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School of Industrial and Information Engineering

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POLITECNICO
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A MODEL TO EVALUATE MOBILE WALLET CUSTOMER EXPERIENCE: IDENTIFICATION AND ASSESSMENT OF BEST PRACTICES, BEST FITTING VALUE-ADDED SERVICES AND MOBILE PAYMENT PILLARS

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ABSTRACT (English version)

The payments world is nowadays facing a digital revolution. With the introduction of mobile wallets and a favourable legislative framework supporting the growth of new forms of payment, the traditional payment system is currently under attack. To win on the marketplace, new systems need to be as effective, simple, intuitive, user friendly and functional as possible. Users look for the perfect customer experience (CX), both on the mere payment functionalities and on the value-added services (VAS) offered in a wallet.

An in-depth study was conducted on the technological solutions powering mobile wallets and on customer experience. A model found in the literature showing accomplishment and prioritization of the 5 assets that digital payments need to master to compete and win against traditional payment systems represented the foundation of the research. The model allowed to find literature gaps on how the principles of CX should apply to VAS selection and on how to assess the level of accomplishment of the payment functionalities of a wallet.

Hence the need to develop a model to assess which suit of VAS each typology of operators (i.e. banks, merchants, service providers and start-ups) should offer to their users to maximize CX. The model is the result of a complex blend of CX principles, VAS descriptive variables, intrinsic characteristics of the operators and insights coming from an on-the-field census of more than 30 wallets. Best-practices for each VAS have been researched with the aim of giving advice not only on which set of VAS to implement, but also on how to introduce them to succeed in the marketplace guaranteeing the highest possible CX. The final output of the model is a list of best-fitting wallets for each typology of operator. Assumptions and results have been validated by means of interviews to companies.

On the payments side, another model was created to assess in a structured way the level of accomplishment of simplicity, diffusion, security and control: the payment assets proposed by existing literature. The model is based on objective drivers to which scores are assigned ranging from low to high level of accomplishment, depending on the findings arising from the census and the literature.

Therefore, this thesis is meant to be a tool for companies launching or updating a wallet to understand not only which set of VAS to offer but also how to build them, referring to the proposed best practices. Moreover, the research aims at raising awareness on the current level of accomplishment of the digital payment assets, helping at the same time to understand how to enhance that very accomplishment, being the model clear on the underlying drivers and assumptions.

ABSTRACT (Versione italiana)

Il mondo dei pagamenti sta attualmente affrontando una vera e propria rivoluzione digitale. Con l'introduzione dei mobile wallets (portafogli digitali) e un quadro legislativo favorevole a nuove forme di pagamento, i sistemi di pagamento tradizionali sono attualmente sotto attacco. Per risultare vincenti, i sistemi di pagamento digitali dovranno dunque essere quanto più efficaci, semplici, intuitivi, user friendly e funzionali possibile. Gli utenti cercano l'esperienza d'uso perfetta sia dal punto di vista dei pagamenti per sé, sia da quello dei servizi accessori che vengono offerti nei wallets.

È stato condotto uno studio approfondito della letteratura sulle soluzioni tecnologiche alla base dei mobile wallets e sull'esperienza d'uso. La ricerca pone le sue fondamenta su un modello trovato in letteratura che mostra priorità e livello di realizzazione dei 5 asset di cui i pagamenti digitali necessitano per avere successo contro i sistemi di pagamento tradizionali. Grazie a questo modello, sono state scoperte lacune riguardo a come i principi di customer experience debbano essere applicati ai servizi a valore aggiunto e a come valutare il grado di realizzazione degli asset che si riferiscono alle mere funzionalità di pagamento del wallet.

È da queste lacune che nasce il bisogno di sviluppare un modello che permetta di valutare quale combinazione di servizi a valore aggiunto debba essere offerta da una specifica tipologia di operatori (Banche, commercianti, fornitori di servizi e start-up) per massimizzare la customer experience. Il modello sarà basato su diversi fattori quali i principi di customer experience, delle variabili descrittive dei servizi a valore aggiunto, le caratteristiche intrinseche degli operatori e un censimento di oltre 30 wallets. Inoltre, è stata condotta una ricerca per definire le best-practices per ognuno dei servizi a valore aggiunto, così da consigliare non solo quali servizi introdurre, ma anche come introdurli per offrire la miglior customer experience possibile e risultare vincenti sul mercato. Il risultato finale del suddetto modello è una lista di servizi a valore aggiunto per ciascuna tipologia di operatore. Le assunzioni fatte e i risultati ottenuti sono stati confermati per mezzo di interviste a compagnie.

Per quanto riguarda i pagamenti, è stato creato un modello atto a valutare in modo strutturato il grado di realizzazione di semplicità, sicurezza, diffusione e controllo, che sono gli asset sui pagamenti digitali proposti in letteratura. Il modello definisce una serie di driver che indicano il grado di realizzazione degli asset e assegna delle valutazioni (basso o alto livello di realizzazione) sulla base dei risultati del censimento o della letteratura.

Questa tesi deve dunque essere intesa come uno strumento grazie al quale le compagnie che vogliono lanciare o migliorare il loro wallet possono comprendere non solo quali servizi a valore aggiunto offrire, ma anche come offrirli facendo riferimento alle best-practices proposte. Inoltre,

la ricerca si pone come obiettivo quello di aumentare la consapevolezza sul livello di realizzazione degli asset di pagamento digitale, donando allo stesso tempo delle indicazioni su come migliorare i risultati data la trasparenza dei driver sottostanti.

EXECUTIVE SUMMARY

1. Research Objectives for the thesis

This thesis aims at building a model to assess what suit of value-added services (VAS) each typology of operators should offer to their customers. These recommendations, together with best-practices that will be studied and presented to the reader, aim at ensuring the best customer experience (CX) at any time. By means of a second model, the thesis aims at assessing in a structured manner the level of accomplishment of diffusion, control, simplicity and security. These are the four assets that the literature deems paramount for new digital payment systems to succeed on the marketplace against traditional ones.

The need for such models comes from the lack of literature on VAS, as well as from a general misalignment among the various mobile wallets in terms of offering (i.e. quantity and typology of VAS offered). Hence, the need for a model that increases the awareness on the VAS choice that companies willing to launch or update a mobile wallet should make. Moreover, no structured model exists in the literature to assess the level of accomplishment of the 4 payment assets. The positive implications of a model that evaluates those accomplishments is not only to raise awareness but also to give indications on how to improve, being the underlying drivers used to reach the final outcome transparent.

CHAPTER 1 – LITERATURE REVIEW

2. Scientific literature review

The scientific literature review revolves around mobile wallets and CX. This is because it is important to shed light on how mobile wallets work from a technical viewpoint giving also an overview on digital payments infrastructure, regulatory framework and solutions currently offered. Equally important is to understand the main customer experience principles in the digital and mobile wallets worlds to shape the most robust model possible. In fact, the insights arising from the literature review are then used to decide the main constraints to be applied to the model for a high-quality result (i.e. the maximum number of VAS that should be offered to customers to guarantee a high customer experience, ...).

3. Mobile wallets

Overview of the infrastructure in Italy and Belgium

Italy and Belgium are the two markets analysed in this thesis. The former presents an excellent infrastructural basis for the acceptance of digital payments (i.e. POS, ...) and a good diffusion of payment cards, aligned or superior to the most developed European countries but with a low utilization rate of digital payment. The latter has a less developed infrastructure and, since most Belgians already switched from cash to card payments, the perception of marginal gain coming from e-payments is lower than for Italians, who are passing from cash to e-payments.

Mobile wallets vs. local realities/local issues

Mobile wallets are very effective tools to solve issues, such as the burden of cash management, safeguard and use costing billions to governments worldwide. In Italy, it is estimated that the cash burden equals 35+ billion euro a year (incl. tax evasion).

Regulatory framework

The regulatory framework, with the introduction of the Payment Service directive 2 (PSd2), looks favourable to the mass introduction of new digital forms of payments. This is because the new directive will open the market to new players that did not have the possibility to take part to the game before.

Technological solutions

Many different technological solutions are available for mobile wallets. The secure element, that is the unit that guarantees user data safety, can be positioned in the cloud, in the sim-card or in the device itself. To further enhance security, tokenization and session keys are other techniques that can be used. Instead, to transmit payments Near Field Communication (NFC), QR codes or text messages are all available technologies. It is key to understand these different solutions as they affect the wallet's performance and the user experience.

Current players solutions

Current players solutions are many and very diverse. Not only digital companies are developing solutions, as one would expect. Retailers, oil companies, cruises, supermarket chains, governments and universities are also active in the game. In 2017, Politecnico di Milano censed 30+ wallets giving a useful overview on the current market offering.

Future technologies

Digital payments are experiencing a moment of strong growth and technological development globally. The most interesting trends that are revolutionizing payments are: geolocation, biometry, cryptocurrencies, blockchain, IoT (Internet of Things), augmented reality and artificial intelligence.

4. User experience

According to a Walker study, "*By 2020, customer experience will overtake price and product as the key brand differentiator*".

Digital customer experience

As Liferay affirms, "*Digital customer experience is the sum of digital interactions between a customer and a company and the resulting impression that a customer walks away with* ".[1] Nowadays, Digital Customer Experience (DCX) and Customer Experience (CX) overlap, hence the focus should be rather holistic. It is important therefore to understand that the customer is one, regardless of the kind of experience and channel we are talking about. Being customers more and more multichannel, it is important to guarantee the integration between systems (i.e. mobile app and website). It is key to offer a seamless navigation experience and simple and intuitive interfaces, avoiding overcomplication (i.e. offering too many services or features).

Mobile wallets customer experience

Politecnico di Milano thinks that the majority of mobile wallets' users choose to activate the service because they find the wallet convenient, giving them a feeling of

[1] (Liferay, n.d.)

modernity, relax & comfort and optimized time management. However, many barriers are preventing mobile wallets to be mass adopted. Among them there are cloning risk, password proliferation, battery-related issues and value concentration in a single device.

A survey conducted by Politecnico di Milano with the support of KANTAR TNS helped to identify the 5 assets required to compete against traditional payment methods. The table to the right shows where these 5 assets are positioned on a priority-accomplishment matrix. Interesting is to see the position covered by the add-on (VAS) category with huge differential benefits (high priority) and a low level of accomplishment. It certainly represents a focus area for the future.

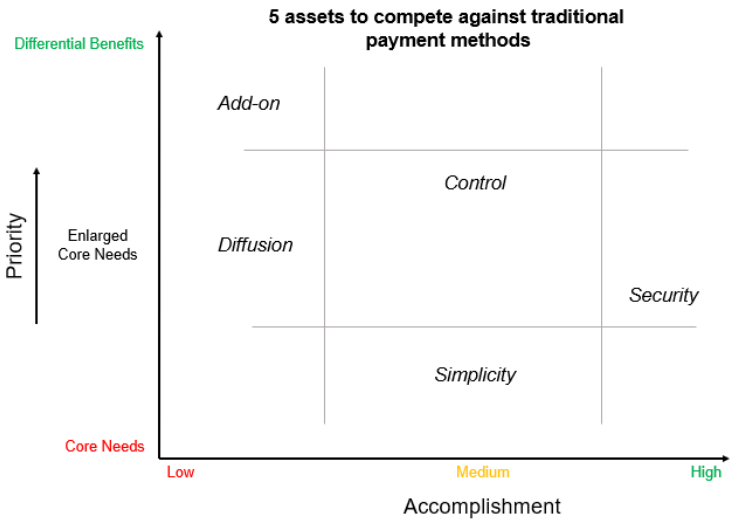

Figure 1 - Assets to compete against traditional payment methods

CHAPTER 2 – ANALYSIS

5. Methodology

The main research question tackled by this dissertation is understanding how to apply the customer experience principles to choose the set of VAS that each operator should offer to their customers.

A rather practical methodology has been adopted for the data gathering. To build the AS-IS offering of wallets there was the need of an on-the-field census, consisting in

downloading and testing 30+ wallets, complementing the discoveries with online searches when needed. A series of analysis have then been performed, aiming at shedding a light on trends and solutions proposed by banks, merchants, service providers and start-ups building intelligence via data aggregation and processing.

To select the suit of best-fitting VAS, a series of descriptive variables have been identified, scored, averaged and ranked. To increase the robustness of the results and to further validate them, interviews to operators of two wallets present in the census have been carried out.

Given that adding supplementary services to the core product increases its perceived value, VAS are deemed a key element of the wallets offering. A series of best-practices will be proposed in the work to ensure customer experience maximization. Best-practices are suggested for VAS such as mobile ticketing, mobile parking, e-couponing, loyalty programs, mobile top-ups, invoice settling, mobile ordering, e-commerce, digital identity, financial services and receipts storing. An example of proposed best-practice is the one for digital coupons. The app needs to automatically convert coupons into discounts applicable to the final bill and, among other features, the wallet should always be able to re-order the different coupons and loyalty cards in order to show at the top of the list the ones geographically closest to the user.

In regard to the second model built to assess the accomplishment of control, simplicity, security and diffusion – which are the four payment assets – a different strategy is adopted. The main inputs are census and literature review. The former is used to evaluate control, simplicity and security whereas the latter gives clarity on diffusion. Similarly to the first model built to identify the best-fitting VAS, a series of drivers have been identified to evaluate the assets. This time, contrary to what was done for the VAS model, scores are not assigned on the basis of the fit between operators'

characteristics and the descriptive variables but on a more objective basis: the census results. In fact, three ranges leading to low, medium and high scores have been identified for each driver and the positioning in the ranges was given by the census findings. Once the drivers have been scored, an average of those results has been made to obtain the level of accomplishment for a certain asset. This process was conducted for each typology of operator and then the results have been averaged to end up with general results that could be compared against those proposed by Politecnico's model.

For diffusion, the literature was used to assign a level of accomplishment, which only gives an overall view being driven by infrastructure, with no possibility to discriminate operator by operator.

6. VAS – Descriptive Variables

As shown in the following table, a series of descriptive variables (DV) have been defined to understand what are the factors that drive the natural adoption of a certain VAS, as every operator has its own set of best fitting VAS.

VAS	DV1	DV2	DV3	VAS	DV1	DV2	DV3
Mobile Ticketing	Ticket Based	Cross Selling	Loyalty Program	**Mobile Parking**	Access Capital	Store Ownership	Customer Volume
e-Couponing	Switching Costs	Repurchase Frequency	Product Perishability	**Loyalty Programs**	Switching Costs	Repurchase Frequency	Mobile Ticketing
Mobile Top-ups	Customer Volume	Agreements Likelihood	Service Based	**Invoice settling**	Offering Invoices	Service Based	

Mobile Ordering	Physical Presence	Different Cashiers	Quick-Service	**Geolocation**	Physical Presence	Promotions	
Digital Identity	Customer Data Access	Agreements Likelihood	Technological Expertise	**e-Commerce**	Online Sales	Product Based	
Financial Services	Customer Data Access	Online Services	Capital Availability				

Table 1 – Overview on VAS and relative descriptive variables

All these DV have then been scored and averaged for every VAS and for each of the four typologies of operators analysed.

7. The four assets to compete vs. traditional payments

There are four digital payment assets that are enablers for success versus traditional payment systems. These assets are diffusion, control, simplicity and security. A series of drivers have been assigned to each of those in order to make a structured and transparent assessment of the accomplishment. For each driver, a score from low to high is assigned according to pre-established ranges. As an example, one of the drivers for control is the number of clicks to check the balance. If the required clicks are ≤1 the score will be high, if 2-3 clicks are necessary the score will be medium and ≥4 low. The average of all the scores will determine the final assessment of the asset.

8. Interviews to experts

Experts were interviewed to gather further insights and validate the assumptions and results of the thesis. Mr. Jwad, interviewed in the name of Mediolanum bank, stressed the importance of CX as a key driver of success and differentiation. The expert also proposed ideas for future research such as creating a new model based on the same

descriptive variables along all the VAS and then using it to validate the robustness of current model (i.e. based on ad-hoc DV for each VAS). He felt satisfied by the quality of the model output and appreciated its originality. Mrs. Del Naja, interviewed in the name of Sisal (service provider), focused on the importance of considering the payment world as a two-sided ecosystem made of both buyers and sellers. She was satisfied by the model output and confirmed the results explaining what they are currently offering and what they will launch in the near future.

CHAPTER 3 – RESULTS

9. Analysis of the available payment solutions

An overview of census analysis and data processing will be presented in this chapter, focusing on banks, merchants, service providers and start-ups.

Banks

Regarding banks, 93% offer biometry features. The majority of the banks offer payment by card and by bank account but half of them only allows proprietary solutions. When registering to the wallet, half of the banks do not ask any information as they already have the required data, while the other half ask their customers to input all the information, either during registration or at a later stage. It is interesting to see that only a handful of banks offer social media login. To attract users, quick registration and activation procedures are in place as well as financial incentives. In terms of payment solutions, 93% of the banks offer proximity payments, 86% offer online and 71% of the banks offer P2P (person to person) payments, with 57% of the banks offering them all. Offering a great customer experience is paramount, and banks do that by offering the

most important information (i.e. balances and past transactions) in one or no clicks at all.

Merchants

As far as merchants are concerned, they are also keen in offering biometry-based features. To increase customer experience, widgets are often offered. All the wallets let users perform online and proximity payments. Instead, P2P transactions are not usually supported. Mobile ordering together with loyalty programs are the most common VAS offered by merchants, as they boosts in-store CX as well as customer retention.

Service Providers

Concerning service providers, 91% of them offer biometry features and only 9% of the wallets have widgets to streamline the access to the wallets. In terms of payment instruments, payment cards (i.e. credit and debit payment cards) and bank accounts are the most common options. 73% of service providers offer online and proximity payments (mostly based on QR technology) as well as P2P solutions in 64% of the cases. 36% of the service providers offer all the three payments options. Different strategies have been pursued regarding VAS, with some operators offering up to 8-12 VAS and many others featuring 0-2 VAS. This highlights once again the importance to create some literature addressing the VAS deployment strategy to increase consistency. Mobile top-ups, invoice settling, e-couponing, geolocation and mobile ticketing are the most common VAS in service providers wallets.

Start-ups

With regards to start-ups, biometry-based features are always present. The majority of start-ups wallets ask users to pay via prepaid accounts. As start-ups are typically not

known by the large public, all their wallets present activation promotions or referral programs as they need incentives to go mainstream. Online, proximity and P2P payments are offered by two thirds of the analysed start-ups, but none of the wallets features all the payment options, as start-ups are typically budget constrained. All P2P solutions are proprietary. 4 VAS are offered on average by start-ups wallets, with e-couponing, loyalty programs, geolocation, mobile top-ups and invoice settling being the most common ones.

10. Final rankings per typology of operator

After assigning a score to every descriptive variable, an average result per VAS and per typology of operator has been created. Here follows the overview of the scores for the 4 typologies analysed.

	Banks
Mobile ticketing	3.3
Mobile Parking	3.0
e-Couponing	5.5
Loyalty Program	4.8
Mobile Top-ups	8.0
Invoice Settling	8.5
Mobile Ordering	3.7
Geolocation	4.0
Digital Identity	4.0
eCommerce	4.0
Financial Services	7.5
Receipts Storing	2.0

	Merchants
Mobile ticketing	3.7
Mobile Parking	4.7
e-Couponing	7.0
Loyalty Program	6.2
Mobile Top-ups	3.3
Invoice Settling	2.0
Mobile Ordering	7.3
Geolocation	7.5
Digital Identity	3.0
eCommerce	8.0
Financial Services	4.3
Receipts Storing	9.0

	Service Providers
Mobile ticketing	5.3
Mobile Parking	3.7
e-Couponing	4.0
Loyalty Program	4.4
Mobile Top-ups	8.3
Invoice Settling	7.5
Mobile Ordering	3.7
Geolocation	3.0
Digital Identity	4.7
eCommerce	4.0
Financial Services	8.0
Receipts Storing	2.0

	Start-ups
Mobile ticketing	4.3
Mobile Parking	2.3
e-Couponing	6.0
Loyalty Program	5.4
Mobile Top-ups	5.3
Invoice Settling	6.5
Mobile Ordering	3.7
Geolocation	4.0
Digital Identity	3.7
eCommerce	4.5
Financial Services	5.8
Receipts Storing	2.0

Table 2 - Overview of the scores for banks, merchants, service providers and start-ups

11. Suit of best-fitting VAS per typology of operator

To define the best-fitting VAS, these results have been re-ordered and a comparison with what is currently offered on the market has been done showing what current VAS choices are supported or challenged by the model. Here follow the tables showing the comparison between model's output and current offer on a per typology of operator basis.

