into five categories. Mobile payment is only one functionality among others like m-transaction, m-delivery, m-authentication and m-banking.

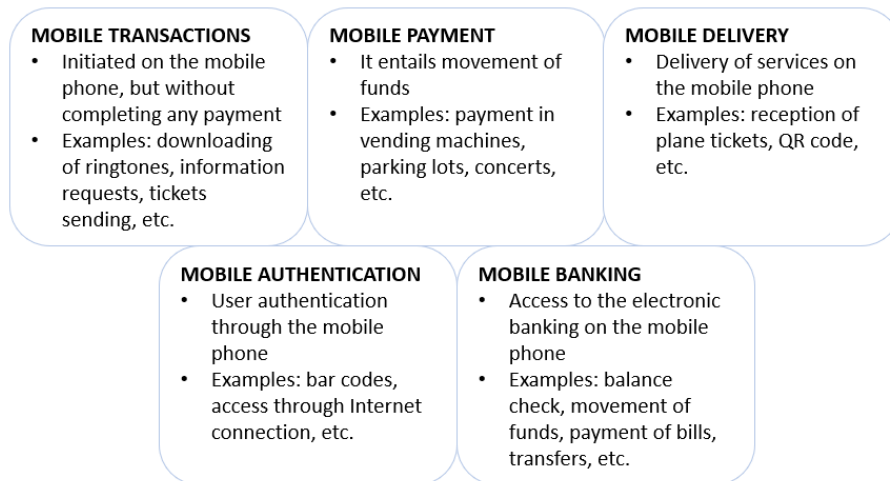


Figure 11 - Mobile wallet functionalities

The high demand for smartphone, the fact that people are always in possession of them and their financial card, and the mobile devices growing capabilities of data acquisition, communication and processing (Forrester Research, 2015) led to consider the digitization of physical wallets into mobile applications as a promising trend for payments, personal identification, marketing and digital tickets.

A mobile wallet is a digital payment instrument which enables the users/consumers to carry out payments electronically through a mobile device, both online and offline. At the merchant's location, instead of using a physical wallet, the mobile phone acts as a credit card, not by swiping the phone, but by tapping or just approaching credit card reader terminals, like traditional, mobile or smart POS (Seungjae Shin, Won-jun Lee, 2014; Shin, 2009).

The aim of this growing mobile digital service is to improve usability, convenience, security, control over items and novel disruptive experience to wallet owners. From the place owner perspective, their aim is also to offer lower costs on payments processing, control over targeted marketing campaigns, increase proximity to costumers and knowledge about their interests and needs. But the real issue is to provide a better shopping experience. Wallets have to give customers the ability to see what is on stored value card at any moment in time, to access loyalty program points and rewards, to automatically receive digital copies of payment receipts and benefit of the so-called Value-Added Services. Indeed, a mobile wallet is able to store financial information like credit/prepaid card numbers, bank account numbers, e-money and loyalty card numbers. The VASs have the role of enriching the customer experience during the usage of the application, as well as of acting as an incentive for users in adopting mobile wallet solutions.

1.6.1 Some example

In recent years, the adoption of smartphone has broken down the last barriers in the payment industry, making digital payments in stores also possible. Thanks to mobile wallets, the smartphone has become the first device able to offer both remote and proximity payment solutions.

Smart Card Alliance (2011) mentioned some innovation in this field, showing as different companies rely on different technologies.

In 2011, Google released on the market its payment system called Google Wallet, available in New York and San Francisco. After having linked a bank card or a Google virtual card and authorizing the secure connection of the card to Google Wallet, consumers can use an NFC-enabled phone to pay for purchases, by just entering a code or pin number into the application and placing the mobile phone near the reader so that the NFC chip completes the operation. Google was also working to allow consumers to be able to redeem promotions and earn loyalty points.

Starbucks, instead, has rolled out mobile payment using 2D bar code technology to its company owned stores in the United States. Consumers could download the Starbucks Card mobile app to a variety of smartphone, which then displayed a bar code that the customer used as a Starbucks Card to make purchases. When the bar code was scanned at the POS, Starbucks deducted the amount of the purchase from the customer's Starbucks Card account. The app also let a cardholder track the card balance, add to it with a major credit card, check the status of rewards points, and locate nearby Starbucks outlets.

Meanwhile, in 2011, PayPal diversified to support payments between businesses and consumers, becoming the leader in the p2p category in America, with the largest global Internet-based payment network (approximately 94.4 million customers). It offered a mobile phone app that allows consumers to send and request money using an e-mail address or phone number and a service based on SMS.

A successful example of the mobile payment scenario development took place in India. The increasing of smartphone usage rate, the high Internet penetration and the continuous strong support by the government after the demonetization led to the introduction of new mobile wallet. In fact, after the demonetization, non-cash payment transaction system was in the early stages and majority of the retail market did not have much POS installations to offer card-based payments. Nowadays, thanks to the government actions, there is a huge change in cashless payment system, with both small and large merchants accepting mobile wallet payment (ASSOCHAM Report, 2017). Flodd et al. (2013) stated that the inclined consumption of mobile wallet is witnessed not only in India but also in other many countries, meaning that companies have to meet customers' needs and government have to get people ready for innovation.

1.6.2 Challenges and requirements

In this regard, Chen et al. (2011) faced three main challenges, related to the security issues, with the aim of proposing some mobile wallet solutions, which were then supposed to lower the cost of processing a transaction and increase customer satisfactions. One challenge regards the user identification, since it is difficult to know that the person presenting the card is the actual owner. It has been a frequent problem for the payment-processing industry and has become more severe in the eCommerce world. Then, another challenge regards fraud, which is recognized as one of the biggest threats to the payment processing industry, being present in different forms such as hackers stealing identity of consumers, stealing card information, fictitious merchant charging gullible customers more money than the consumers owes for the products and services, or Credit

card number generators targeting consumers. Lastly, interchange fee that merchants pay to get a transaction processed, which depend on variables like the number of transactions a merchant make and the type of business, continued to increase.

In general, as stated by Ng and Yip (2010), mobile payment devices are usually registered with the concerned banks and enabled with high security transfer of funds from the payer's bank to the payee's bank account through irrespective of the device and payment service provider.

João Casal, David Monteiro, Laís Sousa, Patrick Santos, João Santos and Jorge Ramos (2017) demonstrated that, despite the recognized advantages of mobile wallets, the current solutions did not fulfil the users' needs, in terms of low adaptation on the current solutions to their needs, small number of users of the m-wallet systems and the current safety concerns ensured to the users. Other issues (European Payments Council, 2014) taken into consideration regarded:

- user experience (lack of acceptability, usability, trust, privacy, perceived value for wallet owners, place owners and others);
- coexistence of mobile payments with other services;
- coexistence of multiple mobile wallets in one device;
- connection between wallets of consumers and merchants;
- interoperability between mobile wallets;
- information security for the proximity payment;
- lack of collaboration between the stakeholders.

After a deep analysis, the main requirements for a holistic mobile wallet have been described with the aim to provide a solution able to increase the perceived added value for Wallet Owners and Place Owners, by optimizing the number of potential users of the system. Mobile ID, mobile payment, mobile ticketing and mobile marketing and gamification are the functional area through which the features have been organized.

In the analysis of the mobile wallet ecosystem, researchers took also into consideration several personas being present in different application areas (restaurants, stores, public transports, corporate facilities, and others) and for different business sizes.

- **Wallet Owner:** the persona that has the mobile wallet application installed on the smartphone and is able to use it for payments and management of receipts, personal identification, buying and managing tickets of several types, receiving and managing items of customer engagement, such as loyalty programs or coupons. The demography of this persona is very broad, basically anyone having a smartphone;

- Place Owner: the persona responsible for the business with which the mobile wallet owner interacts, being interested on the system business metrics (data visualization, business performance notifications and other management features), on managing the system modules and on managing the employees' performance and permissions on the system. This persona has permissions to do everything that the Place Manager and Place Controller do. The businesses scope (places that a Place Owner may own) is defined by any place that involves payments/money transfer, user's identification, ticketing or marketing;
- Place Manager: the operator responsible for interacting with the wallet owner in payments, identification, ticketing and marketing;
- Place Controller: the operator that confirms/validates wallet owner's ID or the permission for those personas to be on a specific spot.

1.6.3 European Directives

Peggy valcke, Niels vandezande and Nathan van de velde (2015) summarized the European directives till the adoption of the second Payment Service Directive.

The first payment services directive was adopted in 2007 and reviewed by the European Commission late 2012, with two legislative proposals presented in July 2013 about card, internet and mobile payments. One of these proposals consists of introducing a regulation on interchange fees for card-based payment transactions. The other one entails the replacement of the current Payment Services Directive by a new one, the PSD2, to be implemented by the middle of 2019 with the objective to reformulate the application areas.

While Payment Services Directive did realize progress in the eCommerce field supporting future growth by regulating payments, some problem emerged. EU payments market still remained too fragmented and the application of the directive was found to be inconsistent, leaving a legal vacuum for newly emerging service providers, and suffering from a lack of standardization and interoperability.

To solve such issues, the new directive has as its principal objective to contribute to the spread of electronic payment in the European market by adapting the existing legal framework to emerging and innovative payment services, dealing with issues like the competition between payment instruments, the harmonization of the legislation and the transaction security.

In Italy, with the decree of 13 January 2018, the implementation of the PSD2 regulation opened concrete opportunities in the New Digital Payment market for banks, Fintech and new intermediaries. According to the new rules proposed by EBA, the European Banking Authority, an API-based strategy that allows access to payment accounts can enable a scenario of "competition" between banks, new intermediaries authorized by the PSD2 to provide services based on access to accounts and Fintech. Indeed, the new regulation promotes the use of new tools that directly access the accounts, such as the bank transfer, for payments that take place via the internet, in mobility and, in the future, also at physical point of sale. With this regard, the notion of Third Party Payment Service Providers is one of the key developments.

More and more, payment transactions are no longer exclusively conducted between a user and his bank, but also include an intermediate party that provides an interface between the merchant and the user's bank. PSD2 does introduce two new forms of payment services provided by third party payment service providers, so that three core actors need to be distinguished. The two new forms of payment service providers are named as payment initiation service providers (PISP) and account information service providers (AISP). In addition, the PSD2 establishes a new for the account servicing payment service providers (ASPSP) which refers to the classic payment service providers, who provide and maintain payment accounts for a payment user.

As these intermediaries are principally not collecting payments, they were excluded from the scope of the original directive. However, as they do act as access gateway to the user's payment information, their activities do bear important security, data and credentials protection and liability issues. This is the main reason why the European Commission subjects them to similar supervision, authorization, and security requirements as the classic payment service providers.

In conclusion, banks and, in general, all the service providers managing customers' accounts, that can be accessed online, can benefit from the implementation of the Open API (Application Programming Interface). In this way, service providers could also offer value added services through collaboration with the Fintech, transforming banks in a platform to aggregate financial services.

The PSD2 also aims to increase and spread confidence in the use of a payment service. As a result, the legislation focuses on the "Customer Strong Authentication", involving the EBA also to strengthen the protection and transparency laws provided by both the PSD2 and the new regulation on card payments fees. In particular, the option to use a single credential for the implementation of payments in a multichannel logic put the attention to a strategic use of Digital Identity. The concept of Mobile Identity, to be intended as the use of the smartphone as a user authentication tool, offers interesting development opportunities. With the PSD2 and the 4th anti-

money laundering directive, which introduces several innovations also about the adequate customer verification, it has been underlined how an innovative use of Digital Identity can bring benefits to the digitalization of the economy (Mobile Payment & Commerce Observatory, 2019).

Chapter 2

Methodology

The thesis has been developed as part of a wider research context carried out by the Mobile Payment & Commerce Observatory of Politecnico di Milano, which studies innovative mobile payment systems. Working within the research context of the Observatory allows to participate to different workshops, roundtable and final conference held by the Observatory at Politecnico di Milano, in order to have an overview on the several aspects related to digital payment, as well as to discover the different perspectives of the players involved, since different partners and sponsors as retailers, banks, financial service providers, technological and telecommunication companies are active participants.

The collaboration with the researchers has affected both the timing and the direction of the work, since the objectives of the paper have been adapted to make them consistent with the broader ones of the research conducted by the Observatory.

The methodological note aims to describe in detail the modality through which the thesis is developed, therefore, the objectives of the thesis work, its structure and the material used during its development will be illustrated. The three main parts of the thesis (context & literature, census and empirical analysis) have been carried out through different approaches. In the following parts, they will be discussed in detail.

2.1 Objectives

Every year, the observatory structures the research and sets several steps and objectives, based on the previous researches, to be achieved with the final goal to draw up the annual report.

In 2017, after years of slow trend, Mobile Payment & Commerce seemed to be ready to catch on in Italy, thanks to the continuous growth of Mobile Remote Commerce in term of transaction value and the Mobile Proximity Payment as driving force of innovative digital payment. In addition, the number of Italian mobile payment users was increasing as well as their satisfaction level. The growing competition, the innovation in terms of technologies, processes and services provided, and development of the legislation led to a profound transformation of the payment environment. Within this evolving scenario, some innovation guidelines were identified to be monitored in the following years in order to get all the actors ready to react to the changes. They regard mobile wallet, biometrics, p2p e instant payment, mobility, Internet of Things, Artificial Intelligence, voice assistant, chatbot and blockchain. In particular, the startups are inexhaustible sources of these kind innovative solutions.

For these reasons, the thesis is supposed to analyse the Mobile Wallet active in the Italian market. The research has been carried out with the aim to provide information about the market and context, the demand and the offering. In particular, the thesis firstly aims at providing general information about the Digital and Mobile Payment market, the characteristics affecting them like legislation, the Mobile Wallet features and the barriers to adoption of the most innovative payment systems.

Meanwhile, the research about the offerings has been focused mainly on the Proximity (for a purchase occasion in proximity with the merchant) and the Remote (for a use case in distance to the merchant) components, and concerning the Commerce (dealing with the whole purchase process) and Payment (only with the payment phase or when the entire purchase process matches with the payment phase) components. In other words, those payment services that are enabled by the mobile phone. In addition, according to the reference classification framework of the context analysis of Mobile Payment & Commerce Observatory, also Mobile p2p solutions have been monitored. In particular, the aim is to update the previous census in order to identify the new proposals and the failed ones, as well as the payment systems available on the market, Value-Added Services and their features, evaluating the main changes.

The research about the offerings has the objective to figure out which payment services are offered by different providers and how they work, as well as the value-added services, which technologies they are based on and the infrastructure accepting the mobile payment systems. In particular, the

thesis aims at getting insights about possible barriers to the customer adoption and possible solutions to efficiently provide payment systems in order to obtain a higher pervasiveness by evaluating the ability of different providers in offering efficient payment services in terms of opportunities to use them and the advantages brought by the solutions based on specific technologies or methods, the usability and possible constraints affecting the accessibility and effectiveness and the mobile wallet adoption.

In addition, since the objective of a mobile wallet should be to include those functionalities fulfilled by physical wallet, the thesis aim at evaluating the general level of payment services, of the Value-Added Services and the payment-related and unrelated functionalities in order to assess the commitment in the enhancement of the customer experience. Moreover, the analysis aims at identifying the main trends among different payment systems, in terms of actors, technologies involved and value proposition, by taking into consideration the several aspects of the mobile payment services monitored and gathered in the census phase.

2.2 Research Structure

In order to achieve the goals above mentioned, the research has been structured into two sections.

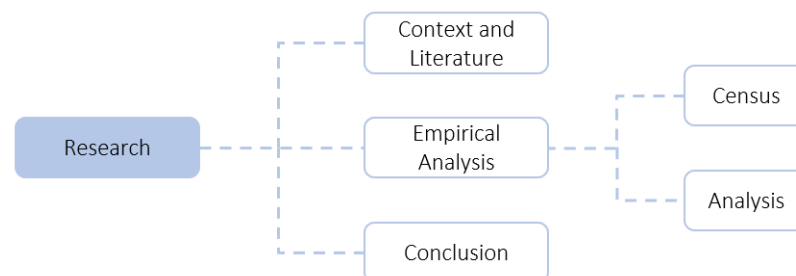


Figure 12 - Research structure

The first part is dedicated to theoretical concepts and literature analysis in order to outline the context of the research.

The second part is focused on the empirical analysis, so that some analysis has been carried out actively in order to understand how the object of the analysis work in practice and get common points and potential trends. This part of the research has been structured into two activities. Firstly, it concerns the census of the Mobile Wallet solutions active in Italy and then it deals with the analysis of the proposals and results of the census.

The conclusion part of the thesis summarizes the result of the research with general consideration, highlighting the critical point of the analysis and suggesting improvement in the related following researches.

2.2.1 Literature analysis

The analysis of the existing literature has been the starting point of the thesis providing information to better understand the topic of Mobile Wallet.

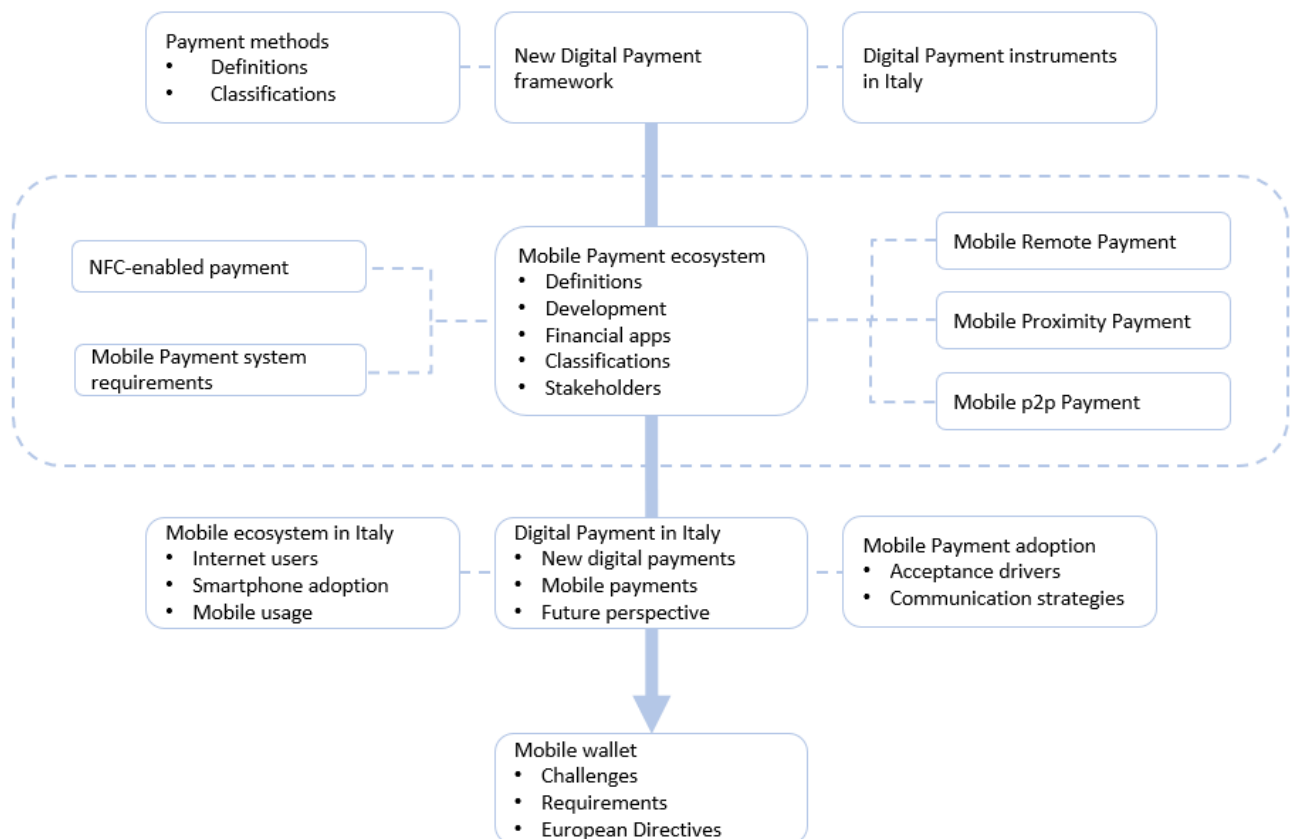


Figure 13 - Context & Literature review workflow

Firstly, considering the mobile as an instrument for making payments, then all the payment methods have been presented, with some definition, classification and description of payment systems. Obviously, a specific focus has been put on New Digital Payment system through the reference framework provided by Mobile Payment & Commerce Observatory. In addition, an outlook to the digital payments instrument used in Italy has been performed in order to have a clear overview on cash and non-cash payment also in terms of transaction value.

Then, the mobile payments have been presented and investigated as a result of filtering the framework by payment activation device, representing the ecosystem where the mobile wallets

have been developed. Several definitions from different perspective, developments and classifications have been provided, as well as the already existing clusters of mobile financial app with the main purpose to explain and separate the mobile banking application from those related to the mobile payment. A deeper description of the mobile remote payments, the mobile proximity payments and the p2p payments was needed, since they represent the main potential features of a mobile wallet. More attention has been put also on NFC payments, since the NFC technology seems to be the leading tools within the mobile proximity payment scenario. Since several actors can benefit from a mobile payment service, the main requirements which should boost the acceptance have been listed from a customer and company perspectives. Such stakeholders have been then presented and described with a scheme to highlight the relationship among them.

Once introduced the digital payment and specifically mobile payment, the focus has been moved on the current and future perspective of the Italian market by providing estimation of transaction value, both in relative and absolute terms, according to the clusters proposed by the Observatory.

In line with the focus on the digital payment in Italy, the next step has been to introduce and discuss about the current Italian mobile scenario, since the smartphone represents the main instrument allowing mobile payments and has a key role in the mobile wallet deployment. Therefore, quantitative data about the internet users, investigated in terms of used device, age and gender, the adoption of smartphone and connected devices and the different usage of a mobile have been presented with the aim of demonstrating the pervasive role of mobile in today's society.

Despite the favourable mobile environment, there are still some barriers to adoption and in attracting consumers and merchants. For this reason, several studies on factors influencing the acceptance of mobile payment systems have been summarized. Furthermore, some advice on how companies should communicate with the final users with the purpose of supporting the growth in this field.

Finally, the topic of Mobile Wallet, central component of the empirical analysis, has been addressed by providing definitions, potential functionalities and benefits for both customers and merchants. In addition, the main actors involved in the mobile wallet landscape have been set out. At the end, with the aim of understanding the evolution and potential features of the mobile wallet, an excursus on the European directives has been submitted detailing the main characteristics of the new Payment Service Directive.

For analysing the literature and the context of the thesis, 38 different online secondary sources have been studied and reported when cited along the work and gathered in the Bibliography section at the end of the thesis.

- Report and White Paper of the main companies operating in this sector, at national and international level and of consultancy companies
- Academic papers
- Scientific and Corporate Websites involved in the Mobile Payment ecosystem
- Data of Official Entities European Central Bank
- Reports and Workshops of the Observatory Mobile Payment & Commerce
- Newsletter of the Observatory Mobile Payment & Commerce
- Newsletter and Portals dedicated to Mobile Payment world, in order to keep always updated
- Italian press

2.2.2 Census

The empirical analysis of the Mobile Wallet services has been developed starting from a preliminary census of the previous year (2017).

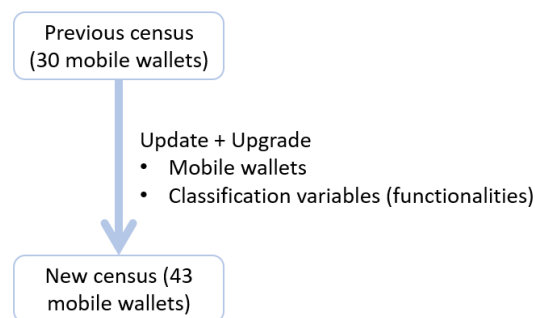


Figure 14 - Census workflow

On the basis of this database, composed by about 30 wallets, 10 of which being active only in foreign countries, several updates and upgrades have been occurred, getting a snapshot of the current situation in Italy resulting in more than 40 solutions.

The mobile wallet concept has been already introduced and analysed in the literature chapter, thus its definition has been considered as perimeter of analysis in the selection of the services available in the Italian market. Basically, a mobile wallet is a mobile applications thanks to which it is possible to virtualize and gather different payment methods and use them both in online and offline conditions. Therefore, the mapped services are related to the payment methods virtualized within a m-wallet, which can be used to pay for goods and services through a smartphone, probably after an authentication procedure.

For achieving the aim of this work and for running the empirical analysis, the old census has been enriched with additional classification variables, mainly linked with payment and value-added services.

In particular, the macro-areas to be tested and analysed regard:

- Application & Provider
- Benefits & Constraints;
- Registration phase;
- Authentication methods
- Payment instruments virtualization;
- Top up payment instrument;
- Interface and browser;
- Mobile Remote Payment solutions
- P2P solutions
- Mobile Proximity Payment solutions
- Distribution and deployment;
- Value-Added Services.

In this way, several factors and variables have been considered for their potential relevance to give a more comprehensive and consistent structure to the analysis.

Application & Provider

The first information about the applications give a picture on the mobile application such as the name of the wallet, the company name, the provider typology which they belong to, and the provision of a widget beside the application downloaded from the app store, if any.

Application & Provider		
Provider	Provider category	Widget

Table 3 - Application & Provider variables

The provider of the mobile wallet has been classified into the following categories:

- Banks;
- Service Providers, also known as the Fintech;
- Device and Operating System manufacturers, also identified as the Big Tech companies, which generally provides the X-pay solutions;
- Telecommunication companies;
- Retailers.

Benefits & Constraints

At the preliminary analysis, general constraints on the use of the application and additional charges, if any, as well as possible benefits from the use have been monitored.

Benefits & constraints				
Requirements	OS	Promo Code	Costs	Transactions value

Table 4 - Benefits & constraints variables

In some case, the download is subsequent to an involvement based on invitation and *promo codes*. Once activated the e-wallet account, the user adhering to the referral program by sending the promotional code to potential new users and the new user receive an amount of money. Sometimes, the *promoting* user has to fulfil constraints like the amount to be spent or the number of new users to be reached in order to get the bonus.

Promo code		
Activation gain	Referral program gain	Constraints

Table 5 - Promo code variables

However, the possibility to use the apps is constrained by *requirements*, such as the age, the need to be client of banks partners of the service and *Operating System*. In particular, the compatibility with Android, iOS and Windows systems have been monitored, meaning that they are downloadable by the related app stores (Play store, App store and Windows store).

The *costs* are related to the activation and subscription fee and the top up of the e-wallet for using the service.

Costs	
Application	Top up

Table 6 - Costs variables

The *transaction value* describes constraints about the maximum amount of available money and topped up money, with limitations in terms of number and amount of the transactions to top up the e-wallet. In addition, the service providing p2p transactions have been analysed in terms of limitation in sending and receiving money on daily/monthly/yearly basis.

Transaction value		
Available money	Top up	p2p

Table 7 - Transaction value variables

Registration phase

Then, information about the registration phase have been gathered, including the number of taps in order to finalise the registration and initiate the service, the number of required personal data, the security tools of the app, the possibility to choose a social network to quickly perform the registration phase and the need to input a personal identification document.

Registration phase			
Steps	Security	Social login	Personal identification

Table 8 - Registration phase variables

The *security* tools analysis refers to the registration of the PIN, the password, the fingerprint and the faceID used to access and pay by smartphone. In addition, the level of security has been assessed in terms of length of the PIN and the password.

Security			
PIN length	Password length	Fingerprint	FaceID

Table 9 - Security variables

In particular, the access to the app and the authorization of payments through biometrics traits of the person represents one of the leading trends of the future. Therefore, the smartphone acts as a reader of fingerprint, a device through which the user can do the facial recognition, and a scanner of the iris for confirming purchases by remote and enabling offline payment, as well as confirming p2p transactions.

Authentication methods

Further analysis regarding the security level has been carried out by summarizing the authentication method used to access the app in three main categories, such as numerical/alphanumeric codes, biometrics, like fingerprint and faceID, and other unusual methods.

Authentication methods		
PIN/password	Biometrics	Others

Table 10 - Authentication methods variables

Payment tools virtualization

As part of the registration processes or carried out later, the virtualization of payment tools is needed to top up the e-wallet or to attach it to the service to pay through the smartphone. Thus, the next variables concern the payment tools and their virtualization, describing the different instruments to pay through the smartphone, and the time required to validate the registered payment instruments (and the identity).

Payment tools virtualization						
Steps	Method	Payment tool	Payment Cards	Bank accounts	Paypal	Validation

Table 11 - Payment tools virtualization variables

Firstly, the *steps* and the number of taps needed to complete the virtualization have been analysed. Then, the *method* through which users can virtualize their payment cards/bank account have been monitored, as well as the maximum capacity. In particular, a card could be virtualized by manually entering the information, by taking a photo of front and back of the card so that the application can read the required information then automatically entered or by automatic association of the payment card to the e-wallet thanks to the personal code recognition or the connection to the home banking.

Method			
# virtualizable cards	Manual	Photo	Automatic

Table 12 - Method variables

The service *payment tool* used to pay through the smartphone can be a new virtualized payment card/bank account/e-wallet provided by the service or a card/bank account already owned by the user to be linked to the wallet account by virtualizing it within the application.

Payment tool	
New	Virtualized

Table 13 - Payment tool variables

However, in the virtualization phase of the *payment cards* there could be some constraints, for example the acceptance of the payment cards which have to belong to the service provider and its partners or be based to just a few circuits. In the same way, the constraints about the acceptance of the *bank account*, which in some case has to belong only to the service provider and its partner, has been monitored. In addition, the cases in which the registration phase lead to the new activation or the virtualization of an existing bank account for using the service has been summarized.

Given these constraints, the proposal of *PayPal* as an additional payment tool has been considered as relevant variable.

After having carried out the registration and virtualization phases, the *validation* and the service activation could not be immediate. Therefore, the time needed and the methods used (such as charge and One Time Password) to check the payment instruments and the identity have been analysed.

Top up payment instrument

When the app acts as a money storage, and not only as a service to virtualize the payment tool, it has to be top up to be able to finalize the payment through the mobile payment solution.

Top up payment instrument	
Money Storage	Top up method

Table 14 - Top up payment instrument variables

The methods through which the wallet could be topped up have been classified in different categories: by virtualized payment card/bank account, by credit transfer, by credit transfer with cash, by debit card at the ATM point.

Top up method	
Virtualized	Other top up methods

Table 15 - Top up method variables

Interface and browser

The next classification variables analyse the usability of the application by describing the structure and layout of the home page in terms of functionalities available for a quick access, the facility

for the oversight of the credit history and the money availability, in terms of number of taps to access them.

Interface and browser		
Home page	Credit history	Money availability

Table 16 - Interface and browser variables

Generally, the applications provide functionalities able to be reached in one tap from the *home page*, facilitating and speeding up the access. Such functions regard the money availability, the credit history, the payments, the data about payment cards/bank accounts, the top up, the merchants, the promotions and similar and the loyalty cards.

Some application offers some ways to filter out and check only a few transactions, so that the *credit history* functionality has been monitored and classified by available filters such as hashtag, location, date, amount, merchant category and input/output transaction.

Payment solutions

Then, the mobile wallets have been analysed and described in terms of payment solutions, by classifying them according to the functions explained in the Literature chapter: Mobile Remote Payment, p2p payment and Mobile Proximity payment.

Payment solutions		
Mobile Remote Payment	P2P	Mobile Proximity Payment

Table 17 - Payment solutions variables

Mobile Remote Payment solution

The mobile remote payment solutions have been analysed to gather information about the different method used to pay through the smartphone. To be noted as only those applications involved in the payment process have been taken into consideration. In particular, the classification variables investigate the tool used by the service to finalize the payment (own solution or MasterPass service), the presence of offerings within the app, the number of steps needed to finalize the payment (considering the locked phone as the starting point) and the tool used to confirm the payment.

Mobile Remote Payment solution			
Tool	In-app offerings	Steps	Validation

Table 18 - Mobile Remote Payment solution variables

The *in-app offerings* are to be intended as the presence of a merchants list within the app which the user has to access to activate the commerce and payment processes in order to benefit of the promotion linked to the use of that kind of payment solution. In some case, there is only a checklist of the merchants, partners of the mobile payment service, with the links to their own eCommerce website.

At the end of the payment process, the mobile payment application could be involved in the *validation* step through different methods: the user has to scan the qrcode, or to enter the pin/password or the fingerprint.

p2p solution

As for mobile remote payment, the p2p service has been investigated to gather information about the payment tools, the functionalities provided, the number of steps needed to carried out the instant payment, and the potential use of tools to validate the payment (like pin and fingerprint) in addition to the identification method to access the app.

p2p solution			
Tool	Functionalities	Steps	Finalization

Table 19 - p2p solution variables

The instant payment services could be based on different *tools*: the own solution based on the payment tools virtualized within the mobile wallet, Bancomat Pay (JiffyPay) and PayPal services. In some case, the adoption of the Bancomat Pay service causes the payment of a fee per each transaction, so that the analysis keeps track of the amount of that. To be noted, as the p2p transaction usually takes place by selecting a mobile phone number or account name, therefore it does not need to disclose and share the bank account number.

The p2p solutions could provide some interesting *functionalities*, such as the option to involve no-users in the transaction, requiring them to register to the service by a link received via SMS, the ability to activate a p2p transaction through the voice commands, the possibility of splitting a bill with other people, so that they are required to send their own quota, and to collect and share the amount of money with other people.

Functionalities		
No-users	Voice command	Splitting/Collecting

Table 20 - Functionalities variables

Mobile Proximity Payment solution

Finally, the mobile proximity payment solutions have been analysed in terms of technology used to carry out the transaction, the steps needed to accomplish the payment and the existence of some method to carry out mobile proximity payment quickly.

Mobile Proximity Payment solution		
Technology	Steps	Quick mode

Table 21 - Mobile Proximity Payment solution variables

The mobile proximity payment services could be based on different *technology*. A first distinction has been based on category of solutions: own solutions, Bancomat Pay (previously JiffyPay) service and contactless solutions.

Technology		
Own	Bancomat Pay	Contactless

Table 22 - Technology variables

Then, the services have been investigated to gather information about the technology used. The services based on *own solutions* rely on geolocation and/or qrcode technologies.

Own solution	
Geolocation	qrcode

Table 23 - Own solution variables

While, those based on *contactless solutions* rely on NFC technology, so that it enables the services to carry out a payment through the own mobile wallet. In some case, the mobile wallet applications provide a mobile proximity service relying on other NFC-based services by linking the owned payment tool to the Big Tech solutions, such as GooglePay, ApplePay and SamsungPay, through functionalities within the apps.

Contactless solution			
NFC	Google Pay	Apple Pay	Samsung Pay

Table 24 - Contactless solution variables

Distribution and deployment

Distribution and deployment macro-category aims to provide an overview of the service acceptance from a merchants point of view, since the greater the opportunities to use the service, the greater its user adoption. Therefore, considering the applications providing mobile remote payment solutions, the analysis has been focused on which and how many retailers/ecommerce accepts their solutions among the payment instruments. Instead, considering the application providing mobile proximity payment solutions, the aim has been to assess which merchants accept their solutions, how many existing stores and active POS and their geographical location.

In addition, the deployment of the instant payment has been analysed by assessing the number of users associated to the service tools.

Distribution & Deployment		
Mobile Remote Payment	P2P	Mobile Proximity Payment

Table 25 - Distribution & Deployment

Value-Added Services

Within a mobile wallet, payment is the core functionality, but it is not the only function that can grant a large adoption and the success of a wallet. Indeed, there are several additional functionalities, the so called Value-Added Services, which have the role to act as incentives for users to adopt mobile wallet solutions and to enrich the customer experience during the usage of the application. Some of them are additional functionalities, while other are related to mobile payments. In particular, mobility services, like the possibility to pay for transport tickets by remote through the smartphone, can enhance the user experience and convincing people in adopting mobile payment solutions even in different context.

In the *Table 26* have been summarized the category of the additional services that a mobile wallet could provide.

VAS				
Bill payment/MAV	PagoPA/f24	Credit transfer	Car tax	Ticketing
e-coupons	Loyalty program	Nearby merchants	Top up	Financial services
Card management	Expenses threshold	Savings	Donation	Others

Table 26 - Value Added Services

Bill payment, as well as MAV, PagoPA and f24, concerns the functionalities allowing users to pay bill mainly related to utilities and Public Administration. They are mostly based on qr code technology, which has to be scanned from the paper document.

As mentioned before, *ticketing* functionalities allow users to buy, pay and validate tickets for services like public transport (urban and non-urban) and parking by remote via smartphone.

Some service could be more marketing and loyalty-centric, allowing users to register loyalty cards, follow and join *loyalty program*, and access *e-coupons*, such as cashback, coupon and loyalty discounts, deals and prizes.

Nearby merchants functionality displays a list of Points Of Sales, based on the geolocation, where using the mobile payment service. In some case the list is based both on geolocation and the proposal of deals.

A frequent functionality is the *top up* service, which enable users to enhance the credit money on the SIM cards and prepaid cards.

In approaching mobile banking, the payment service providers could offer also *financial services* enabling users to manage loans, investments and insurances through the mobile payment application, involving the mobile wallet and the related payment tool.

Then, some functionalities relevant to control the payment tools and the expenses have been analysed. Such services regard the management of the virtualized cards used as payment tools, for example to lock the card in case of theft, the set up of a threshold in order to limit the total or the specific category of expenses, and the management of savings by setting up a budget to be achieved, for example by regularly saving up or rounding up the expenses.

In addition, users are able to also donate to different charity institutions through a mobile wallet.

Among the above described value added services offered by different service providers, several uncommon functionalities have been found out, such as the mobile ordering service, the reservation service, ticket archive function, smartwatch association opportunity, cardless

withdrawal, disposable virtualized card service and smart shopping service through the use of qrcode technology to scan products.

The research of new services has been carried out following different methods. With the aim of listing the new services, secondary sources and technology websites have been the main source of knowledge, to be constantly monitored in order to keep the census updated with the latest news:

- Scientific and technology websites;
- Corporate websites;
- App store.