For banks, out of the 5 VAS deemed to be best-fitting by the model, only 1 differs from current offering. In fact, the model proposes loyalty programs instead of the currently offered geolocation. This choice highlights the need for banks to improve their customer retention mechanisms to contrast fierce competition.

Banks: comparison between analysis results and current offering		
Results		**Current offering**
Invoice Settling	⇒	Geolocation
Mobile Top-ups		e-Couponing
Financial Services		Mobile Top-ups
e-Couponing		Invoice Settling
Loyalty Program		Financial Services

Table 3 - Comparison model results vs. current offering for banks

Also for merchants, 4 out of the 5 proposed VAS are aligned with current offering. as a fifth VAS, the model proposes e-couponing instead of the currently offered loyalty programs. E-couponing is a strong asset for merchants to contrast low switching costs and boost sales by increasing the repurchase frequency of customers.

Merchants: comparison between analysis results and current offering		
Results		**Current offering**
Receipts Storing	⇒	Loyalty Program
e-Commerce		Mobile Ordering
Geolocation		Geolocation
Mobile Ordering		e-Commerce
e-Couponing		Receipts Storing

Table 4 - Comparison model results vs. current offering for merchants

Slightly weaker alignment for service providers, with 3 out of 5 VAS aligned to current offering. Financial services should be offered as there is a strong alignment between the VAS's value proposition and the core business of service providers. Loyalty programs are instead deemed essential for service providers due to medium-to-low switching costs and good synergies with mobile ticketing.

Service Providers: comparison between analysis results and current offering		
Results		**Current offering**
Mobile Top-ups	⇒	Mobile Top-ups
Financial Services		Invoice Settling
Invoice Settling		e-Couponing
Mobile Ticketing		Geolocation
Loyalty Program		Mobile Ticketing

Table 5 – Comparison results vs. current offering of service providers

A strong alignment is present between tool output and current offering for start-ups with four out of five VAS corresponding. Financial services are believed to be another key feature for start-ups as many new fintech companies are making their way into the financial world and the start-ups here analysed are all service providers in their early stages of life.

Start-ups: comparison between analysis results and current offering		
Results		**Current offering**
Invoice Settling		e-Couponing
e-Couponing		Loyalty Program
Financial Services		Geolocation
Loyalty Program		Mobile Top-ups
Mobile Top-ups		Invoice Settling

Table 6 - Comparison model results vs. current offering for start-ups

12. Payments: assessment of the four competitive assets

By assigning scores to the drivers of control, simplicity and security and by investigating the literature insights for diffusion, a final assessment of the accomplishment for the 4 assets has been made. The following table shows the aggregated view on the results.

Assets	**Level of Accomplishment**
Control	High level of accomplishment
Simplicity	Medium level of accomplishment
Security	High level of accomplishment
Diffusion	Low-to-medium level of accomplishment

Table 7 - Aggregated view on accomplishment level for each asset

Control improved its position, passing from a medium level of accomplishment attributed by Politecnico di Milano to a high level of accomplishment. Moreover, diffusion passed from a low to a low-to-medium level of accomplishment.

13. Conclusions

Core findings and traits of originality

The thesis presents a series of traits of originality. First of all, given the differences in VAS strategies amongst operators there is a clear need of enhancing the overall industry alignment on the guidelines for VAS strategy creation. Starting from a census of 30+ wallets, data was initially gathered and then processed and aggregated, generating new insights and intelligence that could not be found in the literature prior to this research, representing the first trait of originality. A second trait can be identified in the definition of best-practices for each VAS. In fact, it is not possible to find in the existing literature clear guidelines on how to structure and present wallet's VAS to maximize CX. The model built to shed light on this aspect clearly represents the third trait of originality, as never before a model was built to suggest the best-fitting VAS to a specific typology of operator based of their characteristics. Flexibility, adaptability and transparency are the key strengths of the proposed model. The fourth and last key trait of originality comes from the second model built to assess the accomplishment of simplicity, control, security and diffusion, the four digital payment assets. Never before a structured model was proposed to test such digital payment assets.

Value and contribution to theory and practice

The two models proposed in this dissertation bring contributions both to theory and to practice. The VAS model stands completely apart from existing models in the literature. The assets model starts from existing literature but creates a new way to assess the assets accomplishment starting from the wallets census and the literature findings. The contributions to the practical domain are also clear, as managers and

practitioners can refer to the two models created and gain further insights to educate their decision-making process. In fact, not only they can look at the proposed VAS or at the assets evaluation, but they can also look at the underlying drivers, variables and assumptions to better shape their actions.

Descriptive, normative and/or methodological value

The dissertation has a clear methodological value, tackling rather soft and unstructured issues with structured models. In fact, both the VAS model and the assets model present a clear structure that leads to predictable and transparent results.

Limitations of the thesis & Opportunity for future research

The dissertation presents a series of limitations. The number of wallets censed is one of those, as more wallets could have increased the quality of the results. Future research could increase the number up to 80 wallets. Moreover, all the descriptive variables are shaped on the associated VAS, leading high quality results but also to difficulties in comparing the scores attributed to the VAS, due to the lack of a common scoring basis. Future research could be based on the same descriptive variables across all the VAS, which would simplify the model. Additionally, a further split of the biggest typologies of operators (i.e. banks and service providers) would increase the quality of the results, as those categories might lack the necessary level of granularity. Finally, the two models proposed focus on the buyers, whereas another key element of a payment ecosystem is represented by sellers and the payment infrastructure. Future research could tackle that aspect, finding innovative ways to incentivize sellers.

CHAPTER 1 – LITERATURE REVIEW

1. Introduction to scientific literature review

The literature review aims at investigating scientific and non-scientific literature to further understand the C*ustomer Experience related to Mobile Wallets*.

Therefore, the literature review focuses on two main domains: *Customer Experience (CX)* and *Mobile Wallets*. Once the two topics are explored individually, the research will focus on how the two interact to maximise the value offered to customers (mainly end consumers).

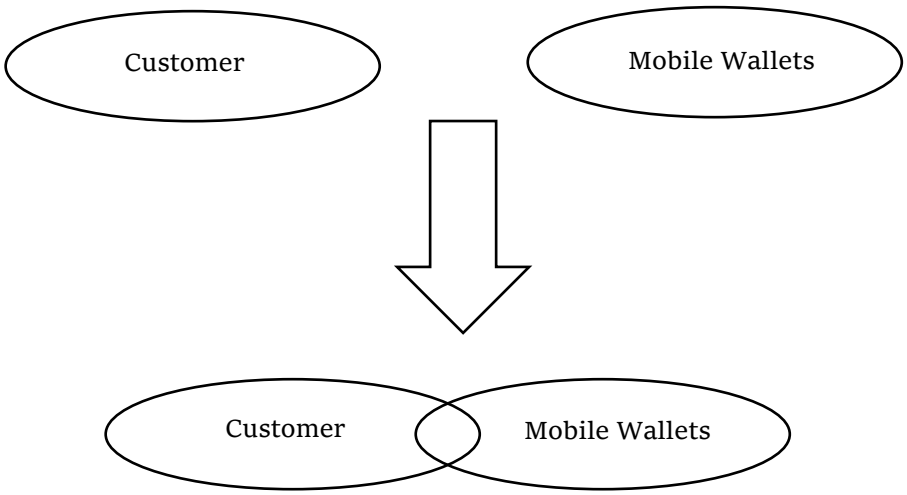

Figure 2 - Logical path followed to conduct the research

The research on customer experience mainly focuses on understanding its nature and the drivers that guarantee a high level of customer satisfaction. This investigation on customer experience focuses on domains such as Digital and Mobile Wallets.

On the other side, the research on mobile wallets aims at understanding the different technologies that constitute the final product that enables consumers

to pay with their smartphones or wearables. Moreover, once a certain level of understanding on the functioning of mobile wallets is reached, further research will be conducted with the aim of understanding global trends and current situation of the different countries, with particular focus on Italy and Belgium, as well as the regulatory framework and current offering on the market.

2. Scientific literature review - Methodology

To conduct the systematic literature review, a series of structured steps have been followed. The following picture gives a clear view of the aforementioned process:

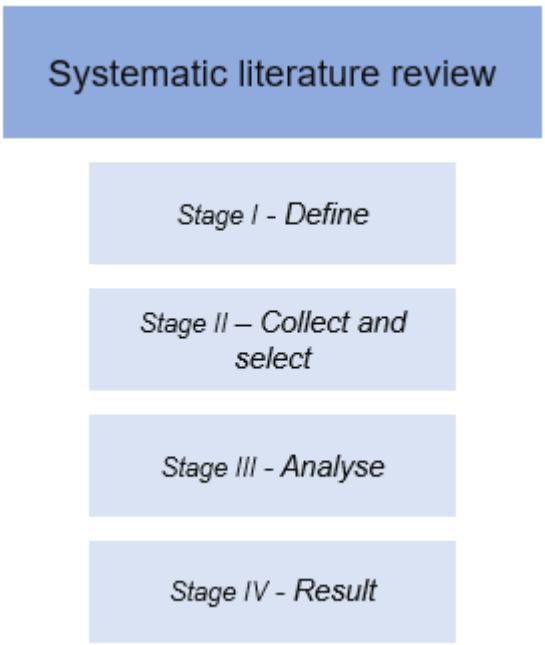

Figure 3 - Systematic literature review framework **Errore. L'origine riferimento non è stata trovata.**

Define

Therefore, first of all, a need for the literature review has been identified. The scope of the literature review is to build knowledge over existing CX models in

the mobile wallets and digital spheres. This is to stimulate critical thinking over existing solutions. Furthermore, the literature review wants to gather insights over the technical functioning of mobile wallets as the perfect CX is the result of synergies between hardware and software.

Collect and select

The collection and selection phase started with the identification of the keywords to be used for the research. The following keywords have been mainly typed:

- *Customer experience mobile wallets*
- *Consumer experience mobile wallets*
- *Customer experience digital*
- *Customer experience e-Commerce*
- *Consumer experience digital*
- *Consumer experience e-Commerce*
- *Customer experience mobile wallets models*
- *Customer experience models*
- *Customer experience classification models*
- *Mobile wallets functioning*
- *Mobile wallets technology*
- *Mobile wallets*
- *Mobile wallets news*
- ...

These keywords have been typed into different browsers to ensure the results' spectrum to be as wide as possible. The library service that Politecnico di Milano offers to its students represented a key source for academic papers and documents (Politecnico di Milano subscribes to various scientific journals and grants access to students). To gather an even higher number of articles, other sources of academic papers have been used. For this purpose, Google Scholar and Scopus have been widely used. Being the topic fairly recent, evolving and still blurred under certain aspects, it is clear that academic papers alone would have not offered the big picture on mobile wallets and the associated customer experience. This is because the breadth of academic literature is currently not ample enough. To obviate to this academic gap, other sources have been used (i.e. consulting companies' reports, newspapers articles, weekly news review from Observatory of Mobile Payment & Commerce team, ...).

At the end of this *collect and select* process, 2417 papers and articles have been identified of which 22 were duplicates. Not factoring in the duplicates, the count of papers and articles equals 2395.

Analyse

When analysing the documents, the attention was mainly directed to their abstracts. This helped to understand the content of the papers without reading them all. This results in enhanced efficiency in the high-level analysis of the documents keeping however a fair grade of accuracy (i.e. sometimes papers/articles titles are misleading, hence the need to investigate the abstracts

for a higher-quality first analysis). After reading all the abstracts, a major cut to the number of useful articles was given: only 136 papers and articles were left.

The analysis of the full text brought to a further shrink in the overall number of articles eventually included for the scope of this work. In fact, only 94 articles and papers have finally been included.

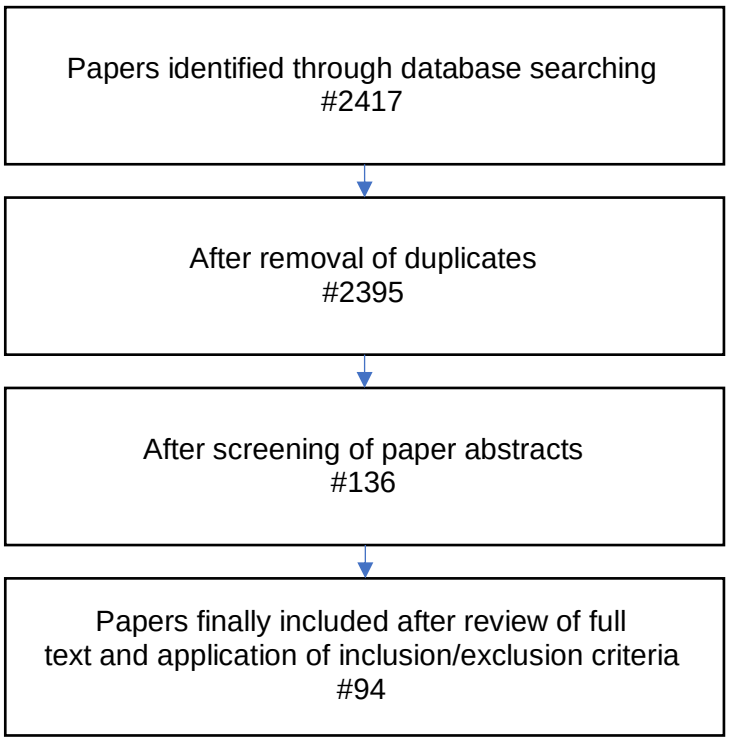

Figure 4 - Number of articles and papers selected in each step of the systematic literature review

The *analysis* phase involved a further step: the categorization of the included articles. This represented a key step of the work, since the same categorization was later used to structure the exposure of the systematic literature review hereafter presented to the reader.

Here follows the chosen classification:

- Mobile wallets
    - Definitions
    - Overview of the infrastructure in Italy
    - Overview of the infrastructure in Belgium
    - Mobile wallets vs local realities/local issues
    - Regulatory framework
    - Technological solutions
    - Current players solutions
    - Future technologies
- User experience
    - Digital customer experience
    - Mobile wallets customer experience

Result

A summary of the articles has been made to ensure a better data extraction out of the 94 papers that were left after the screening and selection processes. This was a key step that ensured an easier re-organization and re-structuring of the content of the papers. The content will be presented according to the categorization just presented in the Analyse paragraph.[2]

[2] (Silva, 2016)

3. Mobile wallets

In this section, the literature review will focus on providing a neat understanding of mobile wallets, their functioning, major trends and a legislative overview.

3.1. Definitions

It is paramount to give definitions to clarify the subject of the dissertation.

Digital payments are payments made via electronic means of payment – credit cards, phone credit, e-wallets, direct debit to account (i.e. payments made via Home and Mobile Banking are not included) – to purchase goods and services.

Old Digital Payments are payments made via credit card at traditional POS, while (New) Digital Payments include all the innovative payments, such as:

- *e-Commerce*: online purchases of goods and/or services paid via payment cards or mobile wallets.
- *e-Payment:* payments of subscriptions, phone credit, invoices, taxes and fines via online systems and using payment cards and/or mobile wallets – excluding payments via Home Banking.
- *Mobile Payment & Commerce:* purchase of goods and services via mobile phones. Here are included both Remote and Proximity purchases.

Mobile Payment & Commerce can be divided into:

  - *Mobile Remote Commerce:* purchases of goods and services made via mobile sites or apps. The whole purchase process happens via

either of the channels and the payment will be made via payment cards and/or e-wallets.

- *Mobile Remote Payment:* payments of subscriptions, phone credit, invoices, parking, transport tickets, car rentals, ... via mobile phones. The payment will be made via payment cards, phone credit and/or e-wallets.
- *Mobile Proximity Payment:* payments at sales points via phones exploiting proximity technologies such as QR codes, geolocation or NFC technology. The payment will be made via payment cards, bank account and/or mobile wallet.
- *Mobile Proximity Commerce:* services supporting the in-store purchase experience, as coupons, loyalty services and extra information via NFC tag.
- *Contactless Payment:* payments with (debit, credit or pre-paid) cards with contactless RFId (Radio-Frequency Identification) tag.
- *Mobile POS:* payments via hardware/software-based solutions that transform your smartphone in a tool to accept card payments.[3] (Valeria Portale, Overview del Mobile payment & commerce in Italia nel 2016, 2016)

[3] (Valeria Portale, Overview del Mobile payment & commerce in Italia nel 2016, 2016)

"Small bank account holders seem ready. Contactless payments registered a +700% in the last few years. New digital payments are over € 30 billion (+51% in 12 months). Electronic payments will reach €100 billion in 2019." [4]

It is clear that there is great value to be captured out of the mobile wallets' revolution. Shopkeepers and retailers want to take part to it. As an example, the restauration sector is firmly betting on the Order&Pay functionalities (i.e. mobile ordering), meaning the possibility to make orders and send payments from remote, before even entering the shop. Starbucks is a great example: the retailer registered 7% of its transactions in remote via Order&Pay functionalities.

Starbucks is not the only big retailer betting on this technology. McDonald's, Tim Horton and Burger King announced the launch of the Order&Pay service in many overseas and European markets such as USA, Canada and France. [5] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)

According to a research conducted by Criteo, European retailers with a shopping app today generate 54% of their sales via mobile. This is explained by the ever-increasing app addiction among acquirers and by the mobile-first vision that very often defined marketing strategies worldwide. The power of having mobile apps is great: conversion rates for shopping apps has been threefold the standard conversion rate (4%) of mobile web.[6]

[4] (Martino, Se il CC te lo gestisce Amazon, s.d.)
[5] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)
[6] (Terlizzi, 2018)

It is therefore clear that future winners will be the ones better able to read and elaborate clients' data to build a tailor-made mobile profile.[7]

One of the biggest challenges for sellers is to develop interoperability between different mobile payment solutions. Merchants and other typologies of operators such as banks and service providers will indeed be responsible of guaranteeing the interconnection among different payment tools. It is therefore up to them to accept them all, to leave to the customer the choice of which mobile payment solution satisfies the most their needs.

This is not an easy task for merchants and Claudia Bruschi, Decathlon's IT cashing and payment-engineer confirms it. Eng. Bruschi said: "With the level of market fragmentation present in Italy, it is difficult to find the most adopted solution by customers" (50% of payments are still cash transactions). She added: "There is also a problem of integration between hardware and software: there are simply not enough physical buttons that could be pressed on the POS. Once a new payment service is introduced, it is necessary to calculate the economic investment to deploy it all over the network. When evaluating the investment, another important factor that should be considered is personnel formation to guarantee an optimal customer experience."[8]

According to an analysis conducted by Doxa for the Mobile B2C Strategy Observatory of Politecnico di Milano, smartphones are one of the most relevant

[7] (Martino, Se il CC te lo gestisce Amazon, s.d.)

[8] (Calabresi, Crescono i pagamenti digitali: nel 2017 spesi 220 miliardi, il 28% di tutti i consumi, 2018)

objects in everyone's life. It is the last thing that 59% of Italians look at before falling asleep, the first one that they look at in the first 5 minutes after waking up. A shocking 36% does that right after opening their eyes. Smartphones are kept in the 60% of the cases in the proximity of the bed, in a position easily reachable from the bed itself. Only 24% of people turn their smartphones off during night time. During breaks, 97% of surveyed people use their smartphone. Smartphones are now the perfect substitute of telephone book, camera, alarm and maps.

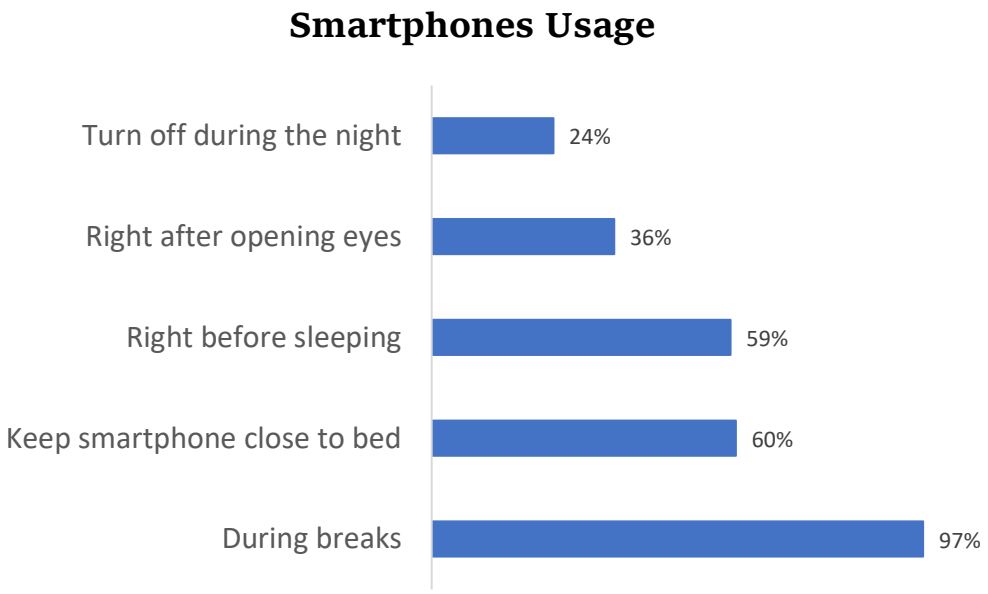

Figure 5 – Daily usage of the smartphone 8

In many cases it is already also becoming the perfect substitute of wallets (50% of the sample has money in their smartphone). 16% has payment cards, 31% loyalty cards, 12% discount coupons, ...

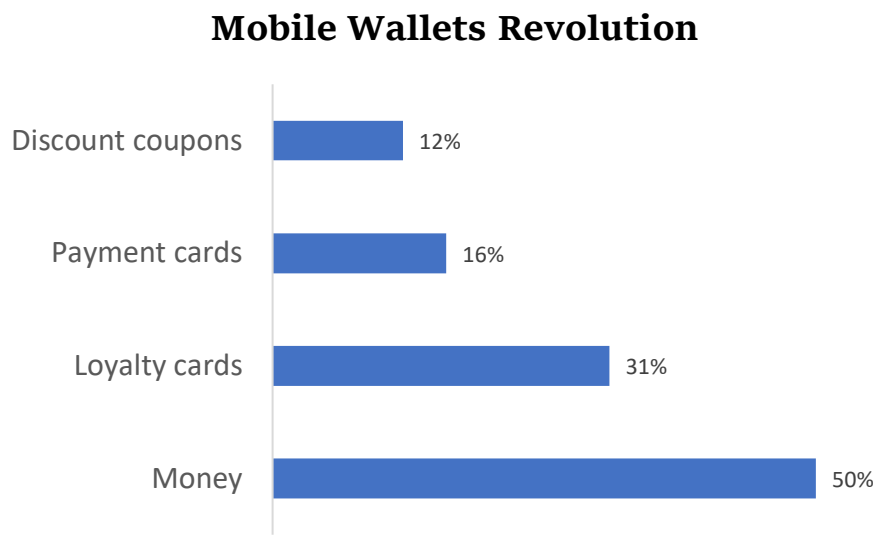

Figure 6 – How mobile wallets are substituting smartphones [8]

63% of mobile surfers would like to have a single app into which digitalize all the content of their physical wallets. [9]

The aforementioned scenario makes it easy to understand why there is plenty of initiatives worldwide to boost mobile wallets adoption. Given the figures revolving around the mobile world and considered people's love for smartphones in general, investing in creating a top mobile wallet customer experience is a must.

This is why there is nowadays a huge focus from many different players (i.e. banks, retailers, small businesses, ...) on developing new mobile technologies, forming alliances or, more simply, business partnerships to generate new and innovative business models.

[9] (Gomarasca, 2018)

The effort is triggered by the expected prize: different actors are not only looking at direct benefits, linked to enhanced revenues and profits. They are also looking at indirect ones, those related to the enormous amount of data they can get to learn about customers' purchase behaviours.

Certainly, there is not enough space for everyone in the industry. Unitary margins are little, hence to be competitive having a great scale gives you an edge over competition. [10] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

3.2. Overview of the infrastructure in Italy

Italy benefits from an excellent infrastructural basis for the acceptance of digital payments (i.e. POS, ...) and a good diffusion of payment cards, aligned or superior to the most developed European countries. This is a clear indicator of how well the financial system worked in the past to create the right condition to support the expansion of digital payments. Nevertheless, we are among the worst European countries in terms of actual utilization of digital payments.

In fact, 1 out of 5 cards and 1 out of 4 POS are contactless, but only 1 out of 85 transactions and 1 out of 200 euros are transacted via Proximity payment methods.[11] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)

[10] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

[11] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)

Considering how developed is the country's infrastructure, it is now key to work on enhancing the perceived value of both sellers and acquirers.

e-Commerce transactions in Italy are worth more than €20 billion (+10% yoy). Instead, ePayments are worth €7 billion (+60% yoy) among which contactless payments (via both payment cards and smartphones) skyrocketed (+150% yoy) to €18 billion with 400 million transactions. According to Politecnico di Milano's forecasts, in 2020 the latter will be worth something between €50 and €90 billion.

Always related to mobile payments, P2P (peer to peer) transactions and mobile remote commerce represent other booming areas. Forecasts project the value of mobile commerce somewhere between €13 and €16 billion in 2020. [12]

In 2017, smartphone payments grew at +65%, passing €5.8 billion. More than 8 million parking tickets have been paid via smartphones. Car and bike sharing are other expanding areas of mobile payments, seeing a +41% yoy growth (topping at 76 million transactions). [13]

3.3. Overview of the infrastructure in Belgium

From Statista, a well-known statistics portal, it is possible to retrieve some interesting data that give a clear overview of the situation in Belgium.

Here follows a graph showing the growing value of card transactions from 2001 to 2017:

[12] (Netti, 2018)
[13] (LaStampa, 2018)

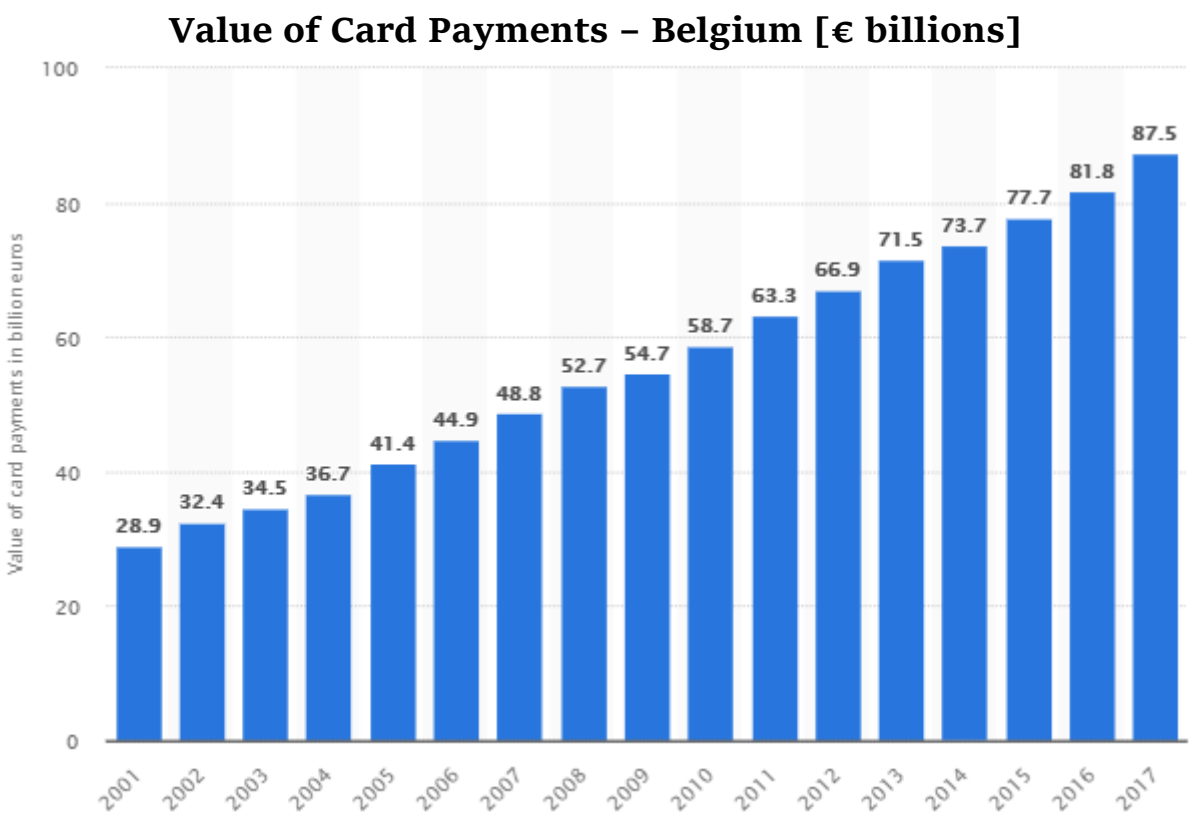

Figure 7 – Value of card payments from 2001 to 2017 [14]

The value of card transactions increased on a steady basis over the whole period topping at € 87.5 billion in 2017.[15]

Merging these data with that contained in the following graph, it is possible to obtain the value of e-payments. In fact, the following graph shows the relative importance of payment services in 2017.

[14] (Stipp, 2018)
[15] (Stipp, 2018)

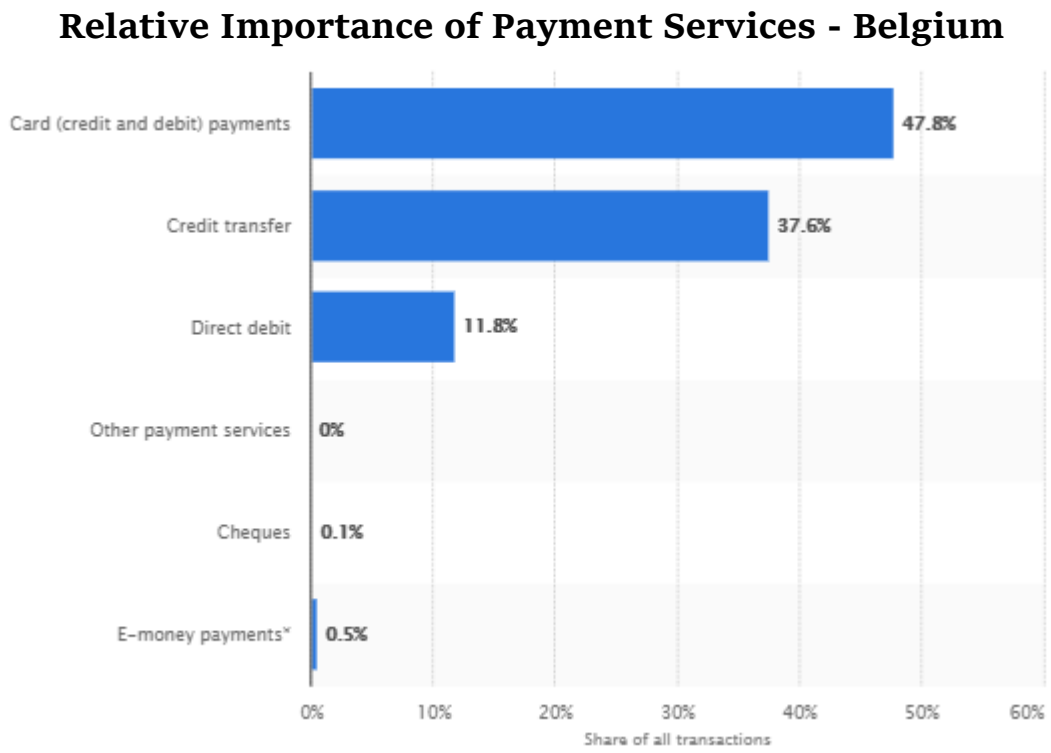

Figure 8 - Relative importance of payment services or instruments as share of total transaction numbers in Belgium as of 2017 [16]

Card payments represented 47.8% of the total transactions, accounting for 87.5 billion euros, as previously said. On the contrary, e-payments represented only the 0.5% of the transactions. This means that e-payments accounted for less than 1 billion euros in 2017. [17]

Therefore, in Italy mobile payment services are more developed than in Belgium. This is mainly because in Belgium card payments are more relevant than cash payments. Hence, Belgians already switched from cash to card payments and the perception of marginal gain coming from e-payments is lower than that passing from cash to e-payments for Italians.

[16] (Greenfield, 2018)
[17] (Greenfield, 2018)

3.4. Mobile wallets vs. local realities/local issues

Mobile wallets and mobile payments are not only fresh, cool and trendy. They help to solve issues at both local and regional levels. A clear example of the advantages of having mobile wallets is the reduction of cash transactions until potentially obtaining a *cashless society*.

According to estimates from Politecnico di Milano's Observatory, cash management in Italy costs around €9.5 billion per year. This estimate comes from different subfactors, such as:

- €4.9 billion cost burden on banks' system to transport, count and manage cash;
- €3.4 billion cost burden on merchants to transport, manage, keep safe cash and for opportunity-costs related reasons;
- €1.2 billion cost burden on consumers to withdrawal and deposit costs, thefts and losses of cash.

On top of this, €27 billion of missed inflow to the treasury are to be factored in. This comes from the illicit activities enabled by the intrinsic non-trackability of cash.

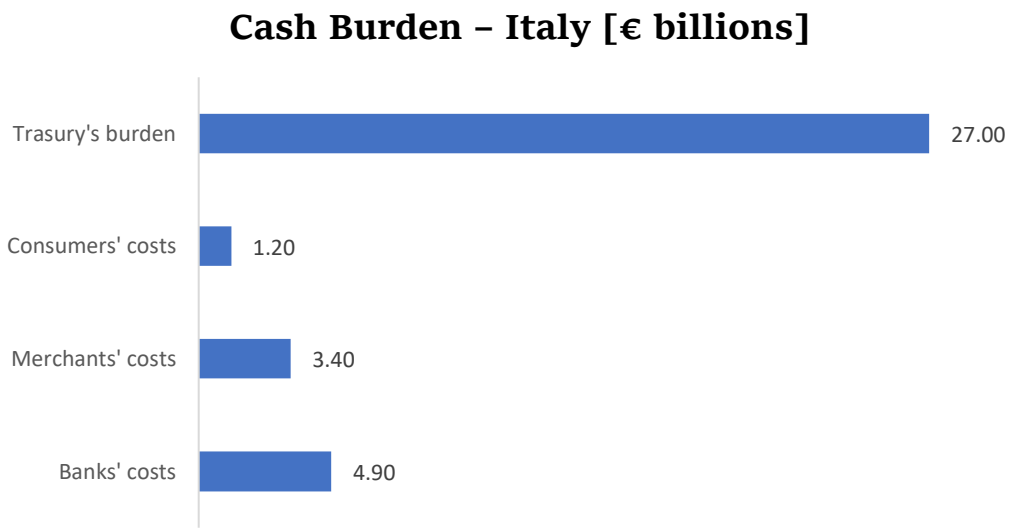

Figure 9 - The burden of having and managing cash in Italy

The total cash burden tops at 36.5 billion euros per year. [18] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)

According to another study conducted by The European House – Ambrosetti, cash-related costs equal 0.5% of Italian GDP. The study estimated that if Italy aligns to the European average cash utilization, up to €1.5 billion could be saved.

Filippo Mastropietro, EY partner, says that every society would largely benefit from the introduction of a cashless payments model. This would in fact reduce the size of black market, of fiscal evasion, of cash production and management operative costs. A further benefit would be an enhanced safety and a reduction of thefts. [19]

[18] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)

[19] (Martino, All'Italia il primato europeo sul cash: costa lo 0,5% di Pil, 2018)

Mobile wallets and payments play a key role in the fight against cash payments. This transition to digital means of payments should not happen at the costs of customer experience. However, in many cases, digital payments can largely simplify purchase processes resulting advantageous also for the final consumer.

A clear example of this is the Milanese public transport company ATM that is installing Points of Sale (POS) in all the 113 metro stations of the city. The new payment system will improve clients' travel experience not only for the easiness of purchase (the only required action to purchase a ticket is to place the travellers' smartphone or credit card near the card reader as if it was a normal public transport subscription) but also for the fact that customers will not select anymore the wrong tariff, enabling them to avoid fines. [20]

Milano is not the only city pushing digital payments for public transport.

"London's public transport network also appears to be operating as a gateway drug for mobile payments, with around one in eight contactless journeys in London now being made using a mobile phone or smart device." [21]

3.5. Regulatory framework

Now that the overview on mobile wallets and, more broadly, digital payments is clear, it is worthwhile to briefly investigate what is the regulatory framework of reference.

[20] (MilanoToday, 2018)
[21] (Finextra, 2018)

Saturday 13th January 2018, the new directive PSd2 entered into force.

Figure 10 - PSd2 Timeline [22]

PSd2 stands for Payments Services directive 2 and it represents the directive that will completely revolutionize the payments world. In fact, the directive has been thought out to harmonize rules in the different European countries but also to enable and support the development of digital payment services.

PSd2 aims in fact at creating a unified and integrated market for payment services. Furthermore, it will decrease entry barriers to allow new operators to enter the game and increase the overall level of competition at the favour of end consumers. This enhanced competition will translate into an enhanced security level of the system, enabling new payment services, guaranteeing transparency

[22] (Meta, 2018)

and a correct level of competition to the advantage, once again, of end consumers.[23]

Many analysts think the PSd2 represents the key actor to enable the digital transformation in the bank system. This is because the new directive will open the market to new players that did not have the possibility to take part to the game before. This trend takes the name of Open banking, which is a more flexible and dynamic way of thinking about the banking system.

Indeed, the directive offers to consumers a broader range of choices since they can also use services not offered by traditional banks. It is now possible to make payments, open loans or invest via services offered by Third Party Providers (TPPs).

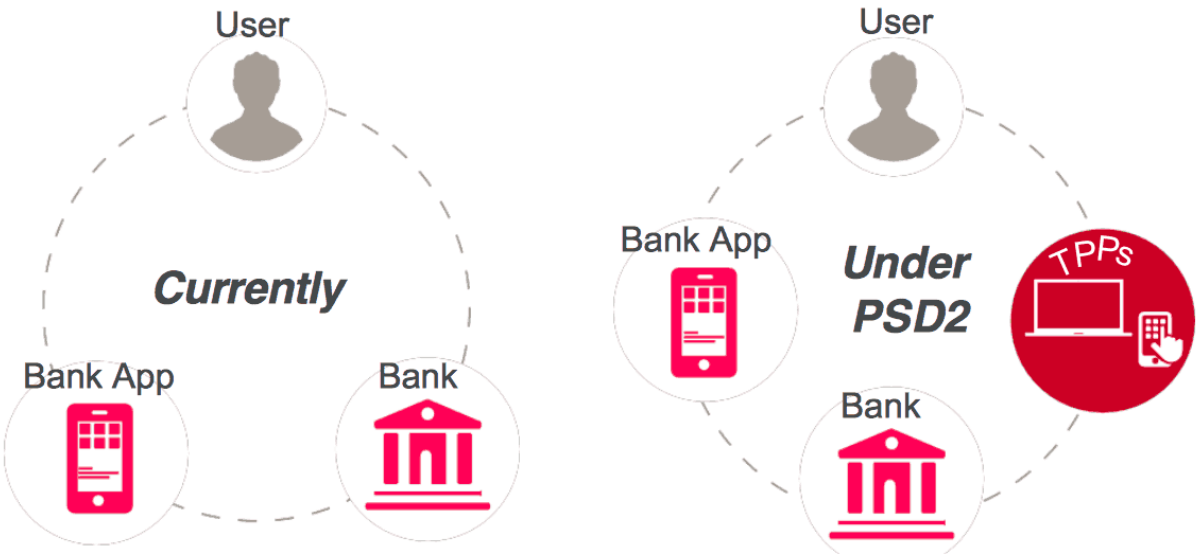

Figure 11 - Difference between before and after the introduction of the new PSd2 [24]

[23] (Meta, 2018)
[24] (GLC, 2018)

The direct consequence of this is an improved customer experience and an increased protection of consumers in terms of avoidance of additional charges for choosing digital means of payment.