Once completed the list of the new services, a deeper investigation has been carried out in order to figure out and better understand the functioning, the features of the usage and the peculiarities of the services.

The underlying goal of the census was to provide an integrated picture of all services adopting a consistent perspective and having homogeneous output data. For this reason, an update of the old services has been performed, adapting the analysis to the new classification variables.

Such activity has been also effective to update the classification variables, since some service could introduce new relevant characteristics to be monitored both in the other services and in the future related research.

For carrying out the analysis, two ways have been followed:

- Some services have been examined by downloading the app from the app store, then tested in order to have a seamless and real experience;
- Some other services have been just approached through secondary sources.

To be noted as most of the services directly analysed have been those easier to be tested thanks to the geographical distribution. Indeed, in Milan, as one of the cities with higher number of stores able to adopt new payment solutions and availability of retail launching own payment solutions, it has been feasible to test the usage of the services.

The other services could not be tested with the available resources due to constraints on the use of the applications, such as the compatible devices, the bank account requirements and the fidelity card ownership, on the geographical location and on the need to top up the wallet, so that dealing with all the services offered by all the providers has been unfeasible. Therefore, they have been indirectly studied through news, technology and corporate website, description of the app

functions within the app store and even official tutorials, that is video showing how the app and its functionalities work.

The final step concerns the check of the consistence between the gathered information of each mobile wallet and the classification variables and their relevance according to the main objectives. This activity allowed to a simplification of data in order to be better examined during the empirical analysis.

As a result, 43 mobile wallets have been analysed and mapped.

2.2.3 Empirical analysis

Once explained how the census has been performed and structured, the following section is dedicated to the methodology adopted for running the empirical analysis.

The census has allowed to study the availability of mobile wallets at a national level. Therefore, next step consists in discovering the current trend about distribution, player involved, used technologies, etc., highlighting the best practices.

The empirical analysis has been structured according to five chapters.

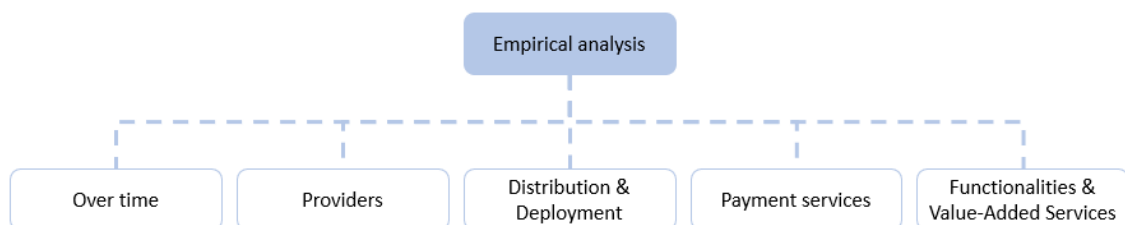


Figure 15 - Empirical analysis workflow

Over time chapter analyses the services of the previous census and compares them with the new one in order to discover the failed mobile wallets and the new proposals, summarizing their history and features. At the end of the updating process, a preview of the current proposals has been provided, classifying them according to the service providers. In the same way, the presence of new functionalities and value-added services have been analysed.

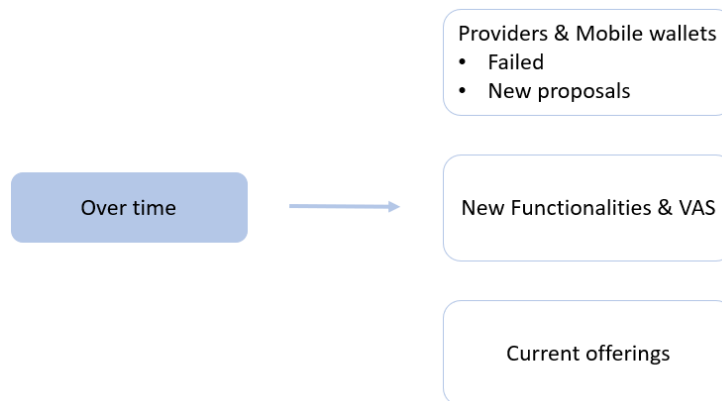


Figure 16 - Over time analysis workflow

Then, Providers chapter analyses the category of service providers as well as the number of proposals by each category. The analysis focuses also on the accessibility to the mobile wallets provided by getting some trend about the accepted payment cards and the Operation Systems supported by their mobile wallets.

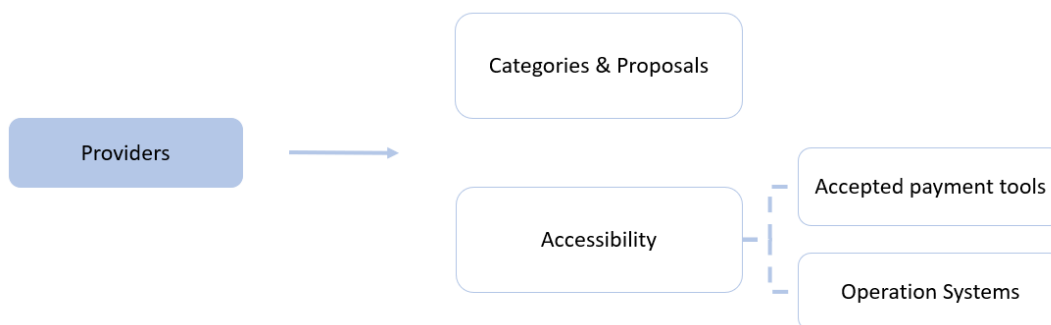


Figure 17 - Providers analysis workflow

Distribution and deployment chapter analyses the infrastructure accepting mobile payment systems in cases of online, offline and p2p solutions, by considering the enabling technology and the payment method, giving an overall perspective of the Italian scenario. For each scenario, the analysis focuses on the different categories of providers.

In particular, the analysis of mobile remote payment solutions considers the only apps actively

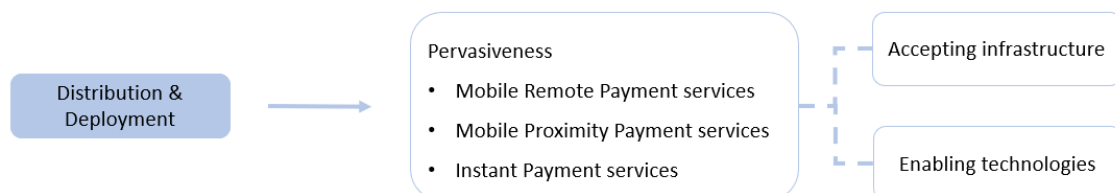


Figure 18 - Distribution & Deployment analysis workflow

involved in the processes of online commerce and payment and, since the opportunity to carry out mobile remote payment by mobile wallet is connected to the presence of the payment method

connected to the mobile wallet within online stores, the mobile wallet have been classified according to the relationship between them and the online stores. As a result, three main categories emerged and they have been described: mobile wallets to be used on owned online stores, partnership-based mobile wallets and MasterPass-enabled mobile wallets.

The availability and pervasiveness of mobile proximity payment services has been assessed by analysing the Points of sales and the opportunities to use mobile wallet to carry out proximity payment. Even in this case, technology and method which the mobile wallets are based on are key points to classify and simplify the analysis, identifying three categories: the mobile wallet to be used at the own stores, the partnership-based mobile wallet and NFC-enabled mobile wallet.

The instant payment systems analysis investigates the number of potential users to get insights about usage opportunities and pervasiveness. As in the previous case, the analysis is based on the methods used to carry out p2p transactions: own solutions, Bancomat Pay and PayPal systems.

Obviously, exceptions and rare cases have been pointed out by analysing applications one by one.

Then, payment services chapter analyses the availability of mobile wallets in terms of number of mobile payment solutions for online and offline purchases as well as for p2p transactions, and their usability in terms of number of steps required in order to carry out a payment process. Even in this case, the providers categories have been considered. Then, the analysis of the mobile wallets has been carried out one by one in order to estimate the average service level, considering the pervasiveness, the usability, the constraints and the other specific factors influencing the effectiveness of the services as relevant indicators of the service level. At the first step, the mobile wallets have been evaluated according to the main categories of payment solutions (in proximity, by remote and p2p), considering the related features to point out the worst and winning services. Then, an overview on all the payment services offered by mobile wallet has been proposed by evaluating the overall service level considering also the mobile wallet accessibility constraints.

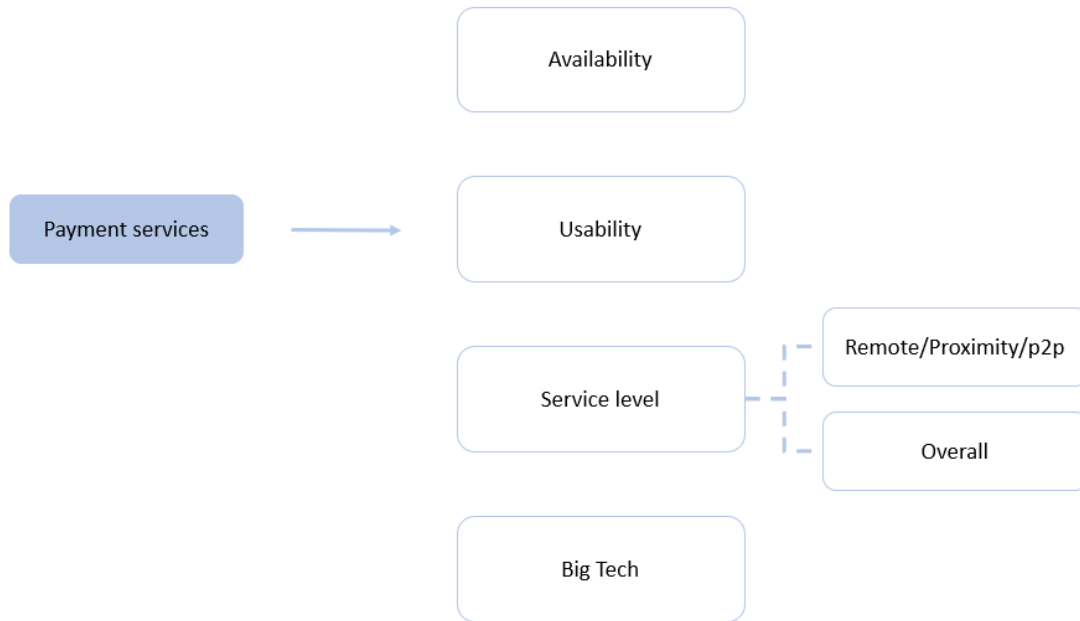


Figure 20 - Payment services analysis workflow

The Big Tech solutions have been analysed in detail, by describing them, their systems, technologies and partnerships, in order to estimate the adoption of their systems and to detect the impacts on mobile wallets offered by partners providers and on themselves.

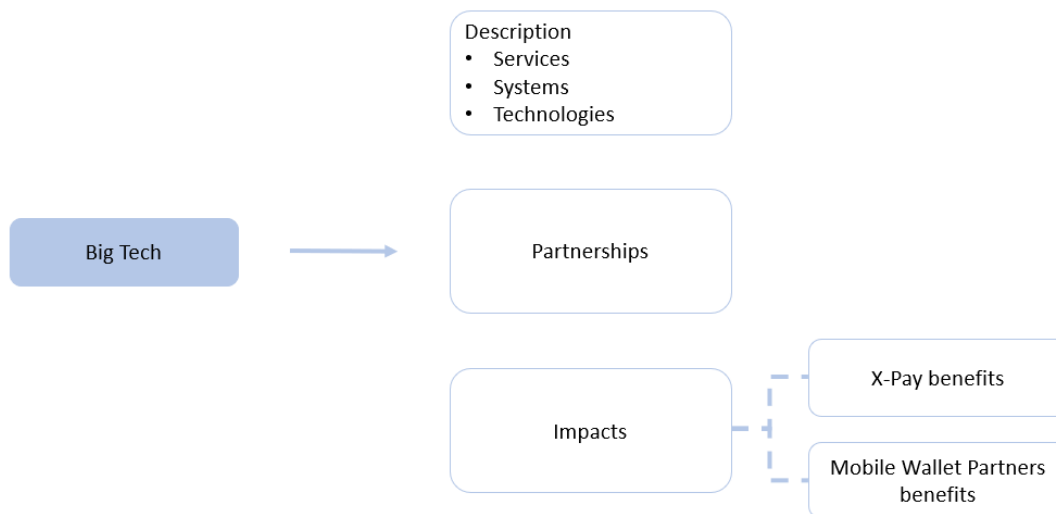


Figure 19 - Big Tech analysis workflow

Finally, the functionalities and Value-Added Services chapter analyses the information gathered during the census related to the VAS.

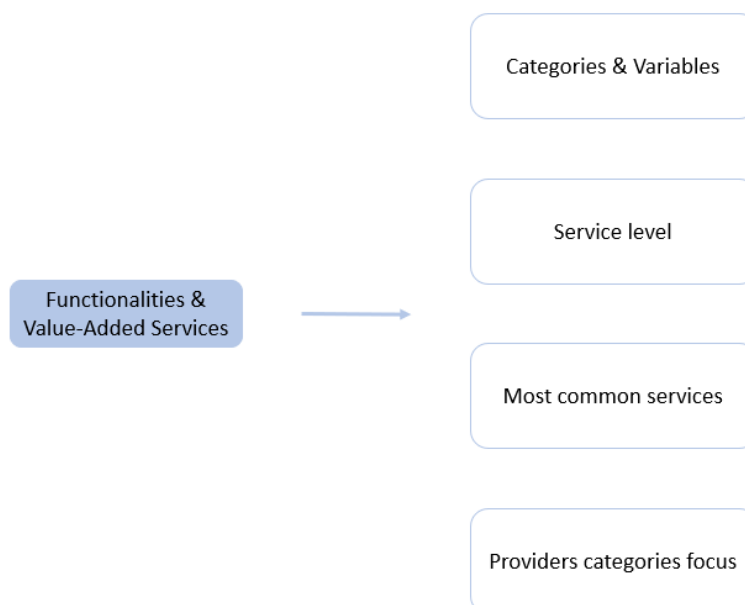


Figure 21 - Functionalities & VAS analysis workflow

Each mobile wallet has been analysed in detail in order to figure out how the providers act in offering additional functionalities and value-added services enriching their mobile wallets value proposition and to identify the best practices. In particular, the analysis takes into consideration different aspects according to the category of service provided with the aim to evaluate the overall level of the additional services in terms of availability and effectiveness and to figure out the most common functionalities. In addition, the analysis moves from one-by-one mobile wallet evaluation to an aggregate since the different providers categories could be focused and specialized on specific Value-Added Services categories.

In order to run the empirical analysis have been used different sources:

- Census;
- Data of official entities as European Central Bank and Banca d'Italia;
- Corporate websites of the services studied in the census;

The tool used for performing the empirical analysis has been Microsoft Excel as in census phase.

Chapter 3

Empirical analysis

In the Literature chapter, the main topics concerning the Mobile Payment and the Mobile Wallet have been presented in order to provide a complete picture of the mobile payment ecosystem and, thus, the reference environment of the thesis. Then, in the Methodology chapter, the steps for performing the census have been described, with the different categories of variables and services involved. The census analysis is strictly linked to the following analysis since the output has been used as input data for implementing the empirical analysis.

The innovation of payment systems is generally driven by the combination of three factors: arising of new technologies, infrastructure development and customers behaviours changes. Bearing in mind these concepts, it is clear that the technologies used by customers to pay for their purchases have already been developed and proven. The literature analysis revealed the high adoption rate of smartphone, its pervasiveness in terms of time spent to access Internet and performed activities, such as online purchases and banking. Therefore, it is reasonable considering everyone owning a smartphone being able to access and adopt payment solutions through mobile, since technology which mobile payment systems are based on have been incorporated in most of smartphones, such as the camera to scan the qrcode and the NFC function.

Besides the technologies appearing to be in favour to the adoption of mobile payment solution, Italian people are more and more familiar with mobile payment and commerce by remote and in proximity, as demonstrating by the research of Mobile Payment & Commerce Observatory (2019).

The aim of the empirical analysis is to investigate the offers of mobile wallet in Italy, their characteristics and their development and distribution, in terms of infrastructures accepting mobile payments systems, in order to understand the main trends, the value creation and the improvement of the customer experience with the final goal to enhance the user adoption.

3.1 Over time

As explained in the methodology chapter, the empirical analysis has been developed starting from a preliminary census, then updated with new functionalities and new services.

Failed Mobile Wallets

YouPay Mobile

SEQR

Vodafone Pay

Vuolly

Table 27 - Mobile wallets failed in 2018

Many services have been added to the list and some of the existing services, launched during the previous years, have been removed from the census database. In particular, YouPay Mobile, SEQR and Vodafone Pay have no longer been analysed in the census 2018, as the providers are not investing in these solutions to improve the mobile wallet functionalities and the customer experience of Italian people.

YouPay Mobile, an application launched in 2014 by the collaboration between Credito Bergamasco (Gruppo BPM) and ATB (Azienda Trasporti Bergamo), allows to register payment cards then used to pay for mobility services provided by the ATB, such as transport tickets (bus, tram and funicular), parking tickets, access to the ZTL (Limited Traffic Zone) and bike sharing service, and also for bill through a mobile device. According to the classification variables proposed in the census phase, these services are included in the VAS category. Therefore, since the application does not provide any other solution to pay in proximity and by remote, it can be considered as an aggregator mainly of transport functionalities instead of a mobile wallet.

Seqr application, launched in 2012, has been rebranded as Glase in 2016. The service provider also launched Seqr Go! mobile wallet with similar purpose. They allowed users to carry out p2p

transactions and mobile proximity payments based on qrcode and NFC technologies. However, at the end of 2018, they have been removed from the Italian marketplaces.

Finally, Vodafone Wallet allowed users to carry out mobile proximity payments through the smartphone thanks to the virtualized payment card provided by Vodafone and PayPal service, and to buy and pay for transport and parking tickets. However, also in this case, it has not been available in the app stores since June 2018, both in Italy and in all European countries.

In addition, Vuolly appeared to be a potential and valuable mobile wallet launched in September 2018 by InformAmuse s.r.l.. Although it was presented and launched as a ‘mobile wallet’, it only allows user to register, read and share data about their loyalty cards, payment cards, bank account and personal documents, with no opportunities to use them to carry out payments. Therefore, according to the definitions of mobile wallet, Vuolly has not been considered as part of the census of mobile wallet.

Nevertheless, a strong recent excitement emerged with an increasing number of mobile wallet solutions developed in the last few years, thanks to new players entering the Italian market and new providers proposing their own solutions by exploiting the existing technologies and infrastructure. Indeed, since 2018, twenty mobile wallets have been launched in Italy.

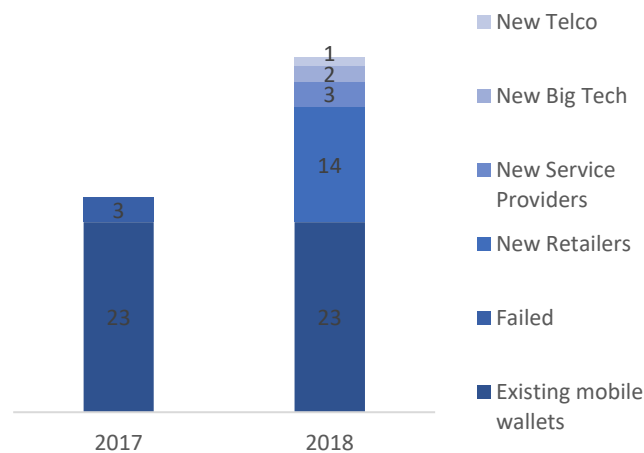


Figure 22 - Over time changes

Retailers are the main innovators, by providing 10 new applications including Enistation+, RecardQ8, Eataly Pay, Iper la grande I, myCarrefour, AuchanSpeedy, Rossopomodoro, Roadhouse, McWallet and MyAutogrill, as well as the vending machine-related providers, Coven and Modo by Sitael S.p.A., Breasy by EVOCA S.p.A., In Time Link by In Time Link S.r.l., which offer different functionalities analysed in the next sections.

In 2018, in Italy, Two Big Tech have presented and launched their own solutions already active in other countries.

Google presented and released Google Wallet in U.S. in 2011, as a p2p payment service. In 2015, it announced the integration with Android Pay, a separate application which allowed android users to pay for in-store purchase through the NFC technology. Finally, in 2018, Google announced that Google Wallet would have been merged into Android Pay. Indeed, during the same year, Android Pay and Google Wallet were unified into a single payment system then released in many additional countries, including Italy, rebranded as Google Pay.

Another novelty is represented by SamsungPay, launched for the first time in South Korea and U.S. in 2015.

In addition, a Telecommunication company and several Services Providers released 7 new solutions, such as YAP by Nexi payments S.p.A., Bill by Sisal S.p.A, Bancomt Pay by SIA S.p.A. and Tim personal by TelecomItalia.

The mobile wallets released only in 2018 correspond to the 46% of the current Italian offers, meaning that different actors are investing in mobile payment services and in particular in the mobile wallet, doubling the range of solutions compared to the previous years.

The *Table 28* shows the involved services resulted by the census, classified by mobile payment service provider categories.

Banks	Service Providers	Retailers	Telco	Big Tech
Hype	YAP	EniStation+	TIM Personal	Apple Pay
Mediolanum Wallet	NexiPay	RecardQ8		Samsung Pay
Intesa Sanpaolo Mobile	Satispay	Eataly Pay		Google Pay
Monhey	CirclePay	Iper La grande I		
BNL Pay	DropPay	myCarrefour		
WoW CheBanca!	PayPal	AuchanSpeedy		
Hello Pay	SisalPay	Rossopomodoro		
Chat&Cash	Bill	Roadhouse		
Tinaba	Bancomat Pay	McWallet		
UBI Banca	PostePay	MyAutogrill		

Revolut	Argenta
	Coven
	Modo
	Wally
	Breasy
	Coffee cApp
	Pay4Vend
	In Time Link

Table 28 - Mobile wallets

As the number of solutions increases, also the range of functionalities differs and grows compared to the previous solutions, meaning that providers are investing in mobile wallet to improve the customer experience.

New functionalities

Integration of different methods in the proximity payment services
Splitting/Collecting money through p2p transactions
Financial Services
Money management services (expenses control and saving collection)
Donations

Table 29 - New functionalities developed in 2018

By exploring the variables, it is to be noted as the main innovation regards the integration of Bancomat Pay, Google Pay, Samsung Pay and Apple Pay with others mobile payment services, as methods to pay in proximity (p2b). This is in line with the explosive growth in the adoption of mobile proximity payments solutions, as explained in the literature analysis, enabled by the enhancement and improvement of the related services.

In addition, new functionalities associated to the p2p transaction could increase the customer experience, like the possibility of splitting a bill with other people, so that they are required to send their own quota, and to collect and share the amount of money with other people.

With the growing pervasiveness of smartphone and the users approaching mobile banking, mobile wallet providers enriched their offerings within the apps by developing and providing financial services such as the possibility to request loans, monitor investments and subscribe insurance, managing them through the smartphone. More attention has been placed also on the management

of money and virtualized payment cards, allowing users to control expenses and set up monthly thresholds, eventually for each expenditure category, and to collect saving, for example by rounding up each expense and converging the difference in the saving pocket or by setting up daily/weekly/monthly amount of money to be saved up.

As related to the mobile remote payments, a new Value-Added Service has been introduced among mobile wallet, allowing users to support Onlus and no-profit organizations by making donations to their favourite charity and organization.

3.2 Providers

As stated several times in the previous sections, many actors are putting their effort in providing the best and the most innovative Mobile Payment solutions. Such actors are involved in the mobile payment transaction process and they can be classified according to the category of stakeholders identified in the Literature review chapter. Indeed, retailers, banks (FSP), service providers (PSP), Device/OS manufacturers and Telecommunication companies (MNO) are all providers of mobile payment solutions.

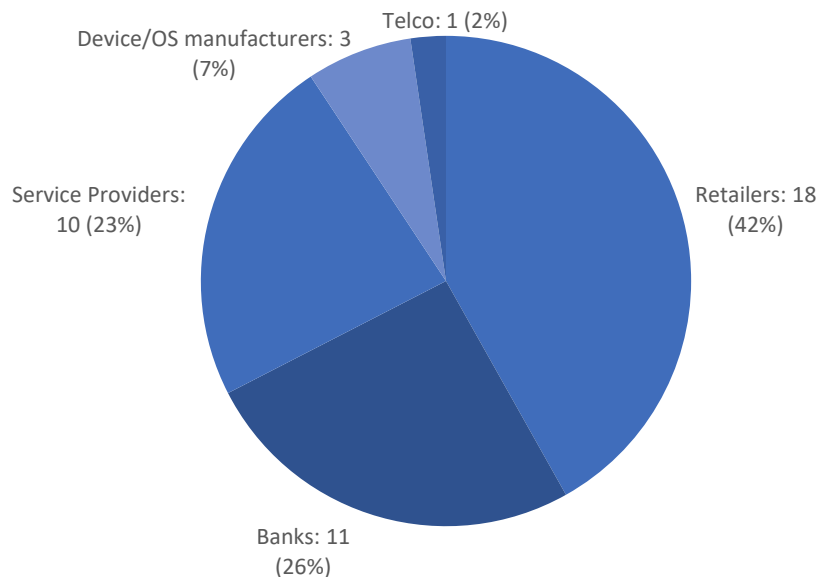


Figure 23 – Mobile Wallet Providers

It is interesting to analyse which actors have a prevalent role in offering mobile wallet applications.

As a result, Retailers appear to be the main players, providing the 42% of the application active on the Italian market, followed by Banks and Service Providers, providing together almost the 50% of the mobile wallet solutions.

To be noted as Retailers category also includes those companies developing and providing mobile payment solutions to be used only at the vending machines where the system has been integrated.

Although Retailers overcome the other providers categories in terms of number of available wallets in the market, a deeper analysis could bring out aspects related to the requirements which could affect the actual accessibility and customer adoption. Indeed, from a rough evaluation of the applications tested and investigated, it merges that some providers restrict the usage of their applications with different constraints.

3.2.1 Payment tools

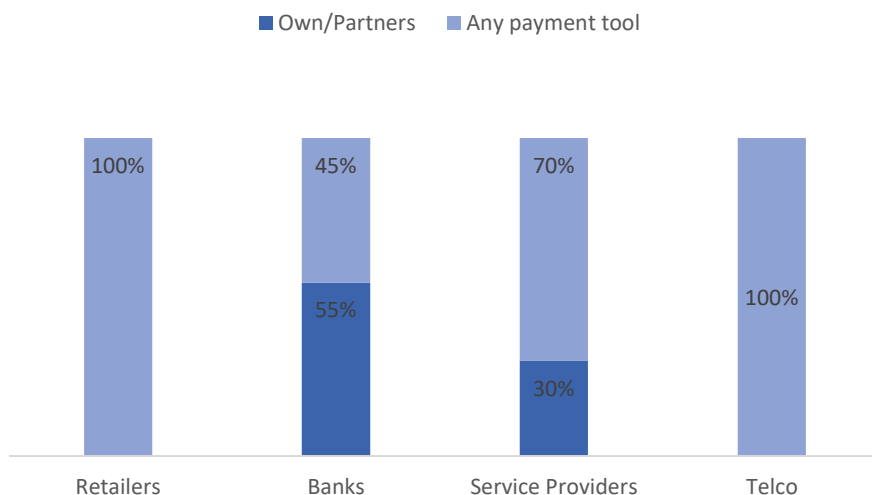


Figure 24 - Required payment tools

By exploring the payment tools used by mobile wallet to carry out the payments, some constraints emerged.

Some banks allow the virtualization of only own payment cards, therefore limiting the registration to their already existing clients. The analysis shows as 6 out 11 (55%) banks pursue this strategy, sometimes facilitating the authentication and access to the mobile wallet services through the home banking (and mobile banking apps) and tokenization systems/personal codes of users already enrolled in the bank services. Instead, 5 out of 11 (45%) services allow users to register and virtualize any payment card belonging to the most common circuits (Visa, Mastercard, etc.),

sometimes enlarging the range to the uncommon ones like Amex, JCB and Aura. However, in 2 cases (Wow Chebanca! and Chat&Cash), the mobile payment functionalities are made available to all the new users while an easier and quicker registration process is available for the clients of the bank, feasible thanks to home banking and/or personal code/tokenization recognized by the bank system.

By analysing Service Providers, it emerges that three of them (PostePay, NexiPay and Bancomat Pay) restrict the access to the applications to, respectively, the PostePay owners, the Nexi card owners and to the Banca di Asti clients.

In fact, similar to the bank constraints, the PostePay owners are the only users of the mobile wallet offered by the Postal Service.

The reason could reside in the central role of Nexi Payments S.p.A. (formerly CartaSi, till 2017) in the cards business by collaborating with a variety of banks and companies (like Trenitalia) through the provision of the payments cards, leading the company to invest in innovative mobile payment systems to provide additional services and enhance the experience of users of Nexi Payment cards. Nexi payments S.p.A. established partnerships with about 150 banking institutions, therefore the limitation could be not so strict as it sounds.

While, Bancomat Pay is based on the Jiffy technology, which require the Jiffy account to be linked to a bank account. Originally developed as an instant payment service (p2p), it established partnerships with several banks enabling them to include the service in their mobile wallet applications and home banking (and mobile banking application). Actually, the only users of the Bancomat Pay application are the clients of only one of partners banks: Banca di Asti.

This means that the remaining 7 (70%) applications offered by Service Providers are not limited by specific requirements, except having a specific minimum age and Italian bank account and phone number.

At the end, Retailers are not associated to specific banks and payment tools, therefore they all allow users to virtualize any payment card to top up the e-wallet or to directly charge the payment. A comparable analysis can be applied to TelecomItalia, the only Telecommunication company offering a mobile wallet solution, even though the payment card created and released at the end of the registration phase has been developed with Hype. In this case, the only requirement is to have a TIM SIM card.

3.2.2 Operating systems

It might be interesting to also analyse which operating system has the higher advantage against the others, being suitable for most of applications, so that the potential customers are excluded from the mobile wallet usage.

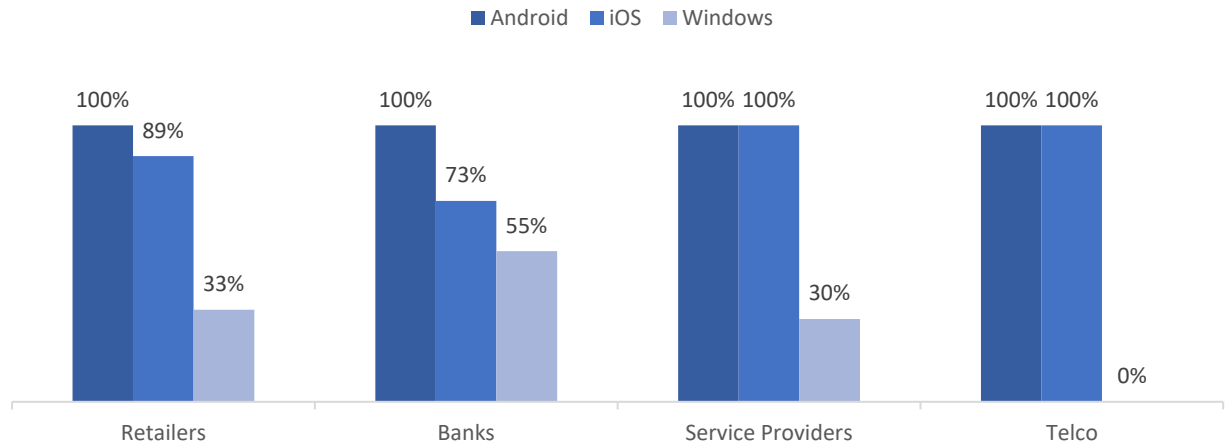


Figure 25 - Operating systems coverage

The main evidence is that Android smartphones are compatible with all the application, except Apple Pay, provided by a Big Tech which will be taken into consideration in the next section. Therefore, Android users can choose which solution better fits their needs among all the mobile wallet services.

By contrast, Windows smartphones are allowed in supporting a limited number of applications. In particular, the only Telco developed the app just for Android and iOS systems and Service Providers have been developing only 3 out of 10 (30%) mobile wallets downloadable by the Windows Phone Store. While, Windows users are better served by Banks and Retailer with 6 available mobile wallets in both cases corresponding to, respectively, slightly more than half of the whole offerings (11) and the 33% of 18 wallet.

To be noted as Banks are the only mobile wallets providers tending to underinvest in development phase to make available their applications within both Apple Store and Windows Phone Store, limiting their potential users' choice in selecting the right mobile wallet. This might be due to several partnerships established between Banks and Big Tech, as will be discussed later.

3.3 Distribution and deployment

Since a widespread coverage of the territory encourages potential customers in adopting a mobile payment solution to carry out payments and at the same time the higher the acquired customers and the customers adoption rates the higher the willingness to develop and improve the services, the ability of different providers in offering efficient payment services in terms of opportunities to use them has been investigated.

The aim is to assess the infrastructure accepting mobile payment systems (focused on mobile wallets) as well as to obtain an overview on additional barriers to adoption of mobile wallets, beside the accessibility constraints previously analysed, and therefore on the advantages brought by the solutions based on specific technologies or methods. The distribution assessment has been carried out according to the payment services usage opportunities, that is by remote, in proximity and for instant payments (p2p).

3.3.1 Mobile Remote Payment systems pervasiveness

Firstly, the analysis of the mobile remote payment offerings focuses on which and how many online stores works with mobile wallets.

To be noted as the analysis takes into consideration the only apps actively involved in the processes of online commerce and payment, excluding those mobile wallets, associated to payment cards/bank accounts to benefit from other payment services, acting as only information storage of payment tools (PAN, cvv, etc.), such as Mediolanum Wallet, YAP and TIM Personal.

In some cases the app is needed in order to start the process by selecting the online merchants from within the app, for example to benefit of some promotion, like Hype and Intesa SanPaolo Mobile, therefore they are equipped with additional services by remote (the e-coupons) but they are not involved in the payment and validation process.

In some other cases, apps like Monhey, Satispay and PostePay are required to validate the payment through in-app push notification at the end of the purchasing process activated by any device. In addition, in few cases, online purchasing process involves the app from the beginning to the payment phase, such as myCarrefour, Rossopomodoro and Roadhouse.

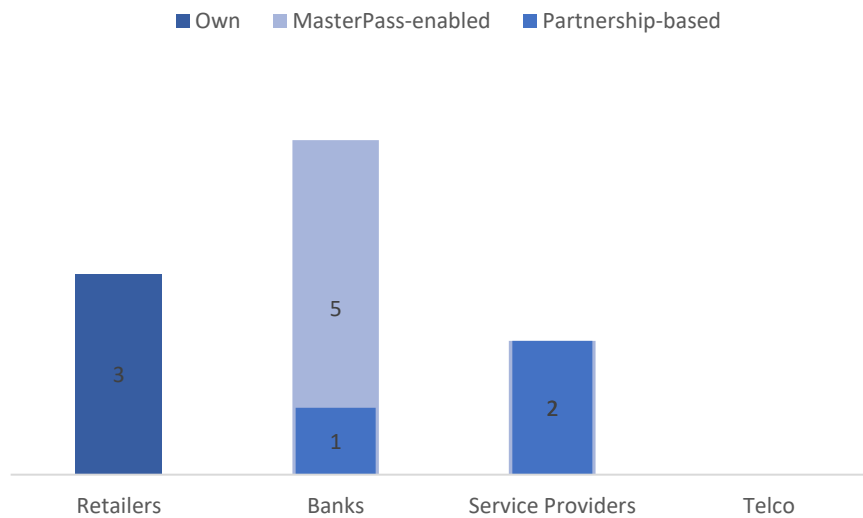


Figure 26 - Mobile Remote Payments infrastructure

The analysis investigated which mobile wallets allow users to carry out mobile remote payment and when they can be involved, in terms of opportunities, limiting the customer choice to established online stores. Indeed, the opportunity to carry out mobile remote payment by mobile wallet is connected to the presence of the payment method/tool of the mobile wallet within online stores.

In order to simplify the analysis, the mobile wallet have been classified according to the relationship between them and the online stores. As a result, three main categories emerged: Own mobile wallets which are probably an additional service to the main business of the provider, Partnership-based mobile wallets which are made available on partners platforms as a payment method thanks to the collaborations to enhance the customer experience, and MasterPass-enabled mobile wallets which can be involved in the payment process through online store accepting MasterPass as a payment method.

The analysis figures out that Retailers are the only providers developing their own mobile wallet app to allow users to carry out online shopping through the virtualized payment tool, with the aim of improving the own customers experience by offering seamless solutions through in-app commerce functionality. In particular, MyCarrefour, Rossopomodoro and Roadhouse are the merchants allowing customers to pay for online shopping within the own online store and for home delivery services through the app, from the products selection to the payment validation, therefore limiting the choice of the merchant and their usage to few occasions.

Different scenarios are provided by Banks and Service Providers.

Service Providers tend to establish partnerships with selected online stores. As shown in *Figure 30*, 2 out of 3 applications are involved in the online/mobile shopping within partners online stores, and a comparable service is offered by a Bank (Banca Profilo).

In more detail, as figured out by a rough review of the detailed census, the 3 mobile remote payment services are suggested as payment methods within the eCommerce website/application of partners companies, in order to be able to validate the payments through the app. They appear with the typical ‘Pay with...’ function and it is applied to the solutions listed in *Table 30*. Indeed, since such apps are not based on existing infrastructure and payment systems, they have to create their own network. In the same way, the three mobile wallets provided by the Big Tech have to be offered as alternative solutions to be integrated into existing online stores.

Banks	Service Providers
Tinaba	Satispay
	DropPay

Table 30 - Mobile remote payments: partnership-based mobile wallets

However, once assessed that users of such apps can interact and carry out mobile remote payments within selected online stores, it is interesting to assess the availability and pervasiveness of such payment solutions, in order to evaluate their coverage and the opportunities to use them. As a result of a rough analysis, different scenarios emerged: while Satispay and DropPay offer hundreds of opportunities thanks to hundreds of partnerships, Tinaba has been integrated only on ePrice website, an eCommerce platform, and Samsung Pay has been integrated in only two online platforms: Worldpay and Stripe. This could be due to the lower investments in marketing campaigns and in the service development.