Moreover, customers will benefit from the AISP (*Account Information Service Provider*) business model which is a service able to give all the information related to the different banks/payment accounts owned by the payer/consumer via a simple online interaction.

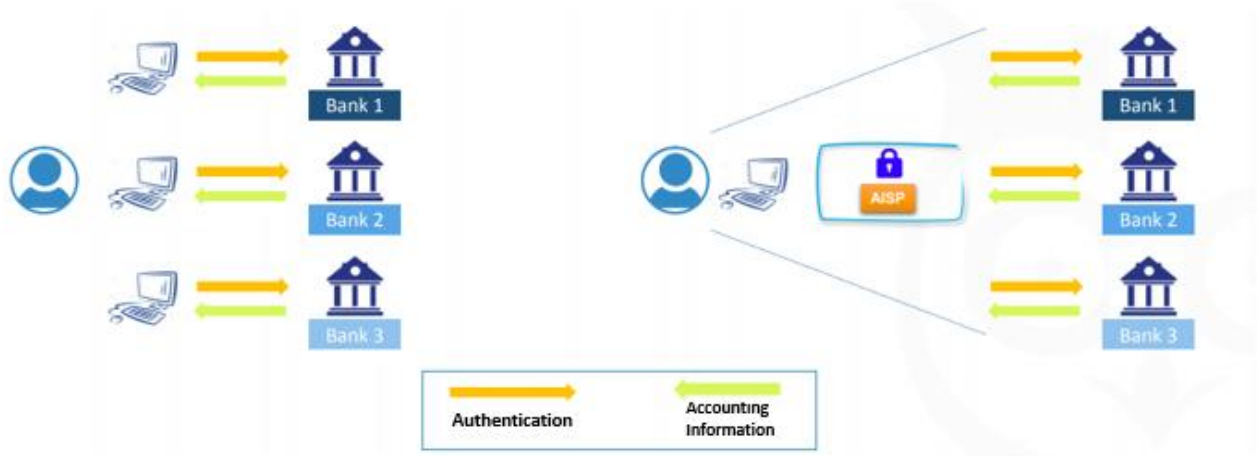

Figure 12 – Open Banking [25]

Another possible business model is the PISP (*Payment Initiation Service Provider)*. This business model gives to the client the possibility to authorize a

[25] (TasGroup, 2017)

service provider to access his/her own bank account and let the provider make the payment on the clients' own name.

The following images help understanding how the payment process looks like with and without Payment Initiation Service provider.

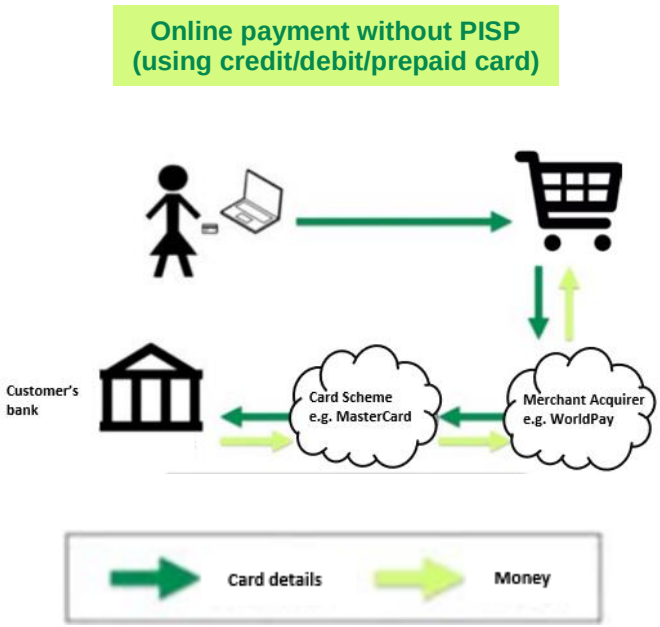

Figure 13 - Third Party Payment Service Provider: PISP [26]

As it is possible to see from the above visualization, today banks are the only ones having the possibility to access clients' bank account data.

[26] (TasGroup, 2017)

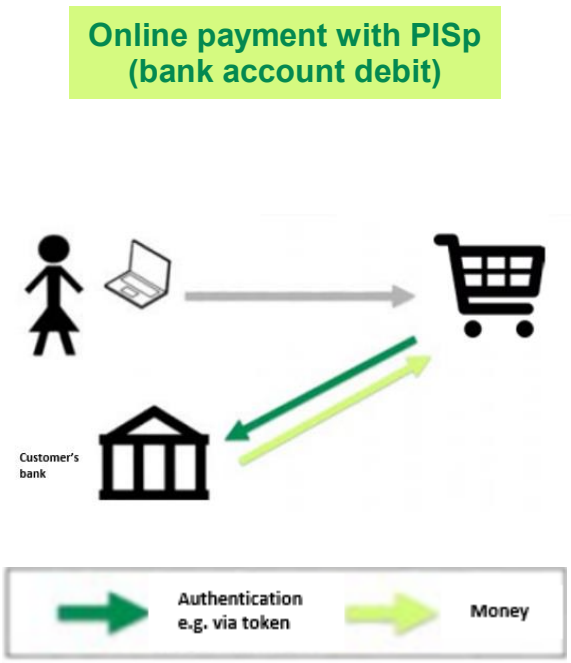

Figure 14 – Online payment post PSd2 [27]

After the introduction of the PSd2, with the PISP business model, new payment options will enable third parties to directly make transactions with the clients' bank account under his/her direct supervision, greatly simplifying the process.[28]

Mr. Asaro, researcher at Politecnico di Milano, declares that there are not yet direct effects of the PSd2. Still, Asaro says that the directive forced traditional banks to push innovation processes to anticipate possible new entrants. [29]

[27] (Meta, 2018)
[28] (Meta, 2018)
[29] (Spagnuolo, Samsung Pay e gli altri: quanto spendiamo con i pagamenti digitali, 2018)

Retailers will have the possibility to accept customers payments bypassing any form of intermediation. This will grant them higher efficiency, payment-related costs reduction and a faster refunds procedure activation. [30]

This regulatory framework represents a menace to traditional banks: "89% of them declares to be frightened by Fintech firms, especially with respect to loans and payments".

Hi-tech giants are certainly to be factored in the equation, since in the so called GAFA (Google, Apple, Facebook and Amazon) era, winners are those who have the "control" on clients. [31]

In fact, Amazon is already negotiating with big banks such as JPMorgan Chase & Co. to create a product similar to a bank account to be directly offered to its clients. Because of its millions of clients, data files, access to low-cost capital and pression from investors to start new and more profitable activities, Amazon – as well as the other tech giants – is a fearsome competitor for banks. [32]

3.6. Technological solutions

Before talking about what big players are currently offering on the market, a high-level explanation of the most important technologies supporting mobile wallets is a must. On this matter, an overview on secure element positioning, near field communication, tokenization and session key will be provided to the reader.

[30] (Bellini, 2018)
[31] (Martino, Se il CC te lo gestisce Amazon, s.d.)
[32] (Liberatore, 2018)

Secure element positioning

One of the key decisions to be made when building a mobile wallet is where to locate the secure element.

As it is possible to read from the Rambus website, "*Alongside an exceptional user experience, robust security is key to driving consumer adoption. To deliver secure services, application issuers need to store user credentials in an environment called the secure element (SE)*." On the Rambus website, it is as well possible to find the definition of SE:

"*An SE is a tamper-resistant hardware platform, capable of securely hosting applications and storing confidential and cryptographic data. The highly-secure environment provided by the SE protects the user's credentials. In the finance industry for example, SEs are used to host personalized card applications and the cryptographic keys required to perform financial (EMV) transactions at a point-of-sale (POS) terminal.* "

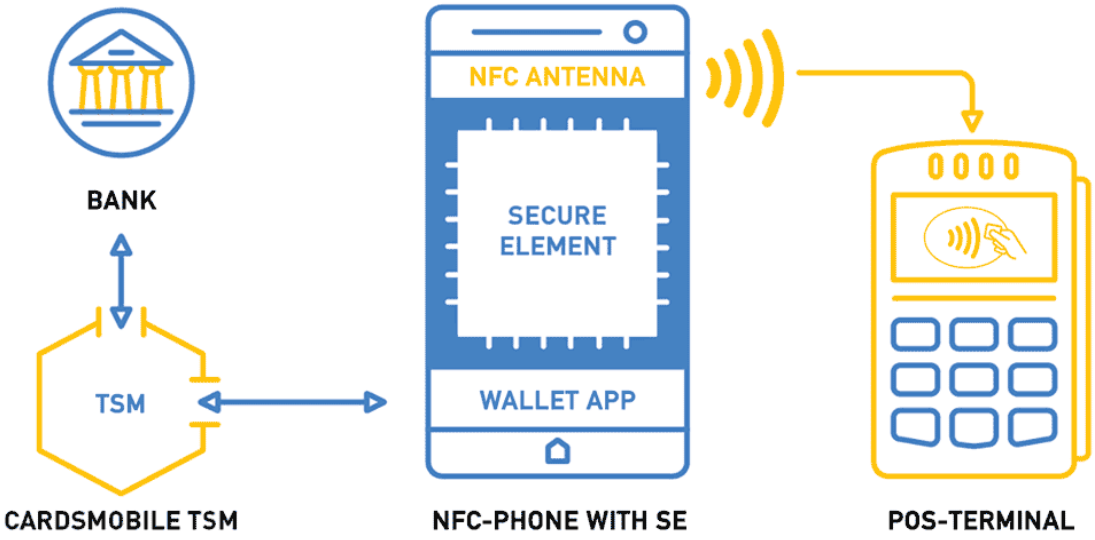

Figure 15 – Secure element positioning in an NFC phone [33]

There are three main configurations for SE: cloud-based, SIM-based and device-based. [34]

Cloud based (or HCE – Host Card Emulation): as it is possible to read from the well-known tom'sHARDWARE technology website, "*HCE is essentially a cloud-based Secure Element, where the emulation of the card happens on the device while using a virtual credit card number. Then, that number is verified on the mobile payments provider's servers. After that, the real credit card number is sent to the merchant to authorize and complete the transaction*." [35] Cloud-based solutions are not the most secure ones and privacy-related issues regarding data may arise. They benefit from multiple ways of securing the credit card data, although they

[33] (Savchenko, 2015)
[34] (Valeria Portale, Le soluzioni di mobile proximity payment a confronto: chi vincerà la sfida?, 2015)
[35] (Armasu, 2015)

ultimately depend on how much companies providing the service are willing to invest in securing that data. Also in terms of privacy, as it is possible to read from tom'sHARDWARE website, "*HCE can also receive a smaller grade than Secure Elements. The mobile payment providers can see who uses a certain credit card number, and then they can even choose to share that data further with merchants or other companies for commercial and advertising purposes. This is something Google has already done with Google Wallet*." [36]

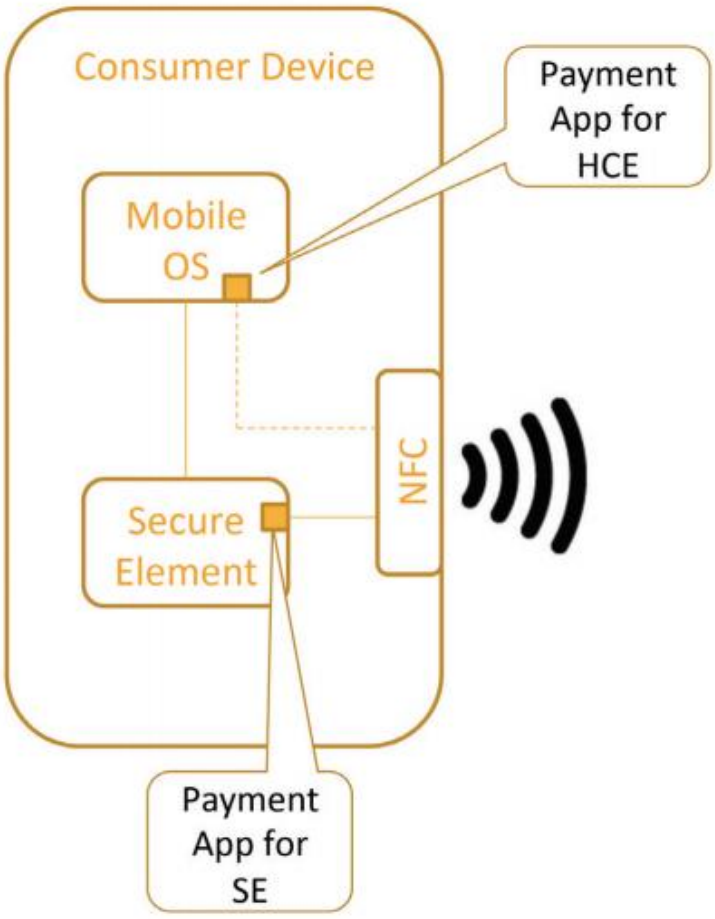

Figure 16 - difference between SE and HCE in the handset [37]

[36] (Armasu, 2015)
[37] (Steve Pannifer, 2014)

This image represents the difference between SE (device or SIM based and HCE).

As it is possible to read in a discussion paper from Consult Hyperion, "*In SE NFC payments, the application (or "payment app") containing the payment credentials (i.e. secret cryptographic keys) are stored in a tamper-resistant hardware module referred to as the SE. The SE has a direct connection with the NFC controller/antenna. Typically, this would be the SIM SE (also referred to as the UICC) owned by the mobile operator, meaning that the mobile operator would need to be involved in provisioning of the payment app.*" [38]

The article continues talking about the SE device-based: "*Android 4.4 KitKat now additionally allows a payment app located in the mobile phone operating system (i.e. held in software) to also communicate directly with the NFC controller/antenna. This allows app providers to load payment apps directly into the handset via an app store and, as the SIM SE is not being used, without needing to involve the mobile operator.*" [39] (Steve Pannifer, 2014)

Tokenization and Session key

To ensure an even higher level of security, tokenization and session key are valid techniques.

A token is a surrogated value of payment credentials with limitations in terms of validity (i.e. time, number or total worth of transactions and merchant

[38] (Steve Pannifer, 2014)
[39] (Steve Pannifer, 2014)

typology). The token is saved within an app (i.e. mobile wallet) in case the HCE (Host Card Emulation) solution is chosen or otherwise directly in the physical secure element. When transacting, the wallet sends to the POS the token instead of the real card credentials.

The following picture helps explaining how a tokenized transaction process works:

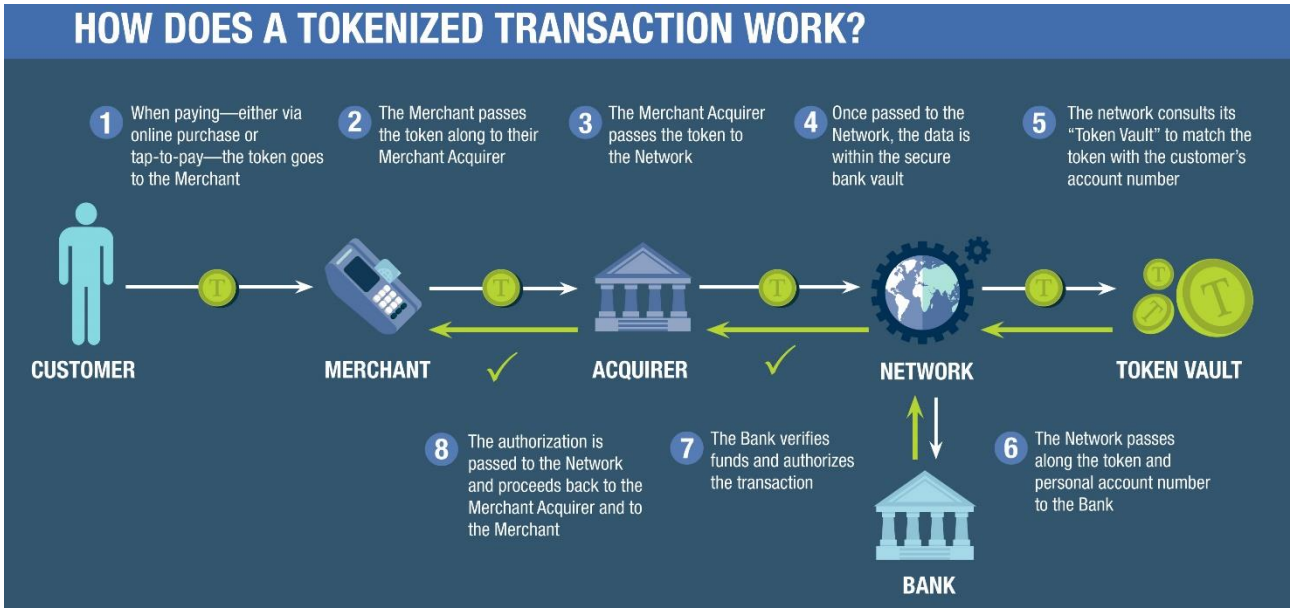

Figure 17 - Functioning of a tokenized transaction [40]

As it is possible to see from the above picture, a tokenized transaction is a complex process that requires up to 8 steps involving many different stakeholders at different stages of the transaction process.

To further increase the security level, the session key technique has been added. The session key is a dynamic key that gets associated to every payment

[40] (Rolfe, 2015)

and modifies itself in each transaction, making it useless for a second payment. Usually, tokenization and session key are adopted at the same time to exploit synergies and ensure a higher level of protection and security. [41] (Valeria Portale, Le soluzioni di mobile proximity payment a confronto: chi vincerà la sfida?, 2015)

Here follows a schematization of the synergic process of tokenization and session key:

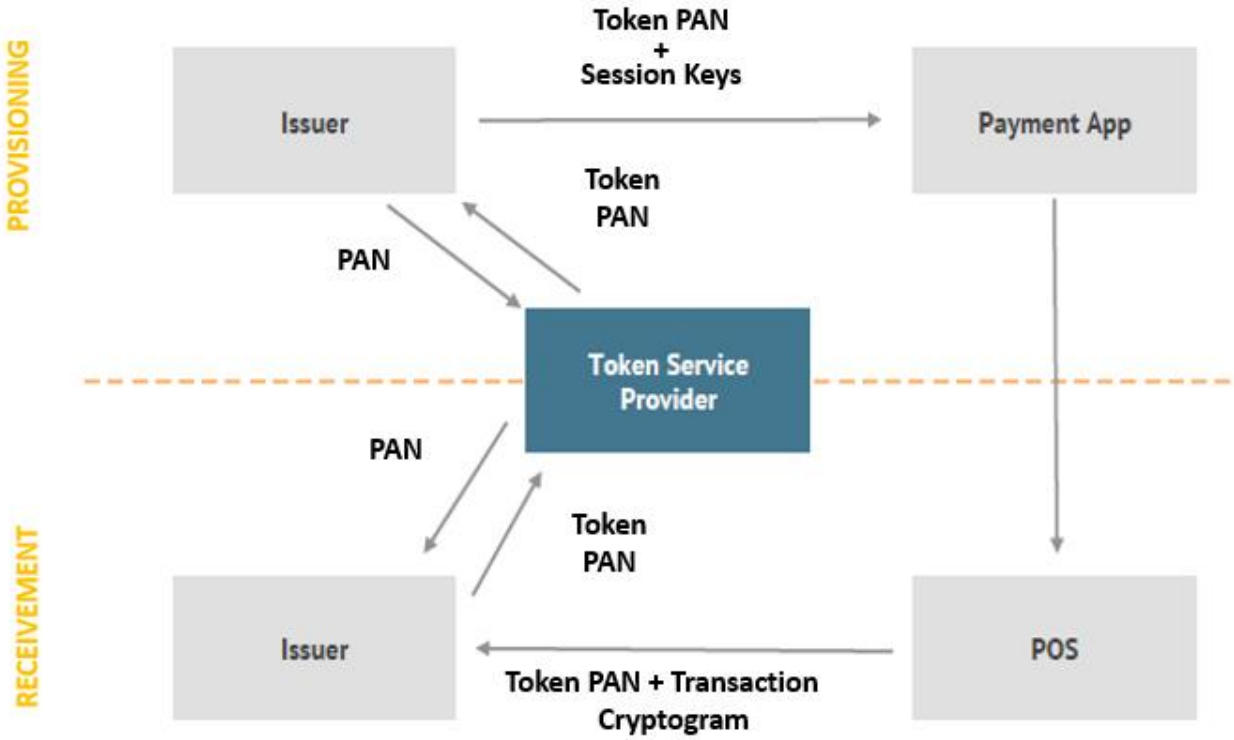

Figure 18 – Synergic process of tokenization and session key [42]

[41] (Valeria Portale, Le soluzioni di mobile proximity payment a confronto: chi vincerà la sfida?, 2015)

[42] (Valeria Portale, Le soluzioni di mobile proximity payment a confronto: chi vincerà la sfida?, 2015)

Near Field Communication

NFC (Near Field Communication) is one of the available technologies used to make the phone (i.e. the mobile wallet) interact with another object (i.e. POS, ...). The NFC uses the card emulation technology to emulate the interaction between a physical card and another reading element (i.e. a POS, the gates at the metro, ...).

All the interactions exploiting the card emulation technology are directed to the secure element, as shown in the following representation.

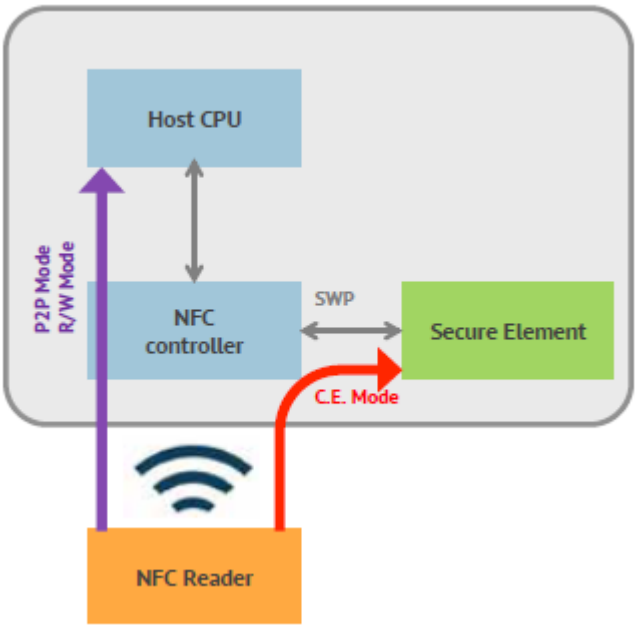

Figure 19 – Link between card emulation technology interactions and secure element [43]

In a discussion paper written by Consult Hyperion, it is possible to read about the difficulties and reasons of the slow NFC technology adoption:

[43] (Valeria Portale, Le soluzioni di mobile proximity payment a confronto: chi vincerà la sfida?, 2015)

"NFC mobile payments have been talked about for a long time. The NFC Forum standards body was founded in 2004. The first commercial trials were seen in 2007 with live products being launched from 2011. There are several reasons why it has taken this long for the NFC payments momentum to build:

- *The first Android smartphone (not including NFC) was released in 2008. Whilst some early NFC products were launched on "feature phones", mobile payments only make sense in the context of full smartphones and the associated app-store ecosystem.*
- *Until recently only a limited number of phones supported NFC. This is no longer an issue. There are now many more NFC handsets. At the time of writing [2014] there are 224 mobile phone models supporting NFC, with more coming soon.*
- *Mobile NFC is dependent on the rollout of contactless card payment terminals. Without them no mobile NFC transactions can be performed. Contactless acceptance now exists in many markets across the globe and is a widely supported interface for payments at POS.*
- *The different priorities and expectations of banks and mobile operators caused delays in the establishment of the required ecosystem. In a growing list of markets, these parties are now working closely together."* [44] (Steve Pannifer, 2014)

[44] (Steve Pannifer, 2014)

Geolocation

However, NFC is not the only available technology to ensure the interaction between wallets and receiving instruments. Geolocation and QR code are two examples of possible alternative solutions. [45] (Valeria Portale, Overview del mobile payment commerce in italia nel 2016, 2016)

An article from Cayan, defines what geolocation is:

"*Geo-location is nothing more than the process and technology of locating an object's geographic location*". [46]

The article continues explaining where the real value of geolocation hides:

"*Geo-location has made it possible for retailers to provide a seamless and secure way to market directly to their consumers. What makes it even more affective, is that this marketing isn't happening through a costly television advertisement, phone call or an annoying online banner ad, it's based on your proximity to the store. The consumer has already met the retailer half-way. The retailer now has an opportunity to seamlessly incentivize the consumer to walk in, shop and buy, sometimes without ever making a line to pay.* " [47]

[45] (Valeria Portale, Overview del mobile payment commerce in italia nel 2016, 2016)
[46] (Cayan, s.d.)
[47] (Cayan, s.d.)

QR codes

QR codes used as payment system are convenient, safe, easy and do not require special equipment. In fact, all is required is a smartphone with a camera and a mobile app to generate, scan and store QR codes.

There are many ways QR tech can be exploited. DPO Think Payments gives three possible uses:

*"1. **Paying retailers with QR scanners.***

At the check-out, the cashier will enter the amount to pay. You will then open your QR scanning app and display your unique QR code to the retailer. The retailer will scan the QR code to identify you and deduct the money from your mobile wallet, using a compatible mobile payment app.

*2. **Paying retailers without QR scanners.***

In this scenario, the retailer will display a QR code and you will scan it using the QR scanning app on your mobile device. The app will identify the retailer. Then you can enter the payable amount and complete the payment. […]

*3. **Paying individuals (such as self-employed professionals).***

Maybe you will need to pay your taxi fare upon drop-off, rent to your landlord, or even pay back a friend you borrowed cash from in the past. In this case, both you and the recipient open the QR scanning payment app. You will scan the recipient's unique QR code, add the amount to pay and complete the transaction."[48]

[48] (Cayan, s.d.)

3.7. Current players solutions

In such a dynamic and evolving context, it is now interesting to see what players are currently offering in terms of mobile wallets and payment solutions. Not only digital companies are developing solutions, as one would expect. Retailers, petrol stations, cruises, supermarket chains, governments and universities are also in the game.

Despite the fact that many actors are trying to reshape the payments world, digital giants are the ones that, for the moment, proposed the most diffused solutions being able to touch people worldwide.

Apple Pay, Samsung Pay, Android Pay, Alipay, WhatsApp payments, Microsoft Pay are all solutions created by tech giants. It is interesting to see how all these wallets differ in terms of focus.

Apple Pay's strength is its security. Secure element installed directly into the phone, tokenization to hide the real PAN (Primary Account Number) of the card, dynamic session key to make each transaction unique and digital fingerprint to recognize the smartphone owner at each transaction are the main features able to guarantee high security levels while using the app.

Samsung Pay is focused on the interoperability. Indeed, this payment solution uses both NFC (Near Field Communication) and MST (Magnetic Secure Transmission) technologies. The former is used in case of a contactless POS, the latter in case of a non-contactless POS (i.e. a POS in which it is necessary to swipe

the credit card to read the magnetic band). The app is able to smartly adapt the technology to use on a case by case basis without manual settings required.

Android Pay is based on innovation. The app uses in fact the HCE cloud-based paradigm. Users also have the possibility of transferring money to peers via the P2P service, integrated in the app. The peculiarity is that when a user associates a payment card to the wallet, the card PAN is not saved. Instead, what is saved is a VAN (Virtual Account Number) that is nothing else than a token that is then memorized via the secure element in cloud.

Alipay aims at offering the highest possible number of services. Alipay functionalities are in fact not limited only to online payments. A series of further functions such as offline payments, taxi reservations, wealth management, bill splitting, reviews, cinema tickets and many others are available to customers.

It is interesting to see how also companies operating in other industries with core businesses not digital-oriented are moving to create innovation in the mobile payments world by launching new mobile wallets.

An example that has already been cited in this dissertation is represented by Starbucks that launched in 2011 its own mobile wallet integrated in the chain's already existing app. Clients have the possibility to recharge the account via PayPal, Apple Pay, Visa Checkout or Chase Pay and then complete the purchase scanning the barcode visualized on the smartphone directly at the cashier. [49]

[49] (Valeria Portale, MOBILE PAYMENT & COMMERCE: il punto di vista di esercenti e consumatori, 2016)

(Valeria Portale, MOBILE PAYMENT & COMMERCE: il punto di vista di esercenti e consumatori, 2016)

Shell and Total are other two good examples of how much mobile wallets are spreading throughout the most disparate industries.

TOTAL eWallet was specifically developed for TOTAL service stations' customers, whether professional or private, creating a fully connected service station whilst simplifying the customer experience.

As a result, from now on, customers will be able to:

- Select the right fuel through their smartphone.
- Unlock the pump to help themselves.
- Fill up automatically and securely.
- Choose their payment method: TOTAL card, bank card, and later on third-party wallets such as Apple Pay.
- All of which without systematically needing to enter the shop or use a conventional automatic pump.
- Apart from paying at the pumps in TOTAL service stations, customers will be able to use the TOTAL eWallet to pay in the shop and in car washes. Ultimately, it will include recharging for electric vehicles.

All this is to guarantee an enhanced customer experience that will also serve as a loyalty system. [50]

[50] (Snauwaert, 2018)

As it is possible to read from the Chevrolet's pressroom, "Chevrolet and Shell are rolling out the automotive industry's first embedded, in-dash fuel payment and savings experience. This new feature will allow drivers of eligible Chevrolet vehicles to pay and save directly through the touchscreen in their vehicle when they fuel up at participating Shell-branded stations, without swiping a credit card or using a mobile device." [51]

Even the public sector is creating new mobile wallets solutions.

Students at some US universities will be able to use their iPhone or Apple Watch to replace their student ID card. With a raise of the wrist, students can gain access to places including the library, dorms and events, and pay for snacks, laundry and dinners around campus simply by adding their ID cards to Wallet on Apple Watch. [52]

Even governments are creating their own apps. A clear example is the IO wallet launched by the Italian government. Citizens will have the possibility to use the app to ask and store documents and certificates, accept and make payments, receive communications, messages and reminders from any public entity. Thanks to the mobile wallet, citizens will not forget anymore duties for car ownership fees, health tickets, taxes, certificates, ... and paying for those will be extremely simple. In fact, it will be possible to associate any digital account to credit cards, bank accounts, PayPal or Satispay. [53]

[51] (Cross, 2018)
[52] (Clark, 2018)
[53] (Simonetta, 2018)

In 2017, Politecnico di Milano developed a census of 30+ wallets which is a very useful asset to understand the current offering on the market. The exercise carried out by the Observatory analyses several factors associated to the user experience of wallets launched by various typologies of operators.

The main user experience drivers censed are the following ones:

- General information
    - Wallet's name
    - Provider's name
    - Typology of operator
- Access and security
    - Additional security services
    - Biometry-based features
    - Free access to the wallet
    - Widget presence
- Available payment Instrument
    - Credit/debit payment card
    - Bank account
    - Prepaid account
    - Phone credit
    - PayPal
    - Number of available options
- Lead times
    - Card issuing date [days]

    - Card activation date [days]
- Registration
    - Number of required steps to register
    - Required data
    - When payment instruments are requested during registration (i.e. prior, during or after registration)
    - Social login
    - Incentive for mobile wallet activation [€]
    - Referral program [€]
- Wallet recharge
    - Credit/debit payment card
    - Bank transfer
    - Physical
    - Other
- Online payment
    - Scan QR code
    - Payment options
    - Number of required steps for payment
- Proximity payment
    - Scan QR code
    - Generate QR code
    - Geolocation
    - NFC

    - MST (Magnetic Secure Transmission)
    - Number of required steps for payment
    - Payment possibility without opening the app (Yes/No)
- P2P payment
    - Proprietary P2P
    - Jiffy/PayPal
    - ID receiver (i.e. e-mail, text message, link, QR)
    - Number of required steps for payment
- Overview on payment services
    - Online payment
    - Proximity payment
    - P2P payment
- Consultation
    - Number of clicks to check balance
    - Number of clicks to check past transactions
- Value-Added Services (VAS)
    - Digital identity
    - Mobile ticketing
    - Mobile parking
    - E-couponing
    - Tickets archive
    - Loyalty cards archive
    - Loyalty program

- Rewards
- Cashback
- Infotainment
- Geolocation
- Mobile top-ups
- Financial services
- Invoice settling
- Mobile ordering
- E-commerce
- Shared cashiers
- Chat
- Number of total value-added services
- Loyalty features

The analysed mobile wallets are the following ones:

WoW CheBanca!

YouPay Mobile

Satispay

MySi

PosteMobile

Tinaba

Monhey

Alipay

PayPal

WeChat Pay

Walmart Pay

Chase Pay

Starbucks

Venmo

Swish

BBVA wallet

Paytm

Android Pay

SisalPay

UBI Pay

Vodafone Pay

BNL Pay

Mediolanum Wallet

Intesa Mobile

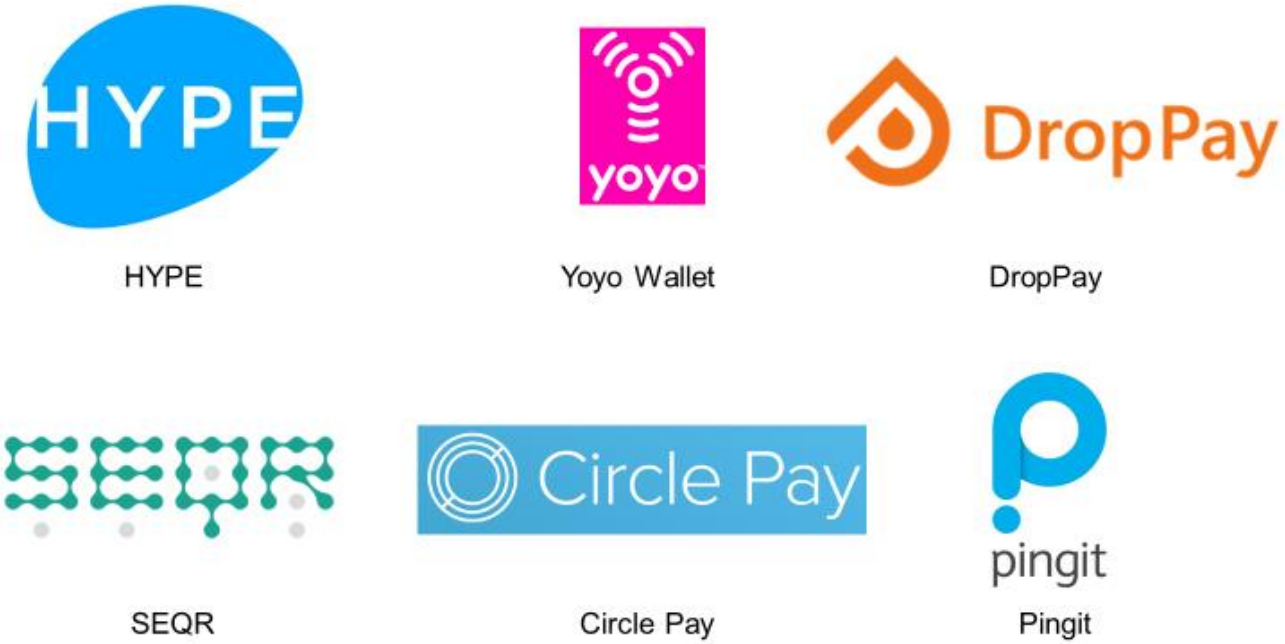

Figure 20 - List of all the analysed wallets

3.8. Future technologies

The most interesting trends that are revolutionizing payments are: geolocation, biometry, cryptocurrencies, blockchain, IoT (Internet of Things),

augmented reality and artificial intelligence. [54] (Valeria Portale, Overview del mobile payment commerce in italia nel 2016, 2016)

A particularly fascinating topic is biometry, which starts however to be considered as an old technology under certain aspects. Bayometric, a website specialized in biometric technologies, affirms that biometry is in fact changing the payment process, and it is doing it now.

As it is possible to read from the Bayometric website: "*Biometrics technology essentially analyses the biological (physiological and behavioural) traits that are unique to an individual. These are the inherent characteristics that differentiate one individual from another.*

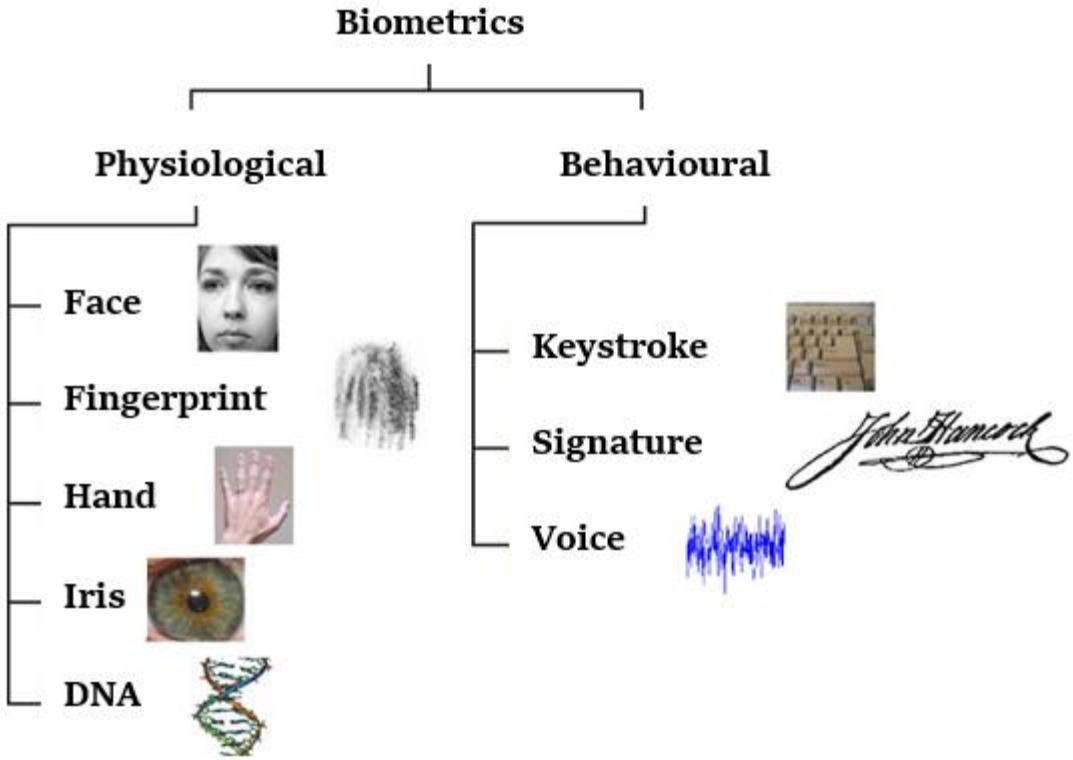

Figure 21 – Biometric technologies [55]

[54] (Valeria Portale, Overview del mobile payment commerce in italia nel 2016, 2016)
[55] (Thakkar, s.d.)