Meanwhile, Banks tend to integrate their mobile wallet with MasterPass, enlarging the use opportunities of their mobile wallets as payment systems on online stores. MasterPass is a digital wallet that allows users to check out faster, by simply store payment and shipping information in a MasterPass account, to ensure a simple, fast and secure experience. Thanks to this service, the online payments are activated by entering the phone number or the email address, connected to the MasterPass account, and then validated through the mobile wallet app.

From the analysis, it emerged that 5 out of 6 banks and two Service Provider as well (listed in *Table 31*), offer the opportunity to virtualize the payment tool of the mobile wallets into the MasterPass account, enabling users to pay in more than 90% of the total amount of online stores, in turn integrated and offering MasterPass service as a payment method.

Banks	Service Providers
Intesa SanPaolo mobile	NexiPay
Monhey	PostePay
BNL Pay	
WoW CheBanca!	
Hello Pay	

Table 31 - Mobile remote payments: MasterPass-enabled mobile wallets

Telco are not providing mobile remote payment solutions, therefore TIM Personal, the only Telco app, does not occur in the analysis.

3.3.2 Mobile Proximity Payment systems pervasiveness

With the aim of catching information about the availability and pervasiveness of mobile payment services on the market, also mobile wallets offering mobile proximity payment solutions have been investigated.

In this case, the infrastructure that enables the proximity payment is composed by physical Point of Sales accepting different mobile payment methods. At this step, the current number of stores and point of sales has been estimated according to the technology and method which the mobile wallets are based on, and they represent the opportunities to use mobile wallet to carry out proximity payment.

To be noted as this aspect is related to the technologies used to enable payment through smartphone.

As in the analysis of the mobile remote payment services, the usage opportunities and thus the Point of Sales have been classified according to the relationship between them and the mobile wallet. As a result, three categories emerged: Own stores, Partners stores and NFC-enabled stores.

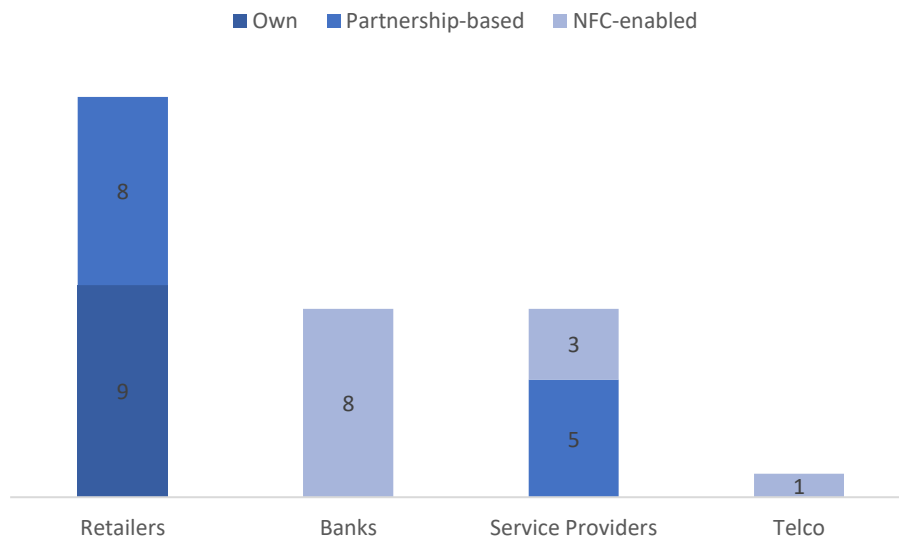


Figure 27 - Mobile proximity payment infrastructure

The results are very similar to the mobile remote payment analysis.

Retailers (shown in Table 32) have been developing own solutions as payment methods to be used at their point of sales, enhancing their customer experience, thanks also to any additional functionalities. In order to carry out the payment, the solution rely on alternatively two technologies: geolocation to be activated on the device on hand and qrcode technology, which has to be scan with the user device at the point of sale or could be display on the customer’s device thus has to be shown at the checkout.

Retailers

EniStation+	AuchanSpeedy	McWallet	Argenta	Wally	Pay4Vend
Eataly Pay	Rossopomodoro	MyAutogrill	Coven	Breasy	In Time Link
Iper	Roadhouse	RecardQ8	Modo	Coffee cApp	

Table 32 - Mobile proximity payment: Retailers

In addition, 8 providers offer solutions to be applied at only vending machines, which rely on geolocation and qrcode and only in few cases also on Bluetooth and NFC technologies. Even though the coverage of each service has not been figured out, an overview on the payment methods at vending machine has been assessed to also estimated the potential expansion. In June 2018, the 84% of the vending machines installed (810,000) allows to pay by cashless methods and the 2% by apps. Therefore, these data are taken into consideration as reference potential

opportunities to use the mobile wallet as payment method, since they are all systems which could be integrated at the existing vending machines.

By contrast, the other mobile wallet providers have to create their network by establishing partnerships with some merchant and by developing solutions based on technologies compatible with existing infrastructure.

In particular, in order to offer their proximity payment services, 5 out of 8 Service Providers (listed in *Table 33*) have to collaborate and integrate their solutions within the purchasing and payment process of other companies, whether they are physical stores, mobile Point of Sales or vending machines.

Service Providers	
Satispay	Bill
DropPay	Bancomat Pay
SisalPay	

Table 33 - Mobile proximity payments: Partnership-based Service Providers

Since each solution infrastructure depends on its own partnerships, a deeper analysis has investigated the partners of such Service Providers in order to assess the coverage and pervasiveness of each solution, founding out different scenarios.

To be noted as the reasons why there are some limits in spreading mobile wallet as a payment system could be related to the technology adopted, the pursued business strategies and, especially in case of Partner-based infrastructure, the ability to involve more and more both final users and merchants in adopting the payment system solution to enlarge its network. In particular, three services are quickly growing.

Satispay, launched in 2013, led the mobile wallet to be present as proximity payment solution in more than 1.8 million Points of Sale in March 2019, by involving the major chains, like Esselunga, Coop and Yamamay, other small merchants and 1,400 taxi services in Milan.

Different scenario is provided by Bancomat Pay, launched in 2016 as instant payment solution named JiffyPay, and then enlarged to the offline payment business in 2018 by testing the market through Carrefour stores, thanks to the agreement with Intesa SanPaolo bank, and Iper stores thanks to UBI Banca. Nowadays, it is available as a proximity payment method at over 2,000 physical stores, mainly in large-scale retailers. The collaboration between SIA and Bancomat

counts on the Bancomat brand strength and on its widespread distribution, with about 37 million PagoBancomat cardholders and over 440 banks using its services, in order to increase the current market penetration, in terms of both users (actually 5 million) and Points of Sales.

Finally, SisalPay, launched in 2017, is offering its solution in more than 40,000 stores through agreements with more than 100 partners.

Beside the services analysed so far, all the Banks providing mobile proximity solutions and few other providers offer NFC-enabled mobile wallets (listed in *Table 34*). Currently, 11 applications allow users to pay in proximity thanks to the Near Field Communication technology, whenever a point of sales is equipped with a contactless POS.

Banks		Service Providers	Telco
Hype	BNL Pay	YAP	TIM Personal
Mediolanum Wallet	HelloPay	NexiPay	
Intesa SanPaolo mobile	Tinaba	PostePay	
Monhey	UBI Banca		

Table 34 - Mobile proximity payment - NFC-enabled mobile wallets

In order to assess such mobile wallet accepting infrastructure, the number of POS installed at physical stores and points of sales (more than 2.5 million) and in particular the number of NFC-enabled POS (80% of the installed POS) has been found out.

It is interesting to note as some companies offer proximity payment solutions thanks to the collaboration with the Big Tech (Samsung, Apple and Google), allowing the virtualization of the payment card associated to the mobile wallet as a payment tool within the X-Pay wallets. The main reason is to enlarge the accepting infrastructure of those mobile proximity payment providers which would otherwise be limited in offering the service at only partners' merchants through different technologies, like qrcode, geolocation and Bancomat Pay. Therefore, among the NFC-enabled mobile wallets, there are some X-Pay-enabled mobile wallets, listed in *Table 35*, which rely on the Big Tech in order to offer a widespread payment method based on NFC technology, in addition to the own proximity payment solutions provided as alternative payment method at the only partners stores.

Banks	Service Provider	Telco
Hype	PostePay	TIM Personal
Tinaba		
UBI Banca		

Table 35 - Mobile proximity payment: NFC-enabled mobile wallet by X-Pay solutions

The analysis also figured out which partners are equipped with such solutions among the proximity payment methods, thus lowering the opportunities to use the mobile wallet for those customers unable to integrate them with the Big Tech solutions. Hype and TIM Personal (which provides a virtualized Hype card for free) have been integrated into 80,000 Ingenico POS with the ‘Pay with hype’ function, while few partnership have been established in the other cases, such as that of PostePay with 400 IP gas stations, of Tinaba with 7,000 taxi in 10 different cities, IP gas stations and some small merchants, and of UBI Banca with SIA to provide JiffyPay service at Iper stores.

Therefore, in such cases, the Big Tech mobile wallets could represent constraints to the accepting infrastructure and the assessment of the systems pervasiveness, whether users do not activate the additional payment systems, thus affecting the usage opportunities and therefore the adoption rate of such solutions.

3.3.3 p2p payment systems pervasiveness

With the aim to complete the pervasiveness analysis, additional investigation concerns the instant payments availability, since they are part of the payment systems offered by mobile wallet.

The analysis provides insights about the systems used to carry out the transactions and thus the number of potential users which people can interact with in order to benefit of the p2p service. Obviously, the higher the number of users enrolled in the p2p payment system the higher could be the mobile wallet adoption rate, thus influencing the catchment area of the mobile wallet and the usage opportunities.

In order to estimate the usage opportunity of each solution, the mobile wallets have been classified according to the methods offered by the applications to carry out instant payment: the own solutions, Bancomat Pay and PayPal.

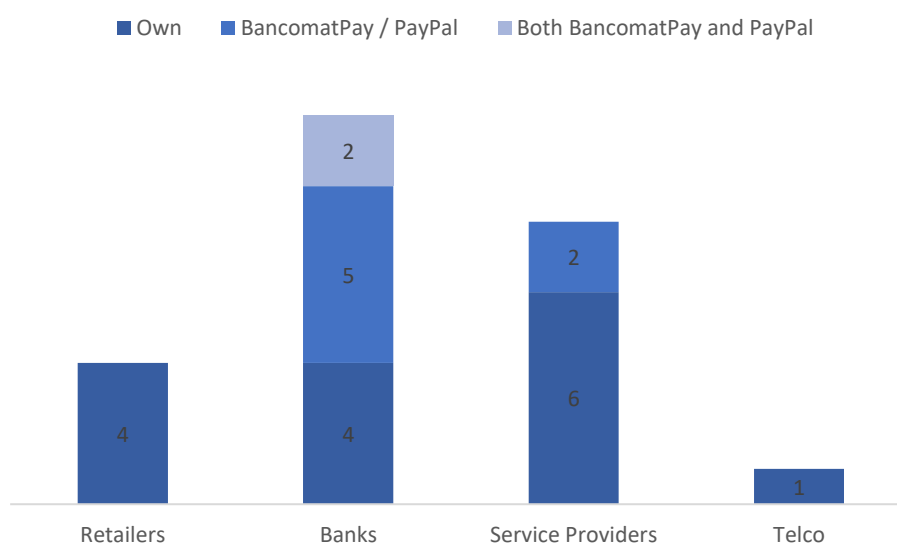


Figure 28 - p2p payment solutions

The analysis figured out how solutions based on own methods and systems are the most used by the most of providers (15 mobile wallets, listed in *Table 36*). Each single service allows less than 1 million users to carry out p2p transactions, limiting the use of each service among users of the same service. For example, Tinaba assessed about 50,000 active users in October 2018.

Retailers	Banks	Service Providers		Telco
Eataly Pay	Hype	YAP	DropPay	TIM Personal
Argenta	Chat&Cash	Satsipay	Bill	
Coven	Tinaba	CirclePay	PostePay	
Modo	Revolut			

Table 36 - p2p payment: own solutions

A special case is the PostePay mobile wallet which has a larger customer base, offering its services to more than 6 million users. Its widespread usage is comparable, and even better, to those of mobile wallets providing p2p service through other systems, like Bancomat Pay and PayPal.

In spite of mobile wallets trouble in spreading the services, to be noted as Satsipay is moving to offer a number of p2p usage opportunities above average, since it is exponentially enlarging the catchment area, from 31,000 users in February 2018 to 34,000 users in May 2018, with a mean of 130 new customers per day, to 550,000 users in March 2019, thanks to its marketing campaign and the development and improvement of new functionalities.

Beside the p2p systems provided by different mobile wallet, Bancomat Pay system is offered as a p2p solution to be integrated within mobile wallet developed by Banks. Indeed, most of Banks prefer to rely on Bancomat Pay system by establishing partnerships to be able to offer the service on own mobile wallet platform. While, as mentioned above, Bancomat Pay application allows users to connect bank account signed with only one partner bank (Banca di Asti). In particular, Bancomat Pay established partnerships with several banks: Banca PoPolare di Sondrio, Banca PoPolare di Spoleto, Volksbank, Banco Desio, BiverBanca, BNL Gruppo BNP Paribas, CheBanca!, Crédit Agricole, Gruppo Banca Carige, Hello bank!, Inbank, Intesa SanPaolo, Banca Mediolanum, Monte dei Paschi di Siena, Raiffeisen, Sparkasse, UBI Banca, Unicredit and Wibida. Such partnerships allow users to send and receive money through instant payments with other more than 5 million people already registered to the service.

Therefore, the mobile wallets of Banks listed in *Table 37*, and Bancomat Pay app as well, ensure about 5 million users to be able to carry out instant payments among them through different activation apps. The new collaboration between SIA (provider of Jiffy system) and Bancomat is enlarging the opportunities to use the service to 37 million new users, being Bancomat cardholders.

In addition, a comparable service is provided by PayPal, which offer p2p payment service to a number of active users assessed around 5.5 million in 2015.

Banks		Service Providers
Intesa SanPaolo Mobile	HelloPay	Bancomat Pay
Monhey	UBI Banca	PayPal
BNL Pay		

Table 37 - p2p payment: Bancomat Pay / PayPal

Therefore, they all have a catchment area of more than 5 million users, significantly higher than solutions based on own systems.

Finally, 2 Banks (*Table 38*) offer the p2p service through both BancomaPay and PayPal systems, enlarging the usage opportunities to more than 10 million.

Banks

Mediolanum Wallet

WoW CheBanca!

Table 38 - p2p payment: both Bancomat Pay and PayPal

3.4 Payment services

So far, the analysis focused on the investigation of mobile wallets with the aim to get insights about possible barriers to the customer adoption and possible solutions to efficiently provide payment systems in order to obtain a higher pervasiveness. They are typically connected with the technologies and systems used, as shown by the classification and analysis carry out in the previous chapter.

However, ideally, a mobile wallet should include the greatest possible number of payment solutions and those functionalities fulfilled by physical wallet with the aim to offer an effective and suitable service and a complete and enhanced customer experience as well.

3.4.1 Payment Services availability

Since the offering and involvement of the apps in remote payments, proximity payments and p2p transactions as well, has been considered as a necessary condition to be included in the mobile wallet census, it could be interesting to analyse which mobile wallet offers one or more payment services and their service level. To be noted as such aspect is not related to technological factors, since each single service will be evaluated irrespective of the way and system used to implement it.

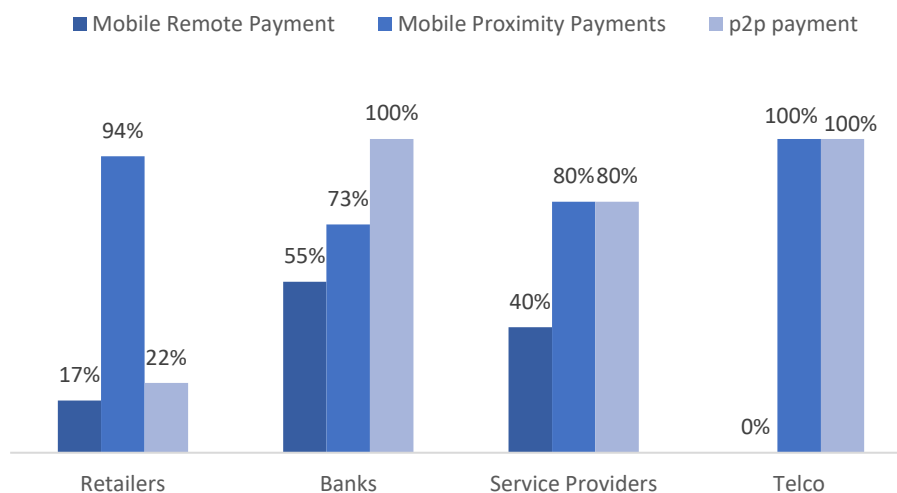


Figure 29 - Payment services availability

From the analysis, it emerged that Retailers are significantly focused on mobile proximity service: the 94% of the applications have been developed to be adopted in store and at the vending machine to carry out offline purchases, while just the 17% offers solutions to make and pay for online purchase. In just one case, the p2p payment service has been provided as an additional service within a Retailer app and in three cases within vending machines-related apps (Argenta, Coven and Modo). Indeed, Eataly Pay allow customers to pay for restaurant bill even when they are still seated at the table and to split the bill with friends by sharing and collecting the amount of money to be paid.

Instead, Service Providers are focused on both mobile proximity payment and p2p services: 80% of the applications (excluding CirclePay and PayPal) offer offline payment solutions through different technologies which affect the pervasiveness of the service, as analysed in the previous chapter. Likewise, the 80% of the mobile wallets (excluding NexiPay and SisalPay) offer p2p transaction solutions as additional payment service, except for Circle Pay which provide only such service. To be noted as Jiffy was also launched merely as a p2p payment service but then enriched with other services resulting in a multi-payment solutions application, named Bancomat Pay. Finally, remote payment services are offered by only 4 mobile wallets.

From the analysis of Banks, it emerges how there are no payment services rarely provided: in particular all the mobile wallets offer p2p solutions to make instant transactions, the 73% offer proximity payment solutions and the 55% offer remote payment solutions. This means that about the 40% of the solutions provided by Banks allow to carry out payment both online and offline. They are the most favourable in terms of amount of payment services provided.

Indeed, as a result of this analysis, few other mobile wallets (listed in *Table 39*) allow users to benefit from proximity, remote and p2p payment services through only one application.

Banks	Service Providers
Intesa SanPaolo Mobile	Satispay
Monhey	DropPay
BNL Pay	PostePay
HelloPay	
Tinaba	

Table 39 - Mobile wallets: remote + proximity + p2p services

How detected by the previous analysis, mobile wallets incorporate different payment services, however it is interesting to evaluate the overall availability of each payment service offered by any provider, summarized in *Table 40*.

Mobile remote payment services	Mobile proximity payment services	p2p payment services
37%	86%	56%

Table 40 - Payment services availability

The analysis confirms the pervasiveness of mainly Service Providers and Retailers in offering mobile proximity payment solutions also in terms of absolute number of available solutions: the 86% of the mobile wallets provide services to pay offline. Similarly, the high commitment of Banks in providing p2p solutions allow users to have a wider choice: the 56% of mobile wallet provide services to make instant payments. Finally, only the 37% of mobile wallet is involved in remote payments, meaning that providers are not investing in such function as in the others.

To be noted as, within the analysis, the mobile wallet applications developed by the Big Tech (GooglePay, SamsungPay and ApplePay) have been taken into consideration to have a full picture of the service provided. As it will be described in a dedicated chapter, they offer proximity and remote payment solutions, increasing the number of available solutions.

3.4.2 Payment services usability

Beside the amount of services, an estimation of their usability in terms of steps needed to carry out a payment could provide an evaluation of the quality, efficiency and service level of mobile wallets, as well as potential drivers.

The analysis has been carried out according to the three typologies of service, that is mobile remote payment, mobile proximity payment and p2p payment service, as usual.

	Mobile remote payment services	Mobile proximity payment services	p2p payment services
Average (steps)	5.1	5.6	6.9
>average (apps)	5	13	18
<average (apps)	11	24	6

Table 41 - Number of steps

The evaluation is based on some conditions, which have to be clarified in order to figure out the proper conclusions.

Mobile Remote Payments

In order to assess the number of steps required to carry out an online payment through the mobile wallet, a locked smartphone is the starting condition. In this way, the analysis takes into consideration the additional taps and steps needed to access the app in case the user is making online shopping through a pc or device different from that used to carry out the payment.

In addition, the count of the steps starts with the selection of payment method at the end of the purchasing process. As already mentioned, typical methods are the 'Pay with...' function, MasterPass system and the payment tool already virtualized within the app in case of in-app commerce, such as the Retailers mobile wallets (Rossopomodo, Roadhouse and myCarrefour). The payment process may go through different way: in some case, after having chosen the payment method, the app has to be accessed in order to scan the qrcode displayed on the payment summary page, while in other case a pop-up notification appears to enable the users to confirm and validate the payment.

Obviously, all these features and the design of the applications as well affect the number of steps required to carry out the payment and then usability of the mobile wallets. As a result, the most of apps (70%) require less than 6 steps in order to carry out an online payment, meaning that the few companies offering this service have been investing to improve it and provide a high-quality service.

Mobile Proximity Payments

Meanwhile, the usability evaluation of mobile proximity payment services reported in *Table 42* is based on two main conditions.

Firstly, the process is considered starting from the unlocking of smartphone, as in the remote payment service evaluation.

Secondly, the number of steps is referred to the use of the applications and their internal functions. Indeed, beside the use of the mobile wallet applications, providers could allow users to carry out offline payments in three alternative ways. The first one, by integrating the mobile wallet at hand, and thus its payment tool, with the Big Tech mobile wallets through dedicated functions within the app, in order to benefit from their services. The second one, by taking advantage of the widget bundled with the downloaded application to make quicker payment without the need to access the app: they could display the main functions, such as ‘Pay in store’ and ‘Switch the payment card’. The third one, through the ‘Tap&Pay’ function, allowing users to pay with one tap: they have to unlock the smartphone and approach the POS to activate and validate the transaction. Clearly, such three alternative methods have been strategically introduced to lower the number of steps and improve the usability of the mobile wallet, in addition to enhancement of the pervasiveness thanks to the Big Tech companies’ solutions.

As an outcome, two third of the mobile wallets require less than 5.6 steps in order to carry out an offline payment, while those requiring more than 5.6 steps have been evaluated without considering alternative systems. Therefore, further analysis focused on the improvement of such performance by assessing the provision of widgets and solutions (Tap&Pay and Big Tech systems) enabling users to carry out proximity payment in only few taps.

	Mobile proximity payment services	Widget + Tap&Pay	Big Tech-enabled Tap&Pay
Average (steps)	5.6	3	2
>average (apps)	13	3	4
<average (apps)	24	6	3

Table 42 - Widget + Tap&Pay & Big Tech enabled

The analysis figured out a low willingness to improve the services of those mobile wallets not efficiently provided: only 7 (3+4) out of 13 mobile wallets offer alternative and quicker solutions. While, with similar relative terms, the most efficient solutions improve even more their customer experience. Therefore, the only underperforming mobile proximity payment services are mainly

offered by Retailers: Enistation+, Iper la grande I, Rossopomodoro and RecardQ8, and DropPay and Bill (Service Providers) as well.

Mobile p2p Payments

Finally, as in the previous cases, also analysis of p2p payment services usability consider the unlocking smartphone as a first step. As a result, 18 out of 24 mobile wallets require more than 7 steps in order to accomplish an instant payment and only 6 mobile wallets have unusual design and more user-friendly interface enabling users to carry out the transaction with less than 7 steps, like YAP, Satispay, DropPay and Argenta. The analysis focused also on potential systems to improve the usability, resulting in only one service (PayPal through iOS Operating System) offer a voice command to carry out the transaction.

3.4.3 Services level

So far, the analysis focused on the main features characterizing and affecting the payment services offered by different providers, in some case identifying the best practices. Reminding that the objective of a mobile wallet should be to include and offer a complete and enhanced customer experience, the several aspects of the mobile payment solutions have been taken into account in order to evaluate the general level of payment services and identify the best combination of the practices currently offered.

The analysis considers the pervasiveness, the usability, the constraints and the other specific factors influencing the effectiveness of the services, which do not encourage potential users to adopt the mobile wallet, as relevant indicators of the service level.

The three payment services (by remote, in proximity and p2p) have been individually evaluated, then combined to assess the overall service level considering the availability of such payment services within each single mobile wallet.

In particular, the mobile remote payment service level is supposed to be dependent on:

- The number of online stores adopting the payment method associated to the mobile wallet, that is the pervasiveness, whose drivers and effects have been already analysed in the previous 3.3.1. section. An adjustment has been introduced in order to better evaluate the spread of the service: as already mentioned the service providers have to create their own accepting network, therefore the lower performance in getting partners has been taken into account.

- The number of payment methods allowed to carry out the payment: indeed, in addition to the potential increase of online store accepting the mobile wallet at hand as a payment methods, that is the pervasiveness, they could be bring more value to customers allowing to choose the favourite payment method among the two alternatives proposed: the own payment system with their own payment process or MastesPass systems with a standardized process which does not depend on the mobile wallet associated. In this way, also the number of steps required could be affected.
- The number of steps needed to perform the transaction by remote as indicator of the usability: to carry out the analysis the values have been standardized in a way to assign a better score to the mobile wallets going through a lower number of steps.
- The presence of an in-app online store allowing users to carry out the whole purchasing process, including the payment one, has been considered a value-added functionality allowing customers to carry out the process within one single application, instead of switching from one to another or from a website to the application, incurring in inefficient activities, such as the double authentication processes.
- The mechanism used to validate the transaction which could, on one side, reduce the number of taps needed and on the other side, enhance the customer experience and the security, for example allowing the user to pay through biometric identifiers like the fingerprint, the faceid and the iris, instead of a pin to be remembered which is not instantaneous to be entered as biometrics.

With the aim to figure out an estimation of the level of service (%), the above mentioned determinants have been weighted according to a merely intuitive logic: the pervasiveness and the usability are much more relevant and tangible factors than the others, which are secondary factors allowing just the improvement of the service provided.

The evaluation of mobile proximity payment service level considers as relevant drivers:

- The number of physical stores and points of sales adopting the payment method associated to the mobile wallet, that is the pervasiveness, whose drivers and effects have been already analysed in the previous 3.3.2 section. In order to better evaluate the in-store availability of the services, the possibility to integrate the mobile wallet with the Big Tech which could enlarge the accepting infrastructure has been taken into account. In fact, Big Tech solutions, and in general NFC-based proximity payment solutions, allow any NFC-enabled smartphone (and simultaneously cardholder) user to pay at any contactless-

enabled POS. Therefore, the analysis considers this system as the most promising and efficient.

- The number of payment methods allowed to carry out the payment, indeed mobile wallet could provide several different technologies and systems to perform the payment, such as the geolocation, the Bluetooth, the qr code and the Near Field Communication as well as the possibility to integrate the mobile wallet with Bancomat Pay, which could affect the number of steps needed to carry out the payment and provide different customer experience.
- The possibility to integrate the Big Tech solutions (SamsungPay, ApplePay and GooglePay) with the mobile wallet.
- The number of steps needed to perform the transaction in proximity as indicator of the usability: to carry out the analysis the values have been standardized in a way to assign a better score to the mobile wallets going through a lower number of steps.
- The possibility to benefit of an easy access to the main functionalities through the widget available along with the application, and to be able to set the 'Tap&Pay' function as default payment method through smartphone, thanks to which the user have no longer to access the app to be able to benefit of the most used functionalities.
- The mechanism used to activate the service which affect the usability: indeed, some service allows to just approach the POS with the smartphone to activate the service and start the process.
- The mechanism used to validate the transaction which could, on one side, reduce the number of taps needed and on the other side, enhance the customer experience and the security, for example allowing the user to pay through biometric identifiers like the fingerprint instead of a pin to be remembered which is not instantaneous to be entered as biometrics.

As in the assessment of the service level of remote solutions, the intuitive logic suggests weighting the variables according to their relevance: therefore, the pervasiveness and the usability are supposed to have a considerable impact, followed by the presence of easy access options and alternative payment methods, and then by the mechanism to activate the payment process by approaching and to validate the transaction through biometrics.

Finally, the estimation of the service level of p2p payment solutions takes into consideration:

- The number of people enabled to make mobile instant payment through the mobile wallet application, that is the pervasiveness, whose drivers and effects have been already analysed in the previous 3.3.3 section. Even in this case, an adjustment has been introduced to take into account the widespread usage of PostePay mobile wallet, despite being based on no conventional and shared method, like Bancomat Pay or PayPal.
- The number of available methods to carry out the transactions through the mobile wallet application, which allows users to choose the favourite one. As already mentioned, the alternatives detected as used to be proposed are the p2p system developed by the mobile wallet provider, Bancomat Pay system and PayPal.
- The number of steps needed to perform the transaction as indicator of the usability: once again, to carry out the analysis the values have been standardized in a way to assign a better score to the mobile wallets going through a lower number of steps.
- The possibility to carry out a quicker process to send money through voice command.
- The possibility to collect an amount of money from several users to create a petty cash or to split a bill among friends.
- The mechanism used to validate the transaction, which could, also in this case, reduce the number of taps needed and enhance the customer experience and the security, for example allowing the user to make the transaction through biometric identifiers like the fingerprint instead of a numerical codes.

As usual, the intuitive logic suggests considering more relevant the variable related to the pervasiveness and the usability, valuing the other variables less influencing, allowing just the improvement of the service provided.

As a result, the following *Table 43* shows the service level of each payment solutions offered by mobile wallet.

	Mobile Remote Payment	Mobile Proximity Payment	p2p payment	Overall Payment Service Level
Retailers				
EniStation+	/	33%	/	54,55%
RecardQ8	/	28%	/	48,48%
Eataly Pay	/	36%	37%	56,26%
Iper la grande I	/	31%	/	53,03%
myCarrefour	42%	/	/	50,24%

AuchanSpeedy	/	33%	/	54,55%
Rossopomodoro	53%	25%	/	57,54%
Roadhouse	42%	33%	/	47,85%
McWallet	/	33%	/	57,58%
MyAutogrill	/	33%	/	36,36%
Argenta	/	56%	42%	56,94%
Coven	/	56%	42%	56,94%
Modo	/	56%	42%	56,94%
Wally	/	53%	/	50,00%
Breasy	/	50%	/	57,58%
Coffee cApp	/	44%	/	54,55%
Pay4Vend	/	47%	/	56,06%
In Time Link	/	53%	/	56,06%

Banks

Hype	/	51%	26%	66,52%
Mediolanum Wallet	/	61%	61%	42,26%
Intesa Sanpaolo	61%	73%	21%	46,31%
Mobile				
Monhey	47%	72%	47%	48,54%
BNL Pay	63%	80%	37%	32,66%
WoW CheBanca!	42%	/	55%	62,92%
Hello Pay	63%	77%	37%	32,15%
Chat&Cash	/	/	37%	62,52%
Tinaba	32%	40%	26%	48,07%
UBI Banca	/	59%	37%	26,21%
Revolut	/	/	32%	56,62%

Service providers

YAP	/	73%	47%	66,20%
NexiPay	47%	69%	/	40,95%
Satispay	53%	50%	32%	60,77%
CirclePay	/	/	32%	44,50%
DropPay	45%	42%	11%	26,71%
PayPal	/	/	53%	55,98%
SisalPay	/	47%	/	53,03%
Bill	/	39%	26%	48,09%

Bancomat Pay	/	72%	42%	49,36%
PostePay	76%	44%	42%	47,63%
Big Tech				
ApplePay	63%	77%	/	56,37%
SamsungPay	/	71%	/	57,07%
GooglePay	53%	80%	/	54,25%
Telco				
TIM Personal	/	46%	26%	53,14%

Table 43 - Service level

Obviously, those applications not involved in the payment process have been marked with a “/”.

Mobile Remote Payment services

As a result, the analysis of remote payment services highlights how few more than half of the solutions involved in the remote payment offer a service level above the average (about the 52%) and no solutions offer a service level higher than that of PostePay estimated around the 76%. It offers the opportunity of completing the payment through smartphone in just 4 steps thanks to the ‘Pay with PostePay’ function suggested on some online stores, as well as to integrate the payment cards virtualized within the mobile wallet with MasterPass system, therefore increasing the opportunities to use them as payment tool, since it is a system accepted by about the 90% of the online stores. In addition, PostePay enhances the customer experience by allowing users to access online stores through the mobile wallet application in order to benefit from some promotion.

On the other side, the worst solution in terms of overall service level (26%) appears to be that offered by Tinaba, mobile wallet developed by Banca Profilo, which allow users to pay through the ‘Pay with Tinaba’ function with just 5 steps to be go through, nowadays proposed as payment method in only ePrice online store, one of the main eCommerce active in Italy.

To be noted as the potential best solution should be a combination of the best practiced detected by the census analysis. It should offer a widespread service with a high acceptance rate, like that currently offered by MasterPass system, enabling users to carry out the payment with the lowest possible number of steps, like the Big Tech mobile wallets which allow to finalize the payment in only 3 steps. Moreover, it should provide a complete customer experience by offering the possibility to choose the payment system, either that developed by the mobile provider or MasterPass system to be connected to the mobile wallet, the possibility to carry out the whole purchasing process within the app, from the products research to the payment phase, and the possibility to validate the payment through a biometrics instead of numerical codes.

Mobile Proximity Payment services

The proximity payment services scenario is composed by more than half (54%) of the mobile wallets offering a service level above the average (52%). Nowadays, the best solution is provided by Google Pay with a service level estimated of about the 80%, which will be described in the 3.4.4 section, while the worst solution appears to be offered by Rossopomodoro application, which allow customers to pay remaining sitting at their table, by scanning the qrcode provided together with the receipt, limiting its implementation in the Rossomodoro restaurants.

Mobile p2p Payment services

Finally, from the analysis of the mobile p2p payments, it emerges how most of the services offer a good quality service compared to overall trend: in fact, the 63% of the p2p payment solutions provides a service level above the average (37%). Even in this case, the best and the worst solutions have been found out. The best one appears to be the Mediolanum Wallet service, which allows to send money to both Bancomat Pay and PayPal users through the association of the mobile wallet with the related service. In addition, the mobile wallet allows to validate the payment with the fingerprint instead of the numerical code, which is to be kept in mind, thus speeding up the process. Instead, the worst one appears to be DropPay, provided by A-Tono Payment Institute S.p.A., which allow users to make instant payment among only those registered to the service by going through a 10 steps process (the maximum number recorded during the census drafting).

Overall Payment Service Level

However, as explained in the first part of the analysis, mobile wallets usage is limited by some constraints like the Operation System which the smartphone user is based on and the allowed payment tool to be virtualized within the mobile wallet. Moreover, the number of allowed methods to top up the mobile wallets, in order to be enabled to make payments, could represent a value-added service, able to enhance the quality of the service. To be noted how some provider allow to manually or automatically charge the credit line. Indeed, applications like Satispay, YAP and Bill allow users to set up time and amount of money to regularly recharge the wallet or to automatically recharge the credit if it decreases below the threshold amount.

For this reason, a comprehensive service level has been estimated in order to evaluate the quality of the mobile wallet developed, in terms of payment solutions.

As a result, UBI Banca and DropPay are the mobile wallets offering lower-quality payment solutions (about the 26%).

In Particular, UBI Banca provides the service to only Android smartphone users and holder of payment cards and bank accounts signed with UBI Banca S.p.A.. It allows to integrate the payment tool virtualized within the mobile wallet with Google Pay and Samsung Pay to carry out payment in proximity through the NFC technology, and with Bancomat Pay to carry out both proximity payments at Iper la grande I stores, thanks to the agreements with SIA and Iper la grande I, and instant payment (p2p).

While, DropPay application allows Android-based smartphone and iPhones to benefit of an account as money storage, rechargeable only by credit transfer. It allows to pay for online purchases in just 6 steps through the 'Pay with DropPay function based on the qrcode technology, proposed within few online stores as payment method, and to make p2p transaction with a low service level as explained above.

Therefore, the low service level is due to such requirements and constraints which restrict the usage opportunities and to the poor payment-related additional services able to attract new users and enhance the customer experience.

On the other side, Hype and YAP appears to provide payment services with the highest quality (about 66%).

Hype, made available on Google, Apple and Windows stores, provides a new prepaid card equipped with a bank account, rechargeable in several way: by any virtualized payment cards (working with the main payment circuits), by credit transfer, by cash at the Banca Sella points, at the Pam supermarkets points and at the Banca5 adhering points (like tobacco shops and coffee shops) or debit card at the ATM points adhering to the QuiMultiBanca circuit. It allows users to send and receive money among those registered to the service (100,000 users at the end of 2017) in just 7 steps (in line with average trend) and to pay for product and service through the mobile wallet application and the 'Pay with Hype' function proposed by more than 14,000 clothing shops, 8,000 restoration points, 5,000 grocery stores and other merchants, for a total of about 80,000 Ingenico POS integrated with the mobile payment system. In addition, the application allows users to integrate the mobile wallet with Google Pay and Apple Pay to benefit from the NFC technology by being able to pay in proximity at any NFC-enabled POS (about 2 million).

In the same way, YAP, developed by Nexi Payments S.p.A. for Android and iOS Operating Systems, provide a new prepaid card equipped with a bank account, rechargeable by any payment card working with the main payment circuits by setting a weekly budget to be available on the mobile wallet at the beginning of the week or a fixed amount of money to be topped up once a week, by credit transfer or by cash at the 45,000 SISAL points. Like Hype mobile wallet, YAP is not involved in the payments process of online purchases, but it provides solutions to make p2p

payment and in-store payment. The p2p solution allow to send and receive money among people registered to the service in just 5 steps, with the additional functionality allowing to equally split the total amount of money of the amount or select a part of the amount and send a request for them. The mobile proximity payment solution exploits the NFC technology to carry out offline payment at any NFC-enabled POS in just 6 steps by validating the transaction with the fingerprint. Nowadays it allows also to integrate the YAP prepaid card with the mobile wallet offered by Google and Apple (Google Pay and Apple Pay). In addition, in order to facilitate and accelerate the offline payment process the mobile wallet allows to be set up as default payment tool to be able to pay in just 2 steps.