Fingerprints, facial recognition, iris or even the pattern of an individual's voice has unique distinguishing characteristics. The data gathered by these technologies can be used to uniquely distinguish a person from the entire global population." [56]

Finger veins recognition is another biometric tech. They are tough to forge and more importantly they are never affected by external factors such as sweat, stains or peeling on fingers. [57]

To this regard, a Mobilepaymentstoday's article, reads: "This assurance of increased security means that even high-value transactions using finger vein scanning do not require the extra step of PIN entry." [58]

AI (Artificial Intelligence) will play a major role into the expansion of mobile wallets usage. Indeed, it will be crucial to fix issues such as security, information privacy, and other evolving elements standing in the way of adoption. AI-powered fraud detection models (and many others) could be implemented "*to sift through tons of transactional data, flagging suspicious transactions that match a predetermined fraud model*.", as a Valuewalk's article reads. [59]

Artificial Intelligence will also be at the foundations of another payment's revolution: voice payments. In fact, mobile wallets can also be integrated with voice assistants or chatbots. As it is possible to read from the *Techrepublic* website, "

[56] (Thakkar, s.d.)
[57] (Leung, 2018)
[58] (Nets tests finger vein payments in Denmark, 2018)
[59] (Agrawal, 2017)

- *66% of US adults use voice assistants or chatbots, and 87% are aware of the technologies. — Mastercard and Mercator, 2018.*
- *21% of US adults use voice assistants or chatbots to perform e-commerce tasks like paying bills or online banking. — Mastercard and Mercator, 2018.*

Normally used for simple tasks, the technology may be growing due to increased consumer trust and understanding." [60]

Here follows a straightforward illustration of how an AI chatbot works:

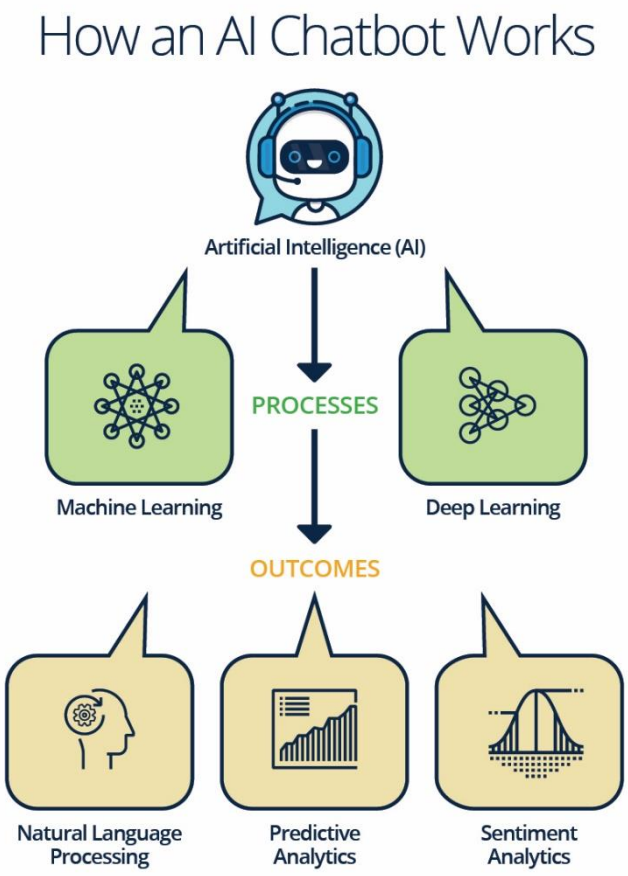

Figure 22 – How an AI chatbot works [61]

[60] (Krauth, 2018)
[61] (Smartsheet, s.d.)

As a *Techcrunch* article reports, the products currently being shopped by voice are lower value items, bought as a one-time purchase. Grocery (20%), entertainment (19%), electronics (17%), and clothing (8%) are the top categories of purchases. [62]

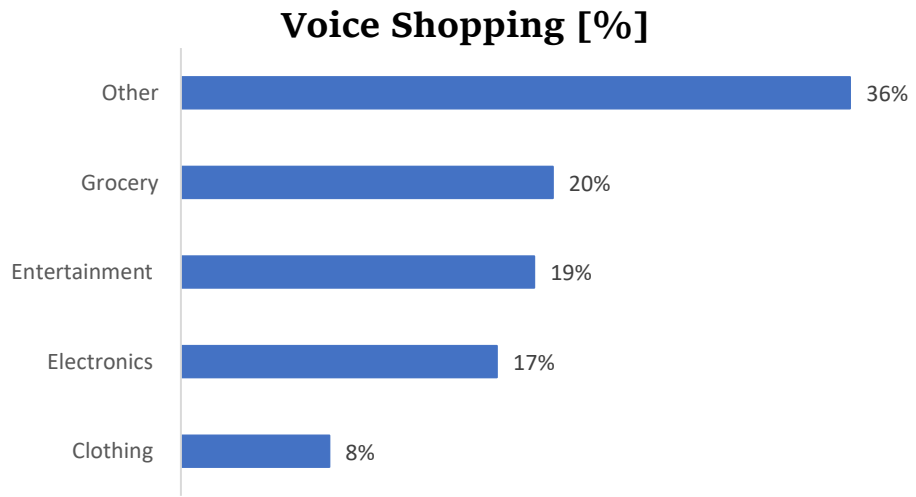

Figure 23 - Voice shopping adoption in different sectors [63]

Mobile wallets are not necessarily linked to smartphones.

According to a report published by Mastercard, 25% of Europeans are willing to pay via wearables, meaning not only smartphones but also smartwatches, fit trackers, rings, bracelets and many other wearable tech devices. An example of wearables present in the market is *Kerv,* a smart ring that becomes a contactless means of payment without needing a smartphone connection. In the future, the

[62] (Perez, 2018)
[63] (Perez, 2018)

token ring is expected to appear in the market, acting not only as a payment tool but also as a badge or car key. [64]

Also an article written by Repubblica talks about the use of mobile wallets via other technological devices, such as smartwatches or other wearables. From the article, it is possible to read that Unipol bank created a bracelet acting as a payment device. The import due is inputted in the POS by the merchant and the bracelet only needs to be drew near the POS to complete the transaction. [65]

Concerning smartwatches, Fitbit launched a mobile payment solution named Fitbit Pay. A *Thepaypers* article reads: *"To pay, they simply press and hold the left button until the debit or credit card is seen on the smartwatch screen and hold the watch against the payment terminal until a payment confirmation appears on the device screen."* [66]

Internet of Things (IoT) is another incredible example of mobile payments revolutionary technology. IoT allows each single device to become a host within the global internet. Amazon's dash button is the perfect example of IoT applied to the mobile payments world. The LG fridge developed in collaboration with Amazon which auto-refills when it empties up is another great example. [67]

In-vehicle-payment company *Pay by Car* has also stepped in the IoT payments world. In fact, as a cspdailynews article reads, "*they released a new payment solution that uses E-ZPass toll way transponders to facilitate non-toll*

[64] (Spagnuolo, Anelli, fit tracker, bracciali: il futuro dei pagamenti è wearable, 2018)
[65] (Calabresi, Non solo smartphone, alla cassa si paga con il braccialetto, 2018)
[66] (Wirecard's mobile payment solution now available on Fitbit Pay, 2018)
[67] (Eichinger, 2018)

transactions, such as pumping gas, paying for a car wash or even paying for in-store items at the pump. RFID sensors installed by Pay by Car at the gas pump can sense whenever enrolled E-ZPass transponders are within range." [68]

This solution will completely remove cash transactions from the equation, exploiting IoT technology at its best.

Interesting is to see the technological solutions proposed by retailers to support the mobile wallets' expansion. In this context, it is worthwhile to spend a few words on retailers currently investing in research to become *cashless* retailers, or at least reducing as much as possible the amount of cash they deal with on a daily basis.

Starbucks, once again taken as the perfect example, is already testing out cashless checkouts in stores nationwide. As RetailDive reported in one of their articles, "*Walmart is offering a Scan & Go capability in several stores that allows shoppers to use a mobile app to scan barcodes of items they want to buy, pay for them in-app with and show the in-app receipt to a greeter as they leave the store.*

The "Amazon Go" store, meanwhile, goes well beyond that, with not just cashless checkout but also a dearth of humans in sight." [69]

In an article from CIO, it is possible to read about the cashless Amazon store:

[68] (Lewis, 2018)
[69] (Howland, 2018)

"*The store utilizes a variety of technologies, including Artificial Intelligence (AI) and sophisticated computer vision to innovate the grocery shopping experience*." [70]

Even WeChat launched a pop-up shop with no cash and no cashiers. In the future, the shop will also present the facial recognition feature. [71]

Ingenico offers a solution to convert small merchants that would never adopt digital payments otherwise. Pin on Glass (PoG) or Pin on Mobile (PoM) is the new service that will enable small merchants accepting payments directly via their smartphones. [72]

Cryptocurrencies are playing a role to support merchants' conversion to digital payments. On the Bitcoin website, it is possible to read that "*A development team from the UK has created a bitcoin cash (BCH) point-of-sale server which allows brick and mortar merchants to accept BCH as a form of payment in-store.*"

This option will generate no costs for the merchants when accepting bitcoin cash transactions: those will in fact be charged on the sender of the transaction (i.e. the customer). [73]

[70] (Tiersky, 2018)
[71] (WeChat opens its first unmanned convenience store in Shanghai, 2018)
[72] (Mobile Payment: Ingenico lancia "Pin on Glass", per pagamenti cashless con lo smartphone, n.d.)
[73] (Redman, 2018)

4. User experience

Now that the technology at the base of mobile wallets has been discussed in depth, a full dive into the user experience will be made.

So far, not many academic papers have been published on the user experience applied to mobile wallets. This is the reason why the research on the user experience has been conducted not only on mobile wallets but also on the digital sphere at large.

4.1. Digital customer experience

As *Liferay* affirms, "*Digital customer experience is the sum of digital interactions between a customer and a company and the resulting impression that a customer walks away with*. " [74]

Nowadays, Digital Customer Experience (DCX) and Customer Experience (CX) overlap. Therefore, there are two approaches that could be followed to manage both. *Liferay* lists:

- "*Focus on the holistic customer lifecycle, giving equal attention to the way digital and non-digital experiences complement each other and optimize both.*
- *Focus primarily on digital customer experience. An article in the Harvard Business Review asserts that "this isn't merely a subset of customer*

[74] (Liferay, n.d.)

experience, and a good customer experience strategy doesn't equate to a good digital customer experience strategy." [75]

It is important therefore to understand that the customer is one, regardless of the kind of experience we are talking about. Hence, the two should never be considered as separated.

When businesses focus on developing the digital experience, they need factors and drivers to ensure the best possible result. In this regard, Forrester Research, Inc. created a table to help understanding strengths and weaknesses of their strategy.

Here follows the table they published:

[75] (Liferay, n.d.)

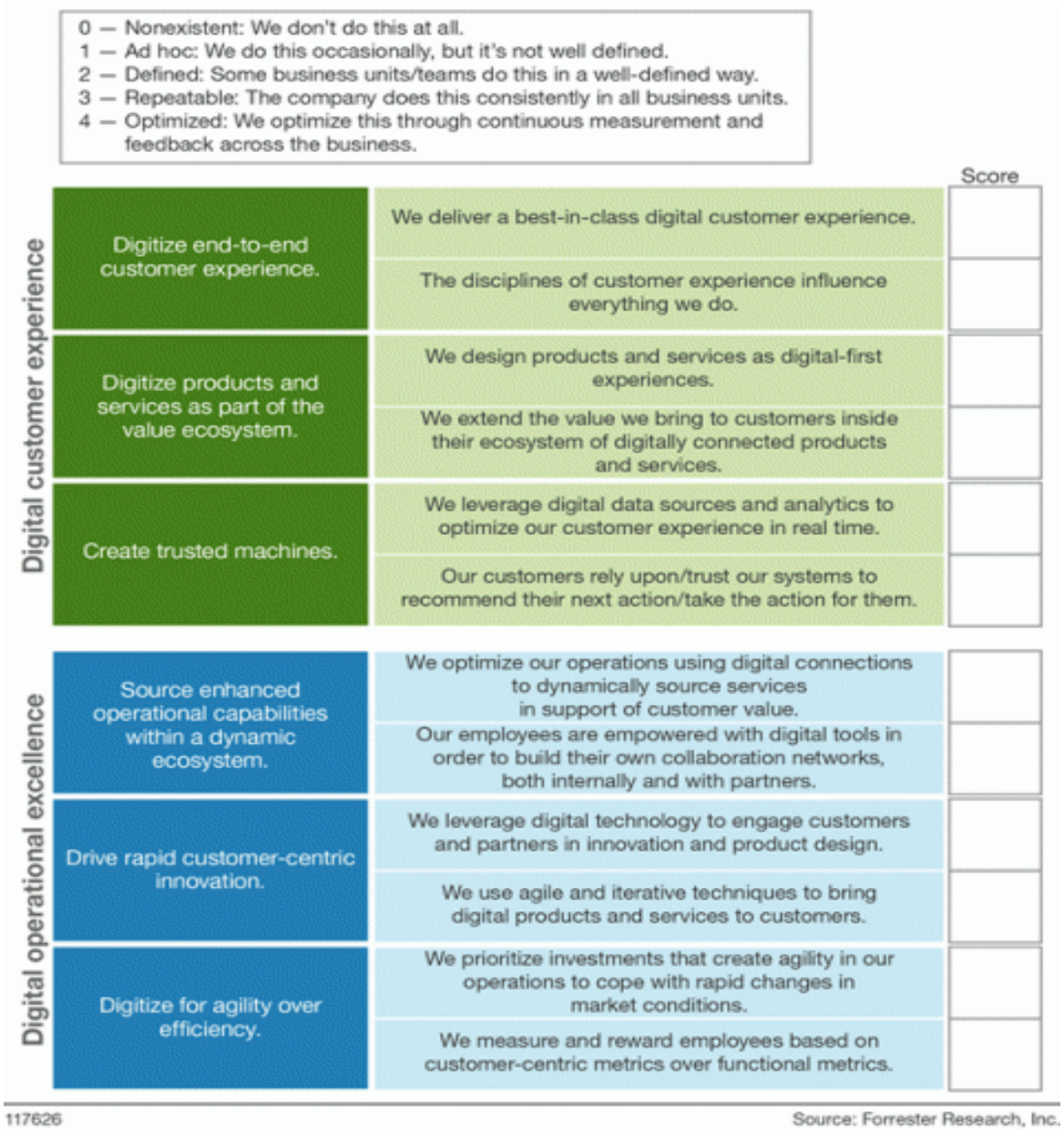

Figure 24 – Customer experience strategy [76]

The framework created is divided into two main areas: *Digital customer experience* and *Digital operational excellence.* Each of those is further divided into subsections to which a score is to be assigned. At the end, the tool offers a clear view of the company's strengths and weaknesses.

[76] (Forrester Research, n.d.)

Being consistent in the quality of the experience when dealing with digital applications is key. This is because technology systems poorly linked and not deeply integrated create poor customer experience. A clear example is when online forms are filled in starting from the PC and then, willing to continue from another device (i.e. phone, tablet, ...), the process has to be started all over again.

Investing in customer experience is a fundamental element to ensure high profitability and success. According to a Walker study, "*By 2020, customer experience will overtake price and product as the key brand differentiator.*"[77] And according to a recent study conducted by Sailthru and Forbes Insights, retailers and publishers that increased their spending on retention "*had a near 200% higher likelihood of increasing their market share in the last year over those spending more on acquisition.*"[78] This is because the conversion rate for a prospect falls between 5 and 20%, while the rate for an existing customer is between 60 and 70%.

Acquiring and retaining customers is anyways not an easy task. Especially nowadays when, as reported in an article by RetailDive, "*A 100-millisecond delay in load time can decrease conversion rates by 7%. Globally, almost 77% of e-commerce shoppers abandon their carts. While many just change their minds, 27% cited a checkout process that takes too long or is too complicated, and 8% said they were dissatisfied with the number of payment methods. The payment process is where it all comes together and where shoppers are most likely to walk away if*

[77] (Harris, n.d.)
[78] (Communications, 2016)

the experience is not seamless. As a result, retailers must consider making payments a top priority." [79]

I-scoop, in one of their articles affirms: "*The end-to-end customer experience is essential for customer retention, customer loyalty, word-of-mouth, acquisition and so much more. The exact same thing goes for the digital customer experience.*" [80]

And again: "*The only way to look at it, remembering that the customer doesn't care about the difference between digital and non-digital, is seeing the digital customer experience (or DCX) as an end-to-end given as well. It's the sum of all customer experiences a customer has with your brand, company, services, offering etc. across all possible digital touchpoints and contact moments.*" [81]

4.2. Mobile wallets customer experience

In the report of a Mobile Payments Convention held by Politecnico, it is possible to read that the majority of mobile wallets' users choose to activate the service because they find the wallet convenient. In fact, they find it more convenient and functional than other payment methods such as payment cards, cash, ... [82] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

[79] (Alaimo, 2018)
[80] (Digital customer experience – connecting the dots, n.d.)
[81] (Digital customer experience – connecting the dots, n.d.)
[82] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

Other users choose to use a mobile wallet because of the pervasiveness of smartphones in everyday life. [83] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

With users that are getting more and more exigent, choosing the right drivers to build a great customer experience to be embedded into mobile wallets is a priority.

Apple, Google and Samsung, while implementing their wallets, focused mainly on the payments. It is only at a later stage that the attention moved to ancillary services such as storage for coupons, loyalty cards, event tickets or boarding passes. All these services are aimed at improving the overall customer experience but considering that the continuity of use depends on the overall value offered to users, the main focus has to be on offering seamless payments. [84] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)

To ensure a payment experience as seamless as possible, here follow the proposed drivers that guarantee the highest success to a wallet.

In an article written by Politecnico di Milano's Observatory on Payments and Commerce named "*Overview of mobile payment commerce in Italy in 2016*", it is reported that the 4 most valuable features are: rapid registration to the service, fingerprint to enable payment, widget in the smartphone's homepage, possibility

[83] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)
[84] (Valeria Portale, Overview del Mobile Payment & Comerce in Italia: Engage your customers, 2015)

to check transactions and successful payment visual confirmation. [85] (Valeria Portale, Overview del Mobile payment & commerce in Italia nel 2016, 2016)

In the report of the Mobile Payments Convention it is also possible to find a list of proposed benefits and barriers linked to mobile wallets adoption and use.

Here follows the proposed table:

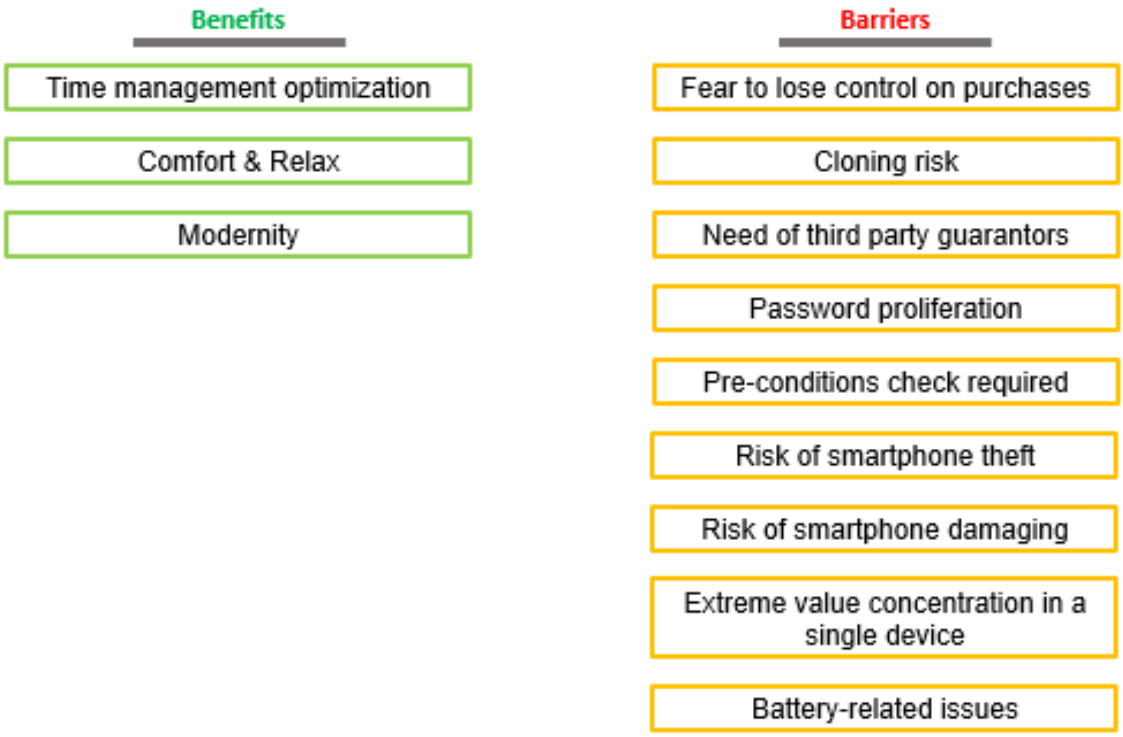

Figure 25 – Benefits and barriers to mobile wallets adoption [86]

Among the beneficial factors, the attention should be drawn to time management optimization and modernity. Indeed, the modernity feeling is supported by the digital nature of payment with respect to old techs based on tangible means. This gives also an eco-friendly feeling to users due to the

[85] (Valeria Portale, Overview del Mobile payment & commerce in Italia nel 2016, 2016)
[86] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

digitization of paper-based tools. Time management optimization is instead driven by the possibility to spend the time saved avoiding a queue or speeding up payments doing pleasure activities. The following situation explains better this concept:

"Maria, our persona, is a 35 years old mother conducting a busy life, dividing herself among house-related tasks, work and family. Maria hardly finds time for herself. Thanks to mobile wallets, Maria avoided a long queue exploiting the remote payment function and finds 1 hour to be spent at the park relaxing or having a fun jogging session." [87] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

PwC, in an article entitled *5 things retailers should know*, gives another example of how a mobile wallet can simplify and improve the daily life of users.

"*While waiting for the metro to work, Sarah sees a billboard advertising her favourite brand and, scanning the QR code on the board via her wallet app, she can access to information on the new collection. In her lunch break, while strolling in the high street, geolocation by the store sends her a targeted offer based on her previous searches and activities, and a recommendation engine suggests her the products she will love. Once in store, an interactive map and a mobile catalogue navigate her to the products she is looking for. QR codes on the labels tell her which colours and sizes are available, and if her size is not in stock at the moment, she can quickly order it. At the till, she pays by [her wallet], redeem the digital coupon*

[87] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

she received and get a digital receipt on her wallet. The wallet also keeps track of her purchases, so that she can re-order some items and receive coupons based on her preferences. Back at the office, happy of her purchase, she shares a pic of her new shirt. She also decides to send a digital gift card to a friend for her birthday, and her friends contribute to the gift by sending her money via P2P service in the wallet. At home, she receives notifications with updates about new collections, latest fashion events and style advice gathered for her from social media." [88]

Furthermore, one of the most liked features of mobile wallets is the possibility to purchase, among others, bus and parking tickets directly from the smartphone sending a simple SMS, resulting in a very efficient time usage.

Some users would also like to have digital agenda connected to the wallet that would maximize the time management of the users. This means for example reminding to the user the renewal date of a document or the date of an event which ticket is stored in the wallet itself. This would improve the overall user experience, making the wallet a sort of "one stop" app.

The feeling of enhanced comfort comes from decreased need of cash when doing group activities, from the overcoming of difficulties related to changes and small coins management to the possibility of settling debts and credits quickly regardless of the number of people involved in the operation.

[88] (L. Barbero, 2016)

Unfortunately, not only good things come with mobile wallets. A few inconveniences or barriers are on the way to mobile wallets widespread adoption.

Password proliferation is certainly one of those. This implies the need to invent, memorize and store securely different access codes and passwords, with the risk of losing them or getting them stolen.

The need to check upfront that the mobile payment option is available in the shop is perceived by users as an additional real and psychological burden with respect to old payment methods. This affects both the initial registration to the service and the daily use once already registered.

Moreover, having such a high value concentrated in a single device, arises concerns as the risk for the personal identity theft if the phone gets stolen or hacked. In their smartphones, users will have their names, surnames, residence, payment coordinates, ...

Users are also scared about having their data and accounts cloned. Payment without physical contacts may give you the feeling of losing control on what is really going on. A user may think: “What if some delinquent passes by and steals money from me without me even realizing it?”. Guarantees are clearly needed with respect to the absolute inaccessibility of data and personal information in any given circumstance. [89]

[89] (Valeria Portale, Il Mobile Payment & Commerce alla conquista del mondo, 2017)

The aforementioned results are confirmed by a customer survey conducted by Politecnico di Milano with the support of KANTAR TNS, which targeted Italian mobile wallets users.

The exercise aims at understanding the degree of overall satisfaction of mobile wallet users via the different phases of use to identify the most critic ones.

It is safe to affirm that the wallet experience satisfies users. 50% of people gave a score ranging between 9 and 10 out of 10 when asked to value the overall experience of mobile wallets services. It is only a minor subgroup of the sample (around 9%) that feels not satisfied, giving grades from 1 to 5 out of 10.

The survey also helped to identify the 5 assets required by digital payment systems to compete against traditional payment methods. The following graph shows the results:

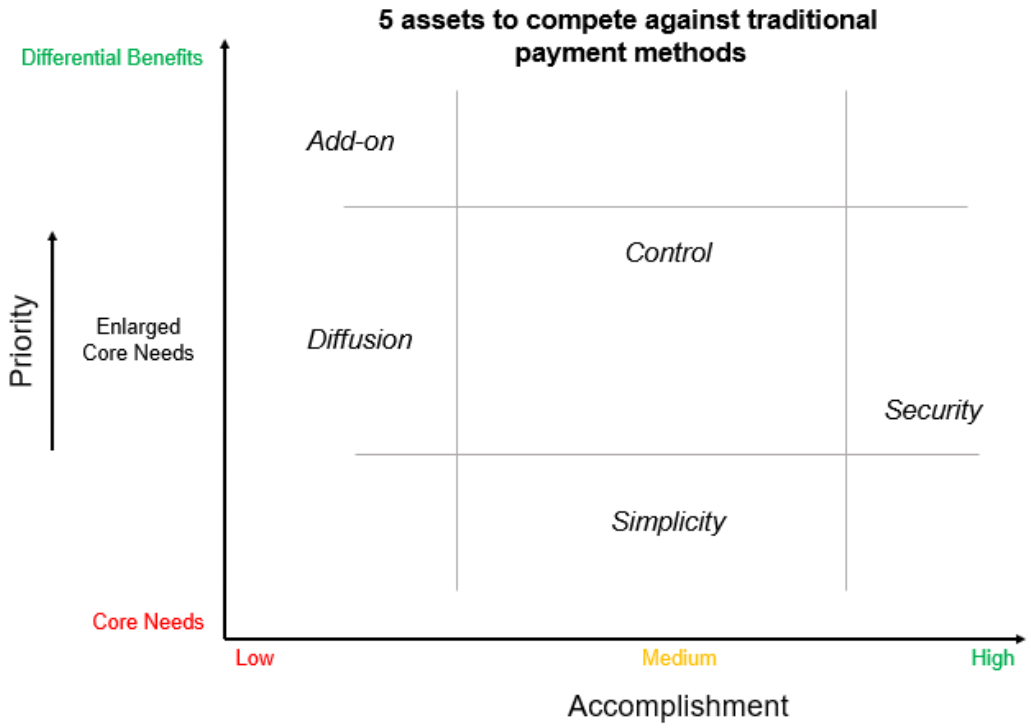

Figure 26 – The five assets to compete against traditional payment methods [90]

Interesting is to see the position covered by the add-on category with huge differential benefits and a low level of accomplishment. It certainly represents a focus area for the future.

The main add-ons would be merchants' localization services, promotions & discounts, rewards and other ancillary services. [91] (Valeria Portale, MOBILE PAYMENT & COMMERCE: il punto di vista di esercenti e consumatori, 2016)

[90] (Valeria Portale, MOBILE PAYMENT & COMMERCE: il punto di vista di esercenti e consumatori, 2016)

[91] (Valeria Portale, MOBILE PAYMENT & COMMERCE: il punto di vista di esercenti e consumatori, 2016)

PwC offers a 360° view of the types of value-added services that can help pushing mobile wallets adoption in the near future increasing the user experience. Here follows the proposed list: “

- *Merchant offers, coupons and discounts – These can even be tied to the use of specific payment instruments in the mobile wallets, such as merchant funded loyalty incentives offered by a specific issuer.*
- *Location-aware offers and services – These offers are in context to a consumer’s current location, making them both time-sensitive and more relevant for the moment.*
- *Loyalty program incentives and redemption – These can be tied to a payment instrument in the wallet or to a specific merchant, or to both.*
- *Mobile banking – The consumer can have the convenience of online banking in their wallet to pay bills, look up account information, make account transfers and electronic deposits, send or receive cash electronically, and so on.*
- *Comparison shopping – Mobile applications can help a consumer compare products and prices and determine which merchant offers the best deal on a product or service.*
- *Management of offers, incentives and rewards – As more merchants and financial institutions send out offers and incentives, it will become more cumbersome for the consumer to keep track of them all, and to know when incentives are about to expire. Applications are springing up to manage these offers in a person’s mobile wallet system.*

- *Ticketing – A consumer can buy and store his tickets for air, bus, rail, ferry and other forms of public transportation, as well as for movies, concerts, sporting events and virtually anything else that requires a ticket.*
- *Receipts – A mobile wallet can store and organize customer receipts—not only for mobile transactions, but any transaction at a retailer with electronic receipt capabilities.*
- *Personal identity credentials – A mobile wallet doesn't have to be limited to commerce applications. Secure credentials in a wallet could be used for building access or other applications where personal identification is required.*" [92]

The same article from PwC proposes also a matrix aimed at helping the visualization of preferred wallets by users. In fact, PwC analysed different wallets and made a comparison of those using the abovementioned matrix. The matrix is called MPSA Matrix (Mobile Payment Service Accessibility Matrix) and it is constituted by two axes representing *Ease of Implementation* and *Ease of Adoption and Use*. It represents a straightforward way of comparing the user experience offered by the different wallets in a very easy yet effective manner. [93]

Here follows the MPSA Matrix showing the ranking of ten wallets present in the Italian market.

[92] (L. Barbero, 2016)
[93] (L. Barbero, 2016)

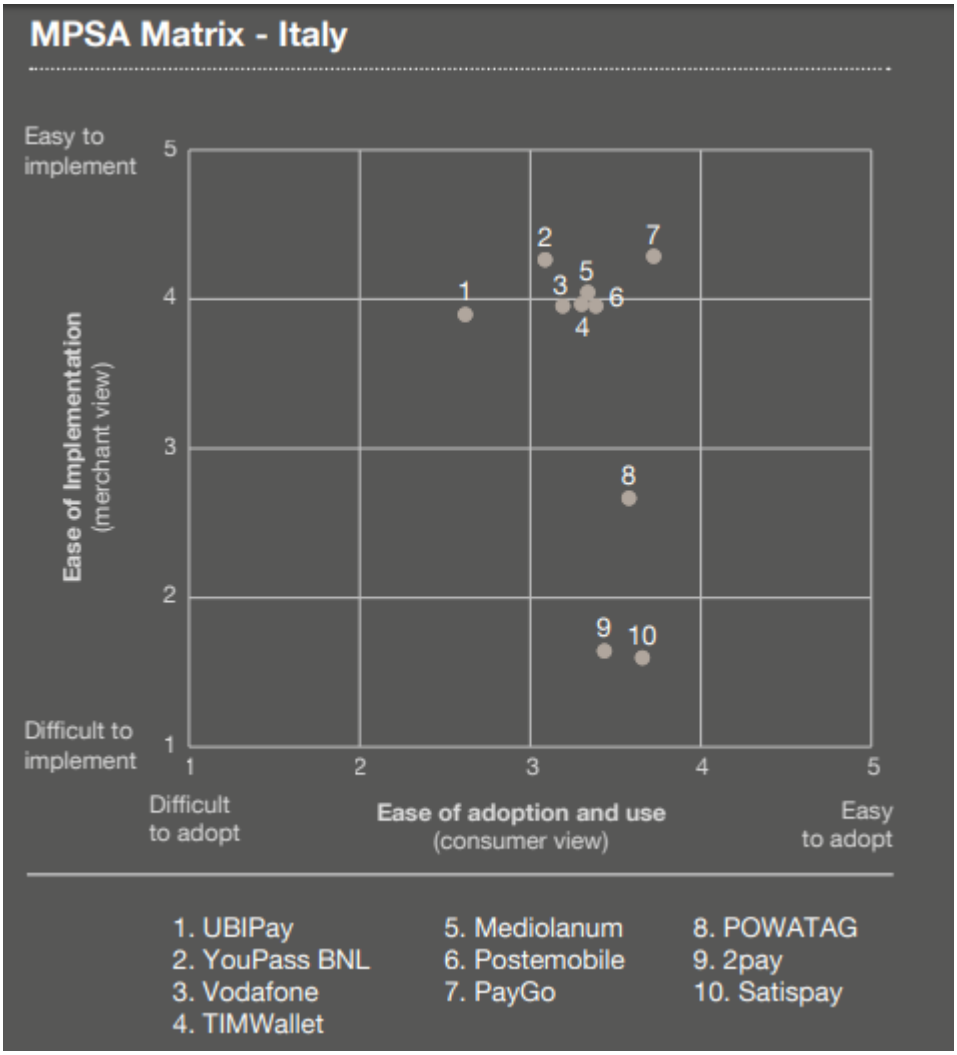

Figure 27 – MPSA matrix, Italian scenario [94]

Mobile wallets become even more interesting if all the things that cannot be done with a normal leather wallet are considered. An article written by Pwc gives a straightforward example of this: "*a geolocation service on a mobile phone can determine with great accuracy where a person is at the moment. Now, combine that information with a timely offer for a nearby restaurant or shop and the wallet*

[94] (L. Barbero, 2016)

holder might be enticed to eat lunch at that restaurant or make a purchase in that store." [95]

Apple, during a conference presenting the main new features proposed by their mobile payments' IT team, gives some advice on how to improve customer experience and maximize users' utilization of the service. Apple affirms: "*Everything done in app, reduces risk of abandonment. [Furthermore,] It is important to have the check-out option of your wallet in every step of the flow.* "

Here follows an example of the Apple mobile wallet present in this e-commerce company's webpage acting as *express checkout*.

Figure 28 - How to streamline checkout operations [96]

The button linked to the mobile wallet must be there as well as anywhere else along the process, according to Apple. This ensures the highest possible customer experience facilitating their payment check-out process.

[95] (L. Barbero, 2016)
[96] (Apple, 2018)

Moreover, during the same conference, Apple talks about some other important concepts to offer the greatest user experience possible:

- *Defaulting*. The idea is that a mobile wallet app should always be set as the default app to ensure seamless payments and enhance user experience.
- *Streamlining*. If you already have some data regarding a customer, you should not ask that data again during the registration to the mobile wallet service. Additional steps could lead the user to abandon the app.
- Offer as many networks (i.e. Maestro, Visa, …) as possible. [97]

Dong-Hee Shin (2009) proposes a model about users' intention to use a system and their subsequent usage behaviour:

"*The UTAUT [Unified Theory of Acceptance and Use of Technology] aims to explain users' intention to use an information system and their subsequent usage behaviour. The theory holds that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behaviour (Venkatesh, Morris, Davis, & Davis, 2003). The variables of gender, age, experience, and voluntariness of use are posited to moderate the impact of the four key constructs on usage intention and behaviour (Venkatesh et al., 2003). These determinants and moderators will be used to extend the proposed research model. The modified UTAUT model will enable a better explanation of mobile wallet acceptance and usage behaviour*." [98]

[97] (Apple, 2018)
[98] (Shin D.-H. , 2009)

Here follows the proposed research model:

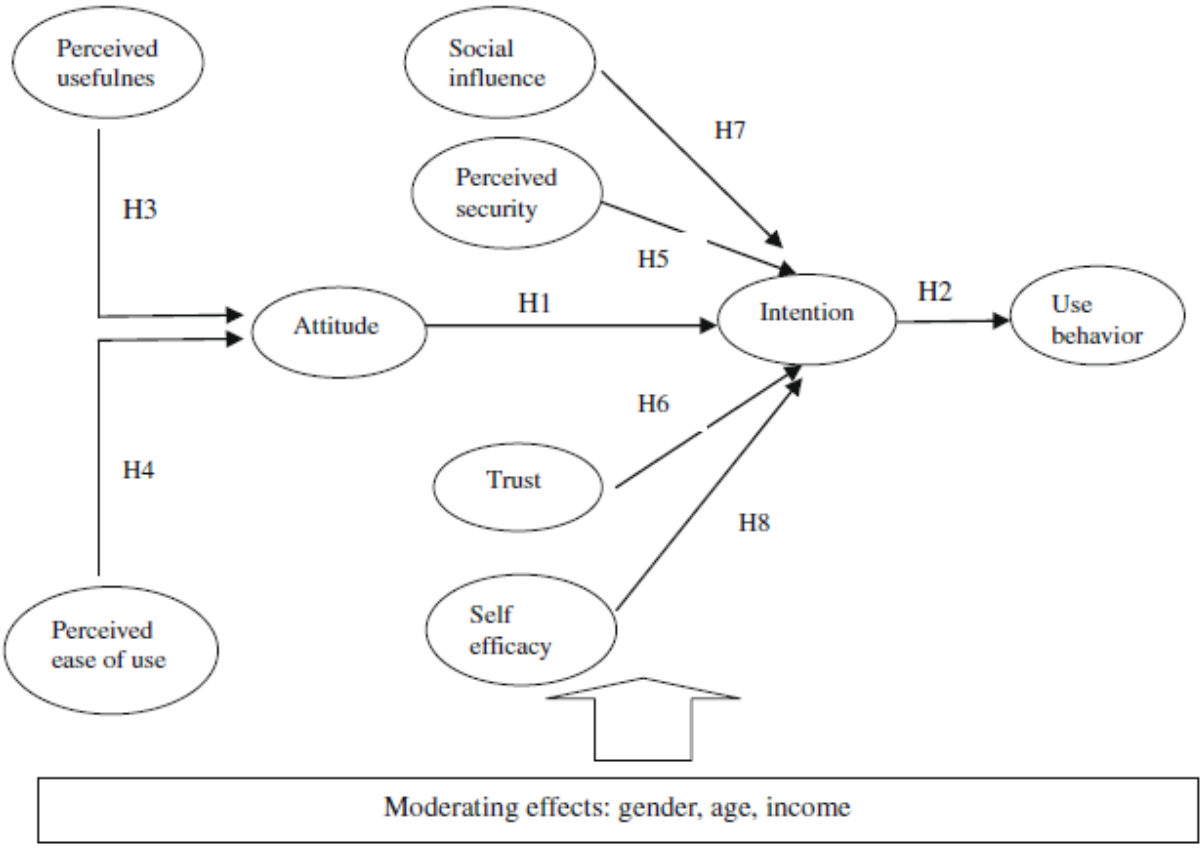

Figure 29 – Modified UTAUT model [99]

The author further explains how the different variables interrelate:

"*H1: Attitude [defined as an individual's positive or negative feeling about performing the target behaviour, while subjective norm refers to a person's perception that most people who are important to him or her think he or she should or should not perform the behaviour in question] toward mobile payment has a positive effect on the intention to use a mobile wallet.*

[99] (Shin D.-H. , 2009)

[...]

H2: An individual's intention to use a mobile payment will have a positive effect on that individual's usage behaviour concerning the mobile wallet.

[...]

H3: Perceived usefulness has a positive effect on attitude toward the mobile wallet.

H4: Perceived ease of use has a positive effect on attitude toward the mobile wallet.

[...]

H5: Perceived security [defined as the degree to which a customer believes that using a particular mobile payment procedure will be secure (Shin, 2008; Yenisey, Ozok, & Salvendy, 2005)] has a positive effect on the intention to use a mobile wallet.

[...]

H6: Trust in virtual malls positively affects the customer's intention to use a mobile wallet. [...] When it comes to the mobile wallet, trust is even more critical, given the possible risks of being hacked.

[...]

H7: Self-efficacy [individual's assessment of his or her ability to perform desirable behaviours in specific situations] is positively related to the customers' intention to use a mobile wallet.

[...]