In conclusion, with an overall evaluation of who could benefit from them and how and where they carry out payment, they appear to work better than the other solutions.

3.4.4 Big Tech

Particular attention has to be focused on the Device and Operating System Providers, also known as Big Tech, which developed and launched their own mobile wallets, offering online and offline payment solutions. Nowadays, in Italy there are three solutions active in the payment market: Google Pay, Samsung Pay and Apple Pay.

Google Pay is a mobile wallet platform and online and offline payment system developed by Google and released in 2018 to power in-app and tap-to-pay purchases on mobile devices, enabling users to make payments with Android phones, tablets and watches. In order to carry out payment in proximity, Google Pay uses Near Field Communication to transmit card information facilitating funds transfer to retailers, by replacing credit and debit cards uploaded and virtualized at the POS terminal. Therefore, the service lets Android devices wirelessly communicate with point of sales systems using an NFC antenna, a Host-based Card Emulation (HCE) and Android's security. It takes advantage of biometric activation method such as fingerprint id where available, as alternative to the passcode. Then, when users make payment to the merchants, Google Pay does not send the credit/debit card number with the payment, instead it generates a virtual account number representing the user's account information and one-time security code. The analysis highlights how users are allowed to pay by just approaching the device with locked screen to the terminal, except in case of amount of money higher than 25€ where the system requires to unlock the screen. In fact, the service has a smart authentication, allowing the system to detect when the device is considered secure, for instance if unlocked in the last five minutes. For these reasons,

from the service level analysis it emerged how Google Pay offers one of the best solutions to pay in proximity.

Samsung Pay is a mobile wallet and payment service developed by Samsung Electronics and released in Italy in 2018 that lets Samsung customers to make payments using the smartphone and compatible devices. The service supports both NFC-based mobile payment systems (which are prioritized when support is detected), as well as those that only support magnetic stripes, by incorporating the Magnetic Secure Transmission (MST) which emulates the swipe of a permanent magnet strip past a reader by generating the near-field magnetic waveform directly. For this reason, system works with the 2,5 million points of sale equipped with POS terminals, even those incorporating no NFC technology. On phones, the Samsung Pay menu is launched by swiping from the bottom of the screen, allowing users to carry out a payment in proximity in just 4 taps, by authenticating using a fingerprint scan or passcode. In this case, the Samsung Pay's security relies also on a secure token where credit card information is stored.

Apple Pay is a mobile wallet and mobile payment service developed by Apple Inc. and released in Italy on May 2017, allowing iOS-based devices users to make payments in proximity and by remote, by digitalizing and replacing credit and debit cards at NFC-enabled POS terminal. As any NFC-based mobile payment system, it does not require Apple Pay-specific contactless payment terminals, since it works with any merchant that accepts contactless payments (2 million). To pay at points of sale, users hold their authenticated Apple device to the point of sale system by holding their fingerprint to the phone's Touch ID sensor or facial recognition via Face ID. The service lets Apple devices wirelessly communicate with point of sale systems by using an NFC antenna, a Secure Element composed by a dedicated chip that stores encrypted payment information, and Apple's Touch ID and Wallet.

As shown in the previous analysis, several partnerships have been established in order to, on one side, allow mobile wallet solutions to benefit from the contactless payment services developed by the Big Tech and, on the other side, to integrate more and more payment tools to be virtualized into the three X-Pay mobile wallets.

Figure 31 shows how many mobile wallets working in the proximity scenario allow to associate their payment tool with the Big Tech solutions through the application interfaces.

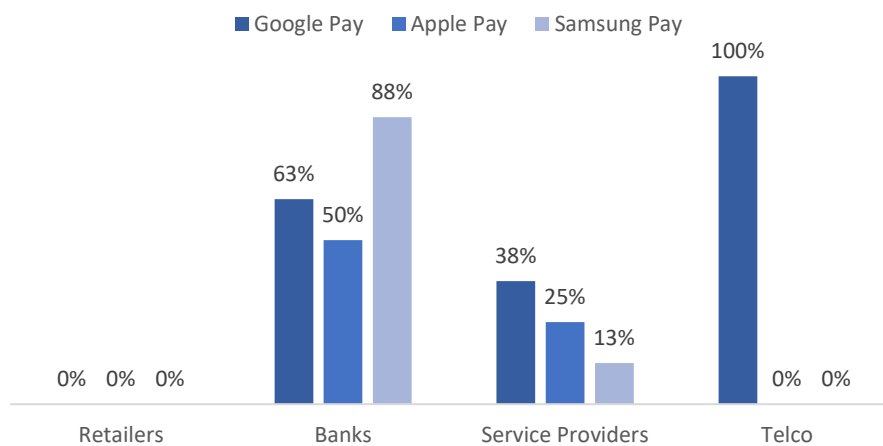


Figure 30 - Percentage of mobile wallets integrated with the Big Tech

The analysis investigated the number of mobile wallets searching for, developing and integrating new payment methods to increase the customer experience. As a result, thirteen mobile wallets (30%) take advantages from the Big Tech solutions. Four Banks and a service provider (YAP) offer the opportunity to choose among two ways to carry out a faster check out than using the mobile wallet application: Big Tech solutions and Tap&Pay/widget function. Meanwhile, four banks, two service provider (NexiPay and PostePay) and the telco company (which provides a prepaid card in collaboration with Hype, the mobile wallet service developed by Banca Sella) completely rely on the Big Tech solutions to provide a better customer service allowing them to pay at physical point of sales through smartphone.

The high adoption rate of Banks is due to the several agreements between Banks and the Big Tech and the overall need of providers to offer a better customer service, an improved customer experience.

In fact, as discussed in the previous chapter, Big Tech solutions allow some mobile wallets to provide an enlarged accepting infrastructure, moving from proprietary solutions (for instance, Hype and Tinaba) offered by adhering merchants as payment method to any point of sale equipped with contactless (and traditional in case of Samsung Pay usage) POS terminal.

In addition, since the Big Tech solutions allow to carry out proximity payment on average in just 2 taps (due to the fact that they work in only Tap&Pay modality) while mobile wallets require on average more than 5 steps process, mobile wallets could benefit from faster check out process, as well as enhanced user confidence on security system.

Meanwhile, Big Tech companies are enlarging their customer base thanks to the partnerships established with several Banks and payment card schemes, by allowing mobile wallet providers to add the 'Pay with...' functions within their application in order to integrate the two systems by

smartphone and by allowing more and more cardholders to virtualize their payment cards into the Big Tech mobile wallets.

In details, Google partnerships involve several institutes:

- Mobile wallet providers: Nexi and its partners Banks, Banca Mediolanum, Revolut, Hype, Unicredit S.p.A. (Monhey), UBI Banca, PostePay S.p.A.;
- Other banks: Iccrea Banca, Wibida Bank S.p.A., N26, Wirecard, BPER, Volksbank, Fineco Bank, Bunq;
- Payment card schemes: Visa, Maestro, Mastercard.

Regarding SamsungPay, the enabled partners are:

- Mobile wallet providers: Nexi and its partners Banks, Banca Madiolanum, BNL S.p.A. (BNL Pay and Hello Pay), CheBanca! (Wow CheBanca!), Intesa Sanpaolo, UBI banca, UniCredit (Monhey)
- Other banks: BPER, Carta BCC, Findomestic, Volksbank
- Payment card schemes: Visa, Vpay, Maestro, Mastercard.

To be noted how there are several other mobile wallet providers partners among Nexi partners, such as Banca Profilo (Tinaba), Banco BPM S.p.A. (Chat&Cash) and Intesa Sanpaolo (which is not allowing yet to integration of its payment cards with Google Pay).

Finally, Apple Pay relies on several partners, such as:

- Mobile wallet providers: Banca Mediolanum, Hype, Intesa Sanpaolo, Nexi, Revolut, Tim Personal, Unicredit (Monhey);
- Other banks: Allianz, boon., buddybak, bunq, Carrefour Banca, Carta BCC, Enderred, Fineco bank, monese, N26, Volksbank, Wibida;
- Payment card schemes: Visa, Vpay, Maestro, Mastercard, American Express.

In this way, all NFC-enabled smartphone (more than 25 million) and payment card holders are able to carry out payment in proximity via smartphone. In fact, the introduction of Google Pay, after Samsung pay and Apple Pay, enlarged the customer base of the NFC-based mobile proximity payment: Samsung Pay enabled the 40% of the NFC-enabled smartphone users, Apple Pay the 20%, and Google Pay the remaining 40%

In addition to the proximity solutions, Google and Apple offer the opportunity to pay by remote via smartphone thanks to the integration of the payment solutions with some partners.

Nowadays, Google Pay Italian users are allowed to select such payment method within few online stores: asos, Booking.com, Deliveroo, Flixbus, musement, Ryanair and Vueling. Moreover,

Google has already announced the next partnerships with *ibs.it*, *mytaxi* and *TIM*. Instead, *Apple Pay* is integrated with few more online stores/apps: *Booking.com*, *Deliveroo*, *Easyjet*, *ePrice*, *Giglio.com*, *musement*, *saldi privati*, *trainline*, and *Unieuro*.

3.5 Functionalities and Value-Added Services

Ideally, as mentioned in the previous chapter, a mobile wallet should be characterized by the broadest set of functionalities, usually fulfilled by physical wallet, with the aim to offer a complete and enhanced customer experience.

Therefore, a mobile wallet gathers multiple functionalities and VAS and allows the user to manage all the payment and related activities from the smartphone.

Looking at mobile wallets as aggregators of services and functionalities, the analysis focuses on additional offerings taking into consideration different aspects according to the typology of service provided, with the aim to evaluate the overall level of the additional services in terms of availability and effectiveness.

During the census, each mobile wallet has been analysed in detail in order to identify the related VAS and to figure out how mobile wallets are able to substitute the physical wallet by integrating several value-added services, which may occur remotely or in proximity.

In particular, the variables registered in the census and then investigated regard:

- The possibility to pay the Public Administration with *PagoPA* and to carry out *F24* payment;
- The possibility to pay for bill and for *MAV/RAV* by scanning the *Data matrix*;
- The possibility to carry out credit transfers and to pay for car tax;
- Transportation and parking ticketing, with regard to the subscriptions to the public transport, the urban and extra-urban tickets and the number of cities served;
- Loyalty and couponing services, which allow users to upload and store loyalty cards, to adhere to own or third-parties loyalty program, to benefit from e-couponing like cashback (a percentage of the total amount paid returns on the mobile wallet), discounts (related to the loyalty programs), promotions and prizes;
- The functions for searching for the nearby merchants and deals, useful in case of mobile proximity payments solutions based on ‘Pay with...’ system in order to have an overview

on the partners adhering to the network infrastructure, as well as for Merchants which improve the customer experience with additional services, such as EniStation+;

- The services to top up the SIM card and the prepaid cards virtualized within the app;
- The financial services, which enable users to request and manage loans for limited amount of money (maximum about 2,000€) through the mobile wallet application, to make investments and to contract insurances;
- The management of payment cards about plafond, functionalities like contactless and lock/unlock, and of mobile wallet payment for instance by setting thresholds on expenses categories or total expenses;
- The management of savings and the way through which users could reach the objective, for instance by setting periodically savings and by rounding up each expense;
- Donation service in favour of Onlus and public association proposed by the providers through the application;
- Several additional uncommon services, such as the cardless withdrawal of money at the ATM points, the connection of the mobile wallet with a smartwatch, the e-invoicing and the storability of receipts and transport tickets on the mobile wallet platform, the automatic payment of bill, the accomodation booking and mobile ordering at the restaurant, voice commands to carry out credit transfers and top up payment cards/SIM cards, the collection of money in favour of third parties and the qrcode reader to scan and record products for a fast checkout at the market stores.

The analysis figured out how the providers act in offering additional functionalities and value-added services in order to enrich the mobile wallets value proposition, thus encouraging potential users in adopting the solutions and improving the customer experience.

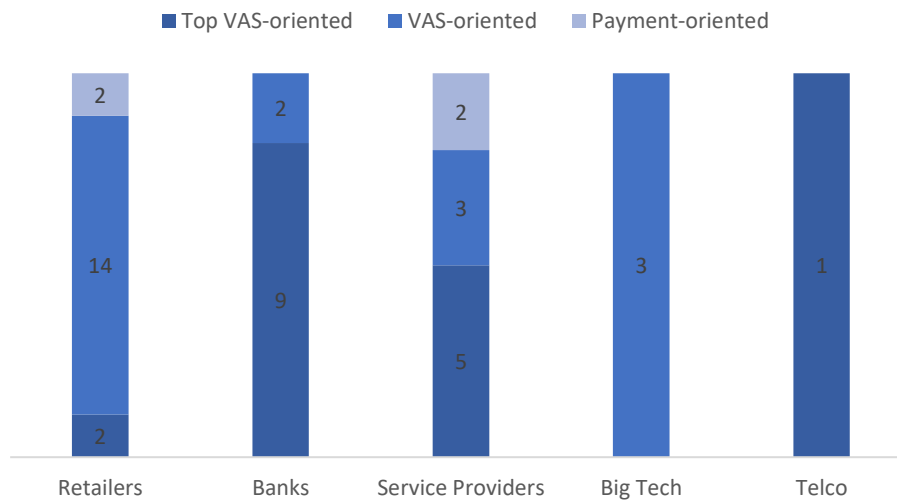


Figure 31 - VAS-oriented mobile wallets

Figure 32 and the following Table 44 show the mobile wallets including the highest number of additional services, which account for only few more than the 30% of the total amount of the applications. They all could be considered as the most Value-Added Service oriented mobile wallets, considering that the highest service level in terms of VAS is offered by PostePay, which includes about the 60% of the services monitored. On the other side, some mobile wallets like YAP, Circle Pay, Breasy and Eataly Pay are completely payment-oriented application, providing no Value-Added Services.

Retailers	Banks	Service Providers	Telco
myCarrefour	Hype Mediolanum Wallet Intesa SanPaolo Mobile Wow CheBanca! Tinaba UBI Banca Revolut	NexiPay Satispay DropPay SisalPay PostePay	TIM Personal

Table 44 – Top Value-Added Service oriented mobile wallets

Among the ‘Top VAS-oriented’ mobile wallets, Banks and Service Providers are the main developers and providers of mobile payment services (whether online, offline or p2p solutions) enhanced by other functionalities able to attract the attention of the users probably in the best way.

It could be interesting to evaluate how often the different functionalities have been included in the mobile wallet services, regardless of the coexistence of other services. In particular, the most common functionalities, proposed in more than the 25% of the mobile wallets, are related to:

- the couponing services, probably for their easy implementation, with a special preference of providers towards in-app promotions and discount related to loyalty programs instead of cashback systems;
- the digitalization of loyalty cards of the users' favourite merchants and the joining to in-app loyalty program to benefit from some special offerings;
- the searching and mapping of the nearest stores accepting the payment systems, in some cases improving even more the service by allowing users to filter the list by merchant category and cashback size (Satispay), or to check information, like the opening hours, and the current offerings (myCarrefour);
- the top up of the SIM cards.

To be noted how ticketing services are hardly to be implemented since they require partnerships and collaboration with companies managing the service, such as parking and transportation, and their changing in the ticketing and access check processes. Therefore, some mobile wallets try to overcome these hurdles by establishing partnerships to integrate the payment solutions with the transportation companies to be used as methods to remotely pay for tickets through their app and online stores, for instance Hype (with Italo), Satispay (with Trenord) and Bancomat Pay (with ATB), thus providing an additional service and allowing mobile wallet users to pay for transport tickets.

However, different providers categories could be focused and specialized on specific Value-Added Services categories.

In particular, the mobile wallets investigation figured out that the majority of Banks listed in *Table 44* are basing their offerings also on e-payment services like the bill and MAV/RAV payment services, functionality to make credit transfers and to top up prepaid cards, as well as on financial services in the attempt to converge mobile payment and mobile banking solutions. For these reasons, the ability of Banks in gather a wide variety of VAS leads to consider them as able to offer more complete and wider customer experience in the usage of mobile wallets.

Slightly different scenario has been figured out from the analysis of Service Providers, which are not focusing on VAS and the enhancement of the customer experience, except for only 4 out of 17 mobile wallets (24%) offering enough functionalities to be considered as one of the most attractive mobile wallets. An interesting point is that they offer different combination of

functionalities, excluding any kind of ticketing service and financial service, a part of Nexi Pay which is offering loan service.

Moreover, the analysis figured out a clear evidence about the Merchants focus only on e-coupons, loyalty, merchants research services and some uncommon functionalities, excluding any other one from the offerings, thus leading to consider their mobile wallets as offering a low range of VASs compared to the variety of services provided on the market, even though myCarrefour in an effort to cover all these functionalities thus resulting as one of the best and complete VAS provider. However, an exception consists of Enistation+ which allow users to pay for parking ticketing, in addition to some of the mentioned functionalities.

In the same way, as shown in *Figure 32*, Big Tech solutions provide a limited range of VAS: Google Pay and Samsung Pay tend to offer the same functionalities as Merchants with a common effort on loyalty function (Samsung proposes own point program, while Google allow to digitalize third-parties loyalty cards), a part of Apple Pay which allow users to only connect the mobile wallet with the Apple Watch, in addition to the payment solutions.

Finally, TIM Personal (provided by a Telco company) focuses on the loyalty and ticketing services, enables users to pay for transportation and parking tickets through the SIM card credit, and on the credit transfer functionality, making the mobile wallet one of the most interesting solution.

Chapter 4

Conclusions

Mobile wallet is an emerging digital payment system aiming at improving the convenience, the security, the usability and the experience of users in carrying out everyday activities as well as offering business opportunities to merchants to lower costs of payment process and increase their proximity to customers. Beside the payment services, whether in proximity, by remote or p2p solutions, Value Added Services play a crucial role in encouraging new users to adopt the mobile wallet services and in the enhancement of the customer experience.

The growing adoption rate of mobile payment solutions, both online and offline, in terms of transaction value and number of active users, could represent a positive determinant for the mobile wallet adoption. However, there are still barriers to adoption, mainly related to the user experience, security, lack of users, lack of collaboration among stakeholders, the acceptance infrastructure, the coexistence of mobile payment solutions with other Value-Added Services and the interoperability between different mobile wallets in one device.

The census allowed to describe the mobile wallets currently active in Italy and their services and characteristics, with the aim to identify the infrastructure accepting mobile payments systems, the main trends, the value creation and the improvement the customer experience as well as possible issues affecting the adoption. Indeed, some features prevent users in adopting the solutions offered by mobile wallets and some other elements do not encourage customers to benefit from services and functionalities provided.

The census highlighted an increasing the number of mobile wallet solutions developed in the last few years thanks to new players entering the Italian market and new providers proposing their

own solutions by exploiting the existing technologies and infrastructure. This means that different actors are investing in mobile payment services and in particular in the mobile wallet, doubling the range of solutions compared to the previous years, enlarging the choice and opportunities to users to select the one that best fits their needs and the competition as well. As the number of solutions increases, also the range of functionalities differs and grows compared to the previous solutions, meaning that providers are investing in mobile wallet to improve the customer experience. Among the new services, functionalities and Value-Added Services, the main innovation regards the integration of Bancomat Pay, GooglePay, SamsungPay and ApplePay with others mobile payment services, as methods to pay in proximity (p2b). This is in line with the explosive growth in the adoption of mobile proximity payments solutions highlighted in the literature analysis, enabled by the enhancement and improvement of the related services.

The analysis figured out the enabling providers which may be classified into five categories: retailers, banks (Financial Service Providers), service providers (Payment Service Providers), Device/OS manufacturers and Telecommunication companies (Mobile Network Operators). Service Providers appear to be the main players, providing the 40% of the application active on the Italian market, followed by Banks and Retailers, providing together almost the 50% of the mobile wallet solutions.

Although they are more numerous than other providers categories, they all are not so specialized and able to enhance the customer experience. Indeed, a deeper analysis brought out aspects related to the requirements which could affect the actual accessibility and customer adoption, mainly related to their presence on the application store platforms (Play Store, Apple Store and Windows Store) and the payment tools required to be virtualized in order to benefit from the mobile wallet services.

Operating Systems

The analysis found out how Banks are the only mobile wallets providers tending to underinvest in development phase to make available their applications within both Apple Store and Windows Phone Store, limiting their potential users' choice in selecting the right mobile wallet.

While, Service Providers and Telco (TIM Personal) tend to underinvest in only Windows users. In particular, Service Providers have been developing only 3 (Bancomat Pay, Satispay and PostePay) out of 10 mobile wallets downloadable by the Windows Phone Store.

In conclusion, Windows users are frequently excluded from the target of the offerings, but in general they are better served by Banks and Retailers with 12 out of 29 mobile wallets, Android

users can choose which solution better fit their needs among all the mobile wallet services and iOS users have a limited choice among the Banks solutions while they are better served by all the other mobile wallet providers.

Payment tools

The analysis figured out how the most of banks (55%) allow the virtualization of only own payment cards, therefore limiting the registration to their already existing clients, devoting to them some special benefit, for instance facilitating the authentication and access to the mobile wallet services through the home banking (and mobile banking apps) and tokenization systems/personal codes of users already enrolled in the bank services.

In the same way, PostePay owners are the only users of the mobile wallet as well as other two Service Providers offer mobile wallet solutions, NexiPay and Bancomat Pay, to respectively the Nexi card owners and the clients of only one of the partners banks (Banca di Asti). To be noted how Nexi Payments established partnerships with about 150 banking institutions

On the other side, the remaining services offered by Service Providers and Banks allow users to register and virtualize any bank account or payment card belonging to the most common circuits (Visa, Mastercard, etc.), sometimes enlarging the range to the uncommon ones like Amex, JCB and Aura. Actually, DropPay (offered by a Service Provider) does not required any payment tool to be virtualized, since it generates a new bank account to be charged by only credit transfer, thus it is not totally subject to this kind of requirement.

Likewise, Retailers and the Telco all allow users to virtualize any payment card to top up the e-wallet or to directly charge the payment.

In conclusion, currently, a Service Provider (PostePay) and more than half of Banks are restricting the usage of their mobile wallet to their clients, since, for their nature, they are associated and involved in some way with a payment system, having a smartphone compatible with the application in term of OS. Therefore, such mobile wallets are basically an additional service dedicated to their clients in order to enhance the customer experience.

Most of the Service Providers and Telco are restricting the usage to only Android and iOS users.

On the opposite, Retailers are not associated to specific banks and payment tools, thus, even though in some case the mobile wallet development does not include a Windows version,

probably due to the low investments, they offer to any payment card owner the opportunity to benefit from their services.

Beside the accessibility constraints previously analysed, additional barriers to adoption of mobile wallets have been analysed. Since a widespread coverage of the territory encourages potential customers in adopting a mobile payment solution to carry out payments and at the same time the higher the acquired customers and the customers adoption rates the higher the willingness to develop and improve the services, the ability of different providers in offering efficient payment services in terms of opportunities to use them has been investigated.

Mobile Remote Payment systems pervasiveness

The analysis found out that Retailers are the only providers developing their own mobile wallet app to allow users to carry out online shopping through the virtualized payment tool, with the aim of improving the own customers experience by offering seamless solutions through in-app commerce functionality. In particular, MyCarrefour, Rossopomodoro and Roadhouse are the merchants allowing customers to pay for online shopping within the own online store and for home delivery services through the app, from the products selection to the payment validation, therefore limiting the choice of the merchant and their usage to few occasions.

Different scenarios are provided by Banks and Service Providers. Service Providers tend to establish partnerships with selected online stores, so that they are suggested as payment methods, with the typical 'Pay with ...' function, within the eCommerce website/application of partners companies, in order to enable users to interact and validate the payments through the app. To be noted how also a Banks (Banca Profilo providing Tinaba mobile wallet) acts in the same way. Since such apps are not based on existing infrastructure and payment systems, they have to create their own network. In the same way, the mobile wallets provided by the Big Tech (Apple Pay and Google Pay are already working with some online stores) have to be offered as alternative solutions to be integrated into existing online stores. Therefore, different scenarios emerged from different payment systems, according to the ability of companies to spread the solutions. The evaluation of their coverage and the opportunities to use them, found out how Satispay and DropPay are able to offer hundreds of opportunities thanks to hundreds of partnerships, while Tinaba has been integrated only on ePrice website, an eCommerce platform. This could be due to the lower investments in marketing campaigns and in the service development.

Meanwhile, Banks tend to integrate their mobile wallet with MasterPass, enlarging the use opportunities of their mobile wallets as payment systems on online stores. Thanks to this service, the online payments are activated by entering the phone number or the email address, connected to the MasterPass account, and then validated through the mobile wallet app. Also, NexiPay and PostePay (by Service Providers) offer the same service.

In conclusion, most of mobile remote payment solutions, mainly composed by Banks (a part of Tinaba mobile wallet), offer mobile remote solutions able to cover a wide usage opportunity, since they enable users to pay in more than 90% of the total amount, in turn integrated and offering MasterPass service as a payment method. Then, Retailers provide own mobile wallets to enhance their customer experience and to allow users to carry out shopping on their in-app stores, from the products selection to the payment validation, thus limiting the usage on the related online stores. Finally, the other mobile wallet providers, which have developed the own payment systems, have to create their accepting infrastructure, which depends on their ability in involving and establishing partnerships with online stores, in order to encourage users to adopt the payment solutions. To be noted as in this case also small merchants play a crucial role in the creation of a strong and widespread accepting infrastructure.

Mobile Proximity Payment systems pervasiveness

The analysis figured out results very similar to the mobile remote payment analysis. Retailers have been developing own solutions as additional payment methods to be used at their point of sales. Therefore, the opportunities to use them are limited by the number of stores of each merchant, in any case considered low and limited if considering the purpose of using the mobile wallet, To be noted as they all rely on alternatively two technologies: geolocation to be activated on the device on hand and qrcode technology, which has to be scan with the user device at the point of sale or could be display on the customer's device thus has to be shown at the checkout. However, the payment services to be used at the vending machines included in the 'Retailers' providers category, based on geolocation, qrcode as well as Bluetooth and NFC, offer a wide potential accepting infrastructure composed by all the vending machine not being equipped with by app cashless systems.

While, the other mobile wallet providers have to create their network by establishing partnerships with some merchant and by developing solutions based on technologies compatible with existing infrastructure.

Most of the Service Providers collaborate and integrate their solutions within the purchasing and payment process of other companies, whether they are physical stores, mobile Point of Sales or vending machines. Even in this case, different scenarios have been found out according to the different payment systems and the ability of companies to spread the solutions. In particular, three emerging scenarios have been identified: Satispay, Bancomat Pay and SisalPay, which are involving more and more point of sales. In this case the enabling technologies are alternatively qr code, NFC and geolocation.

While, few Service Providers (providing YAP, NexiPay and PostePay), Telco and all Banks providing mobile proximity solutions rely on NFC technologies. This means that users are allowed to pay whenever a point of sale is equipped with a contactless POS (about 2 million NFC-enabled POS).

To be noted as some companies (few Banks, Telco and a Service Provider) offer a widespread proximity payment method based on NFC technology thanks to the collaboration with the Big Tech (Samsung, Apple and Google), with the aim to enlarge the accepting infrastructure of those mobile proximity payment providers which would otherwise be limited in offering the service as alternative payment method at the only partners' stores through different technologies, like qr code, geolocation and Bancomat Pay. Therefore, in such cases, the Big Tech mobile wallets could represent constraints to the accepting infrastructure, lowering the opportunities to use the mobile wallet for those customers unable to integrate them with the Big Tech solutions and the adoption rate as well. In fact, for instance, Hype and TIM Personal offer the 'Pay with hype' solution through about 80,000 Ingenico POS, and very few partnerships have been established in the other cases, such as that of PostePay with 400 IP gas stations, of Tinaba with 7,000 taxi in 10 different cities, IP gas stations and some small merchants, and of UBI Banca with SIA to provide JiffyPay service at Iper stores.

In conclusion, most of providers proposing mobile proximity solutions, composed by only Service Providers, collaborate and integrate their solutions, based on qr code, geolocation or NFC technologies, within the purchasing and payment process of other companies. Therefore, the breadth of the accepting infrastructure depends on the ability of companies to spread the solutions. Meanwhile, the other Service Providers (YAP, NexiPay and PostePay), Telco and all Banks providing mobile proximity solutions rely on NFC technologies, sometimes enabled by the integration with the Big Tech solutions. This means that users are allowed to pay whenever a point of sale is equipped with a contactless POS (about 2 million NFC-enabled POS). Finally, Retailers provide qr code and geolocation-based solutions offering low opportunities to use them,

limited to the number of stores of each merchant, in addition to those services based on Bluetooth and NFC technologies to pay at the only vending machines integrated with the systems.

p2p payment systems pervasiveness

The analysis figured out how most of providers rely on own p2p payment methods, limiting the usage to the users of the same service, lower than 1 million. However, there are emerging scenarios, fed by the larger customer base of PostePay, which provide the p2p service to a number of users (6 million users) comparable to the ones benefitting of p2p systems (Bancomat Pay and PayPal) adopted and shared with several mobile wallets, and by the ability of Satispay in exponentially enlarging the customer base offering the service to about 550,000 users in March 2019.

In fact, beside p2p systems provided by several mobile wallets, most of Banks rely on Bancomat Pay and, in few cases, on PayPal solutions, which are integrated within the mobile wallets, in order to offer a p2p solution reaching a customer base of more than 5 million users, even though they are registered on different mobile wallets. In addition, the two systems offer a dedicated application, even though Bancomat Pay allow only clients of Banca di Asti to register and use the app. Even in this case, the emerging opportunity resides in new collaboration between SIA and Bancomat, able to enlarge the customer base and therefore the usage opportunities to 37 million new users, being Bancomat cardholders, resulting in the most promising p2p system.

In conclusion, the higher the number of users enrolled in the p2p payment system the higher could be the mobile wallet adoption rate, thus influencing the catchment area of the mobile wallet and the usage opportunities. Most of Banks have a catchment area of more than 5 million users, significantly higher than solutions based on own systems, adopted by the most of mobile wallets. Moreover, with the new collaboration between SIA (provider of Jiffy system) and Bancomat is enlarging the opportunities to use the service to 37 million debit card owners (the new potential users of the solution), Bancomat Pay appears to have a great potential for future growth.

Payment services availability

In order to summarize the previous results, an additional analysis about the general availability of the payment services have been carried out. The analysis confirms the pervasiveness of mainly Service Providers and Retailers in offering mobile proximity payment solutions also in terms of absolute number of available solutions: the 86% of the mobile wallets provide services to pay offline. Similarly, the high commitment of Banks in providing p2p solutions allow users to have

a wider choice: the 56% of mobile wallet provide services to make instant payments. Finally, only the 37% of mobile wallet is involved in remote payments, meaning that providers are not investing in such function as in the others. Moreover, few mobile wallets allow users to benefit from proximity, remote and p2p payment services through only one application.

Payment service usability

Ideally, in order to encourage potential users to adopt a mobile wallet, it should include the greatest possible number of payment solutions and those functionalities fulfilled by physical wallet with the aim to offer an effective and suitable service and a complete and enhanced customer experience as well.

Therefore, beside the amount of services, an estimation of their usability in terms of steps needed to carry out a payment could provide an evaluation of the quality, efficiency and service level of mobile wallets, as well as potential drivers.

The analysis of remote solutions figured out how the most of apps (70%) require less than 6 steps in order to carry out an online payment, meaning that the few companies offering this service have been investing to improve it and provide a high-quality service. Even though the most of wallets adopt MasterPass system to carry out online payment, the relation between the method used and the number of steps needed does not appear significant, meaning that the design of the applications play a relevant role.

The analysis of proximity solutions found out how two third of the mobile wallets require less than 5.6 steps in order to carry out an offline payment, while those requiring more than 5.6 steps have been evaluated without considering alternative methods. Indeed, 7 out of 13 mobile wallets with low performance improve the service through widgets and solutions (Tap&Pay and Big Tech systems) enabling users to carry out proximity payment in only few taps (usually 3 taps).

The analysis of the p2p solutions figured out how only about one third of mobile wallets have unusual design and more user-friendly interface enabling users to carry out the transaction with less than 7 steps, like YAP, Satispay, DropPay and Argenta.

Payment services level

Reminding that the objective of a mobile wallet should be to include and offer a complete and enhanced customer experience, the several aspects of the mobile payment solutions analysed (pervasiveness, usability, constraints and other factors influencing the effectiveness, which do not

encourage users to adopt the mobile wallets) have been taken into account in order to evaluate the general level of payment services and identify the best combination of the practices currently offered.

The three payment services (by remote, in proximity and p2p) have been individually evaluated, then combined to assess the overall service level.

The analysis of remote payment services highlights how few more than half of the solutions involved in the online payment offer a service level above the average. In particular, the best service level has been awarded to PostePay mobile wallet, while the worst performance has been attributed to Tinaba, considering that the best practices result from a widespread service with a high acceptance rate, like that currently offered by MasterPass system, through a user-friendly interface enabling users to carry out the whole purchasing process within the app and to finalize the payment in just few steps, like in the involvement of the Big Tech mobile wallet, validate the payment through a biometrics instead of numerical codes.

The analysis of proximity payment services figured out how more than half of the solutions involved in the offline payment offer a service level above the average. Nowadays, the best solution is provided by Google Pay which is based on NFC technology, while the worst solution appears to be offered by Rossomodoro application, which restricts its implementation within the Rossomodoro restaurants.

Finally, the analysis of the p2p payments services found out how most of the services offer a good quality service compared to overall trend. In particular, the best offering appears to be the Mediolanum Wallet service, which proposes both Bancomat Pay and PayPal systems with a quick validation process enabled by biometrics, while the worst performance has been attributed to DropPay, which allow its users to make instant payment to each other by going through a 10 steps process (the maximum number recorded during the census drafting).

At the end, an overall evaluation of the payment services has been carry out by considering the level of each payment service in addition to the constraints related to the supported Operation Systems, the allowed payment tools to be virtualized and the methods allowed to charge the credit line (manual or automatic). The analysis figured out how UBI Banca and DropPay are the mobile wallets offering lower-quality payment solutions, due to such requirements and constraints which restrict the usage opportunities and to the poor payment-related additional services able to attract new users and enhance the customer experience. On the other side, Hype and YAP appears to provide payment services with the highest quality.

Big Tech

Nowadays, in Italy three Big Tech are active in the payment market by providing mobile wallet solutions: Google Pay, Samsung Pay and Apple Pay. They all ensure a widespread accepting proximity infrastructure, a high service security level and quick checkout. For these reasons, more and more mobile wallets are integrating these solutions in order to benefit from their higher performances improving the customer experience. On the other side, Big Tech established partnerships also with several banks with the aim to include more and more payment tools to be virtualized into the X-Pay mobile wallets enhancing the service level.

The analysis figured out how one third of the mobile wallets working in the proximity payment area takes advantages from the Big Tech solutions. In particular, the high adoption rate of Banks (8 out of 11 mobile wallets) is due to the several agreements between Banks and the Big Tech and the overall need of providers (both Banks and Big Tech) to offer a better customer service. While, most of the other providers completely rely on the Big Tech solutions to improve the customer experience, instead of improving the performance of the own process, for instance developing a Tap&Pay solution.

In conclusion, a widespread adoption of these solutions allows to entirely cover the customer base composed by NFC-enabled smartphone holders (more than 25 million), resulting in efficient systems to obtain the highest pervasiveness.

Functionalities and Value-Added Services

Mobile wallets gather multiple functionalities and VAS and allow the users to manage all the payment and related activities from the smartphone with the aim to enrich the value proposition, offer a complete and enhanced customer experience and thus encouraging potential users in adopting the solutions.

The analysis about the overall level of the additional services in terms of availability and effectiveness revealed as only one third of the mobile wallets are significantly involved in the development of Value-Added Services, able to attract the attention of the users probably in the best way by enhancing the mobile payment solutions with additional related and unrelated functionalities. In particular, the highest service level in terms of VAS is offered by PostePay, while some mobile wallets such as YAP, Circle Pay, Breasy and Eataly Pay are completely payment-oriented application, providing no Value-Added Services.

The analysis figured out that the most common functionalities are related to the e-couponing, the loyalty services, the searching for the nearest stores and the top up of SIM card. Although different

providers categories could be focused and specialized on specific Value-Added Services categories, the most common ones should be considered as necessary functionalities to be developed as part of the minimum viable product.

4.1 Critical issues

It is important to highlight how the research, the census and thus the analysis of the information face several difficulties and hurdles.

The data and information gathering have been affected by the real availability of the means through which the mobile wallets have been tested, for instance the lack of payment cards and bank account compatible with the mobile wallets or smartphones based on operation systems supporting the applications.

As alternative source of data, corporate websites, scientific and technology websites and tutorial videos has been analysed in order to get missing information. However, in some cases, information gathered from different sources differ each other probably due to outdate data, therefore the most reasonable information has been taken into consideration.

In some other cases, data have not been gathered so that proxies were necessary in order to carry out the related quantitative analysis. For instance, the estimation of the usability required to assume as valid data of similar services based on the same technologies, such as mobile wallet providing Jiffy as p2p payment system.

Indeed, the proxies have been necessary, since the totality of the functionalities have been too numerous to be tested in addition to the aforementioned constraints, that is the lack of secondary data and information sources and of means to collect primary data.

Finally, the analysis is inevitably based on temporary data, since most of mobile wallets are constantly subject to changes of functionalities and range of Value-Added Services.

To conclude, the thesis mainly focuses on the analysis of the service level of payment solutions, their functionalities, the main technologies used to carry out the payment, their usability and the Value-Added Services provided. However, further analysis could be addressed to evaluate the security level, taking into consideration the registration process, the access phase, the virtualization of the payment tools and their validation, as well as the characteristics of the technologies which the systems are based on. In this way, also a detailed and comprehensive evaluation of the services level provided by the mobile wallets could be carried out.

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Websites of each service mapped in the census

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