H8: Social influence [the person's perception that most people who are important to him think he should or should not perform the behaviour in question] positively influences customers' intentions to use a mobile wallet." [100] (Shin D.-H. , 2009)

Here follow the conclusions drawn out of the study by Dong-Hee Shin:

"*As expected, and consistent with prior research, the results show that perceived security and trust are the two main predictors of intention. Previous studies and industry reports have shown that security concerns are the most important factors in mobile payment. The present study confirms the importance of security and trust, and further shows that security and trust can be enhanced by social influence. These findings together raise a need to highlight the customer's subjective viewpoint. As Linck et al. (2006) argue, the perception of mobile payment security by the customer is one major factor for the market breakthrough of the system*." [101] (Shin D.-H. , 2009)

The author proposes also some solutions to tackle the highlighted issues:

"Based on findings of the importance of customers' perceived security, vendors should implement security tools like the Mobile Transaction Assurance Seal for mobile commerce. Mobile trust mechanisms, such as payment credentials, trust

[100] (Shin D.-H. , 2009)
[101] (Shin D.-H. , 2009)

negotiation systems, and a trusted third-party system are necessary to increase users' perceived security." [102] (Shin D.-H. , 2009)

Venkatesh, et al., "*suggested that individual reactions to using information technology directly affect intentions to use information technology that in turn influences the actual use of information technology.*" [103] (Venkatesh, 2003)

To determine consumer acceptance, Lu, Yao and Yu argued that "*while perceived usefulness and perceived ease of use are strong variables in consumer willingness to adopt mobile technology, variables such as personal innovativeness and social influence must also be taken into consideration.*" [104] (June Lu, 2003)

Carlsson, et al., found that "*variables such as performance expectancy, effort expectancy, and attitude toward using were directly related to behavioural intention.* " [105] (Carlsson, 2006)

Lin and Wang affirm that "*perceived value and trust were found to be directly related to customer satisfaction and customer loyalty; customer satisfaction was also suggested to positively affect customer loyalty.*" [106] (Lin, 2006)

Shin defined the three variables driving consumer adoption. These were derived from the technology acceptance model and they include "*perceived ease of use, perceived usefulness, and attitude toward using the mobile wallet*. ". [107] (Shin, 2009)

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[102] (Shin D.-H. , 2009)
[103] (Venkatesh, 2003)
[104] (June Lu, 2003)
[105] (Carlsson, 2006)
[106] (Lin, 2006)
[107] (Shin, 2009)

As Shin defined them:

- "*Mobile consumer adoption consists of three variables, as derived from the technology acceptance model, to include perceived ease of use, perceived usefulness, and attitude toward using the mobile wallet.*
- *Perceived ease of use is defined as the degree to which an individual believes that using a particular system would be free of physical and mental effort.*
- *Perceived usefulness is defined as the degree to which an individual believes that using a particular system would enhance his or her performance*" [108] (Shin, 2009)

Donald L. Amoroso and Rémy Magnier-Watanabe argue that:

"In the context of mobile wallet, perceptions regarding reputation, image and service quality determine the attractiveness of alternatives. Because mobile payment solutions are still in their infancy, few alternatives may exist; however, established substitutes with strong network externalities may be a bigger obstacle to their adoption." [109] (Donald L. Amoroso, 2012)

At POS, new payment instruments have the potential to both increase the convenience of payments and lower the transaction costs.

Mobile payments provide consumers with ubiquitous payment possibilities, timely access to financial assets and an alternative to cash payments. The relative

[108] (Shin, 2009)
[109] (Donald L. Amoroso, 2012)

advantage of mobile payments compared with traditional payment instruments is thus likely to include time and location independent payment possibilities.

Ease of use and convenience have been found to affect consumer adoption of mobile technologies and services [110] (Jarvenpaa, 2003); [111] (Nysveen, 2005); [112] (Teo, 2003). Mobile payments are commonly expected to increase consumer convenience by reducing the need for coins and cash in small transactions and increasing the availability of payment possibilities. [113] (Mallat, 2004)

Mallat and Tuunainen suggested "*barriers of such mobile payment adoption for merchants include complexity of the systems, unfavourable revenue, lack of critical mass, and lack of standardization.*" [114] (Mallat, 2004)

Niina Mallat, in a qualitative study on adoption of mobile payments, affirms that: "*Several other barriers to adoption were also identified, including premium pricing, complexity, a lack of critical mass, and perceived risks.* " [115] (Mallat N. , 2007)

In the diffusion of innovations theory, complexity is determined as the ''*degree to which an innovation is perceived as difficult to understand and use*''. [116] (Rogers, 1995)

[110] (Jarvenpaa, 2003)
[111] (Nysveen, 2005)
[112] (Teo, 2003)
[113] (Mallat, 2004)
[114] (Mallat, 2004)
[115] (Mallat N. , 2007)
[116] (Rogers, 1995)

Complexity and problems with usability have contributed to the low adoption of a variety of payment systems, including smart cards and mobile banking. [117] (Laukkanen, 2005); [118] (Szmigin I. B., 1999)

Limitations in mobile device features diminish the usability of mobile technologies [119] (Siau, 2004). Typical limitations include small keypads, limited transmission speeds and memory, and short battery life.

Kim et al. found that the perceived fee has a significant effect on the perceived value of mobile Internet. [120] (Kim, 2007) Perceived service cost has also been found as a significant determinant for the intention to use wireless financial services [121] (Kleijnen, 2004), mobile banking [122] (Luarn, 2005), and mobile commerce transactions [123] (Wu, 2005). In the mobile payment context, the transaction costs of mobile payments are often included in the price of the purchased item. For example, a soft drink at a vending machine costs more if it is paid for with a mobile payment than if it is paid for with cash. Cost is therefore likely to have a significant impact on mobile payment adoption.

Consumers' concerns about the privacy and security of mobile payments are commonly related to authentication and confidentiality issues as well as to concerns about secondary use and unauthorized access to payments and user

[117] (Laukkanen, 2005)
[118] (Szmigin I. B., 1999)
[119] (Siau, 2004)
[120] (Kim, 2007)
[121] (Kleijnen, 2004)
[122] (Luarn, 2005)
[123] (Wu, 2005)

data (Dewan and Chen, 2005). Perceived security and trust are thus expected to impact the adoption of mobile payments.

Network externalities are considered as a relevant factor in mobile payment adoption because payment technologies exhibit indirect network externalities [124] (Economides, 1996) [125] (Hove, 1999). Failure to create critical mass has impacted the continuance of several previous payment systems [126] (Szmigin I. B., 1999); [127] (Van Hove, 2001). Mobile payments represent a new payment network in the market. A consumer's decision to adopt the network is significantly affected by the number of merchants using it, since that amount determines the opportunities for consumers to use the new payment service. New consumers adopting the network indirectly increase the value of the network for all consumers because they attract new merchants to join the network. Consumer adoption of mobile payments is therefore likely to depend on the perceived amount of adopting merchants and other consumers. [128] (Mallat N. , 2007)

The limited size of smartphones' screens represents another obstacle to mobile wallets adoption. However, voice assistants can help overstepping that obstacle since they can be used to restrict the range of options or navigate throughout the app features. [129] (Frollà, 2018)

[124] (Economides, 1996)
[125] (Hove, 1999)
[126] (Szmigin I. B., 1999)
[127] (Van Hove, 2001)
[128] (Mallat N. , 2007)
[129] (Frollà, 2018)

CHAPTER 2 – ANALYSIS

5. Research objectives for the thesis

The literature review gives insights on the customer experience at both digital and mobile wallet levels. Mobile wallets are not created by a single typology of operator (i.e. banks, ...) but many different typologies are free to launch in the market their own wallet. There is a clear gap in the literature in terms of how specific operators should shape their wallets to maximize the experience offered to users (CX).

Therefore, the main objective of this dissertation is to create a model able to dynamically suggest the VAS that should be offered by each typology of operator to maximize the customer experience. In order to do so, the work will start from the customer experience guidelines arising from the literature review and will suggest how to shape them according to the type of operator willing to launch or update their wallet. The model's output will also consider the features currently offered by successful players on the market, educating the decisions with the census. This is the reason why in the next section there will be a thorough analysis of the market, putting under scrutiny mobile wallets offered by different typologies of operators.

The thesis will also tackle a second research question. This time the focus will be on payments, the core feature of mobile wallets. A model already present in the literature will represent the main input of this section. Such model explains what are the "*5 assets to compete against traditional payment methods*" and lists VAS as one of those. As VAS are in the scope of the first research question, only

the remaining four assets will be tackled by this second research question. The aim will be to study the level of accomplishment that the different typologies of operators have on the remaining four assets to compete against traditional payment methods. Here is the theoretical model at the basis of this thesis, which has already been presented in the Mobile wallets customer experience section:

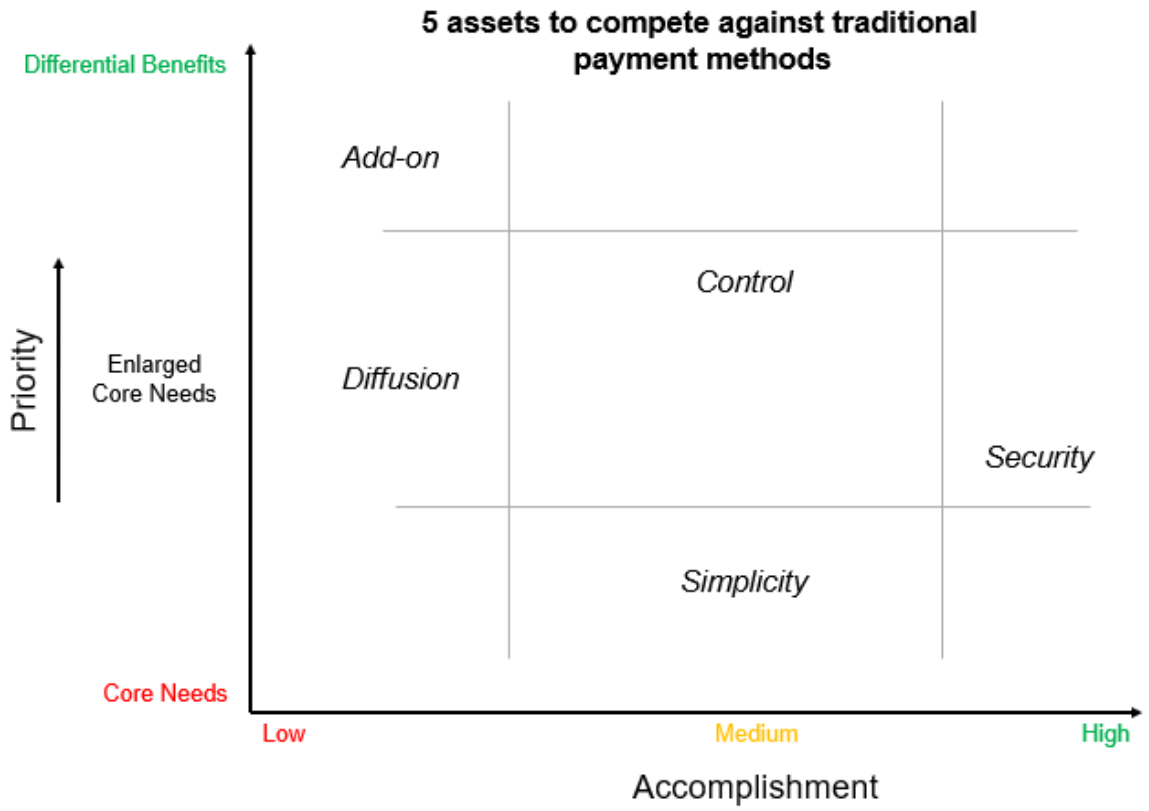

Figure 30 – Assets to compete against traditional payment methods

As it is possible to notice from the graph, the horizontal axis presents already as assessment of the level of accomplishment. Hence, the objective of this second research question is to validate or rather challenge the results proposed in the graph by Politecnico's Observatory. However, the second model will not only validate or challenge prior literature but will go a step further assessing the level

of accomplishment for each typology of operator (i.e. banks, merchants, service providers and start-ups).

6. Methodology

The aim of this section is to explain the research methods and the methodology employed in the framework of this study. There will be a reconnect with the literature review and a discussion on what choice of methodology was made and the reasons why that is considered to be the best option for this research. Moreover, there will be an in-depth explanation of the concrete steps taken to obtain the final results.

The literature covers extensively the way mobile wallets work from a technical viewpoint. Publications and articles can also be found with regards to how the customer experience applies to different areas such as the digital world and specifically mobile wallets. However, there is a clear lack with regards to how the customer experience principles apply to the choice of best VAS for the different typologies of operators. Therefore, the main research question that this dissertation tries to tackle is understanding how to apply the customer experience principles to the choice of the value-added services that each operator should offer to their customers. The thesis will then try to build insights on the best-practices for the adoption of the proposed VAS. Finally, another model will be built to assess the level of accomplishment of control, simplicity, security and diffusion. As previously explained, these are the four assets that the Observatory of Digital Payments of Politecnico di Milano deems paramount for a successful

transition to new forms of digital payment, making them succeed versus traditional payment systems.

It is important to notice this thesis is intended to serve as a reference for operators willing to launch or update their wallet and are in no way binding. In fact, operators are then left free to choose the set of VAS they think would bring the most value to their customers, based on company-related specificities, particularities or needs. Furthermore, the thesis is not intended to criticize the combination of solutions already implemented in the market. On the contrary, the final results of this dissertation draw on the currently adopted solutions by means of an extensive census (more on this in the remainder of the methodology section) that has been carried out to have a clear view on the AS-IS situation. Hence, companies already offering a set of VAS in their wallets can refer to the model built for this thesis to think whether a change in their offering should be made or, instead, if they still believe their choice best serves their customers' needs and wants.

The methodology chosen for the data gathering on currently adopted solutions is a rather practical one. In fact, as no comprehensive view of the solutions offered by different companies in their wallets is available online, it was clear that to build the AS-IS offering there was the need of an on-the-field census. The census has not been created from scratch, but it was developed for the first time in 2017 by the Politecnico di Milano's Observatory of Digital Payments and has been totally updated for this thesis. The on-the-field analysis consisted in downloading 30+ mobile wallets and exploring their functionalities. This process

turned out to be a rather complex one, as not all the apps run on both Android and iOS devices. Hence, the census and the further classifications have been done via the use of different operating systems and have been integrated also by some online researches, condensing the results into a single Excel file at the end of the process. Online researches were used to have a full view on wallet's functionalities in case the apps could only be used with proprietary payment systems and had no free access.

The update of the census was fundamental to ensure the analysis made later in the work was grounded on the most up-to-date information.

This on-the-field methodology to tackle the AS-IS analysis is certainly not the only possible approach. In fact, also online researches alone or interviews to users could have resulted in a similar output. However, a concrete approach results in a higher-quality output, as the data is created on the moment and there is no risk to incur into not-up-to-date or biased information. Furthermore, this approach is the most time effective and complete one, as it ensures every functionality and detail is included and scrutinized.

Once the census was completed, a series of analysis have been performed aiming at building intelligence aggregating and processing the raw data collected on the field. The aggregated data resulting from this process helped to better understand the big picture on the functionalities and the CX level present in the various wallets. The intelligence built sheds a light on the solutions proposed by different typologies of operators. In fact, in the census there are wallets belonging to more than 10 typologies of operators. For each of them,

considerations could be made based on the data collected. However, the initial results were not statistically relevant, as many typologies were only featuring one or two wallets. Hence, a further iteration of the work has been done, this time aggregating some of the categories present in the census eventually resulting in only 4 aggregated typologies: banks, merchants, service providers and start-ups.

The knowledge built via the on-the-field AS-IS analysis represents a key input to build the TO-BE scenario. In fact, in order to create the best-fitting suit of wallets per each typology of operator, a list of variables describing each value-added service is required. In order to build this list, having a deep knowledge on the market offering is deemed to be essential. The decision on the best descriptive variables for each of the VAS is the result of a complex process made of many inputs eventually merged. In fact, the knowledge on the AS-IS situation is only one of the inputs that led to the final decision. The insights gathered via the literature review also represent another key input. Once these two inputs were available, an individual brainstorming session was performed. This exercise led to the initial draft of descriptive variables for each VAS. As this research aims at finding rather unpredictable outcomes, the best research method to gather open feedbacks are focus groups. Hence, the outcome of the individual brainstorming session has later been integrated with the output of two focus groups.

The first focus group consisted in 9 people of ages between 40 and 55 years old, all workers and with an equal gender distribution. Instead, the second focus

group consisted of 6 people of ages below 25 years old, all university students and with an equal gender distribution. The work process consisted in two main steps. The first iteration included a series of open-ended questions to which the participants of the focus group had to reply, possibly sharing the reason why they replied in a certain manner. In this first step, the two work groups were kept separate and had no interactions. The output of this step was an initial assessment per group of the descriptive variables for each VAS. The second step consisted of another session with the same two groups kept separate. This time, the two groups were presented with the descriptive variables the other group defined at the end of the first step. This helped the two groups to challenge their solution resulting in a higher alignment of the two groups.

Once the focus group sessions were completed, those results have been used to challenge the individual brainstorming session, reaching the final decision on the descriptive variables.

To further validate this final outcome, two interviews were made. The interviewees were selected as representatives of banks and service providers, the two most populated typologies of operators analysed. Such a process made of multiple iterations and validations is deemed to be the best one to create a solid basis to build the model for this thesis. Other methods such as the creation of surveys could have been used, but they were thought as limiting. In fact, surveys are very effective when there is the need of validation of certain assumptions or decisions taken and they do not provide the freedom of expression to recipients that a focus group offers. In terms of final validation, an

even more solid result could have been obtained from a higher number of interviews. In fact, interviewing all the companies that launched the censed wallets, a slightly better final result could have been achieved. However, the additional benefits coming from this work do not justify the increase of complexity coming from more than 30 different interviews. In fact, considering the Pareto principle or the 80/20 theory, it is believed that 80% of the quality of the final result is obtained by 20% of the interviews, whereas the remaining 20% of additional quality is obtained by the remaining 80% of the interviews. Hence, it was clear that no further interview had to be conducted.

The dissertation aims not only at indicating the best-fitting VAS per typology of operator but also at advising on how a certain VAS should be to offer the best customer experience. This research of best-practices is nothing but a mix of on-the-field research and online searches. In fact, the census update helped understanding which solutions felt more user-friendly, intuitive, smart and useful. This first level of understanding has been completed by an extensive online research that helped confirming what has been experienced while testing the wallets for the census, as well as extending the overview on the best practices offered by wallets all over the globe. Eventually, this process led to the identification of the best practices for each VAS.

Once all the descriptive variables have been identified, they had to be assigned to a rating on a scale from 1 to 10 aiming at understanding the best-fitting ones. The score considers the fit between a descriptive variable and the intrinsic characteristics of the different operators. To summarize, the descriptive

variables were decided based on the peculiarities of each VAS linked to the characteristics of the typologies of operators via the aforementioned scoring process. All the scores and consequent results have been validated via the interviews. This structured process helped ensuring great robustness and solidity of the final model.

Once the scores have been assigned to the descriptive variables of the VAS, they have been averaged per each typology of operator and per each VAS. Hence, as an output of the process, all the four typologies of operators were assigned to a list of scores for all the possible VAS studied in the framework of this dissertation.

The scores have been reordered from the highest to the lowest for each typology of operator. This list of sorted scores has then been compared against the AS-IS situation arising from the census. In fact, the census allowed to highlight the most offered features by each typology of operator. The rationale of this comparison is that companies will tend to offer what they think best suit their customers' desires. Therefore, the most offered VAS' are the ones that a certain typology of operator thinks to be the best ones. Interesting is to see that the majority of the model's suggestions are aligned with the current offering. Once again, by means of the final interviews, a validation of the output of the model has been done.

With regards to the model aiming at assessing the level of accomplishment of the payment assets, the two biggest inputs have been the literature review and the census. In fact, the model coming from the literature review proposes already

the 4 assets influencing the payment performance of a wallet. On the other side, the census presented abundant data that could be easily used to generate practical insights on the literature's assets. In fact, the census provides insights, scores and assessments on almost 100 different variables for all the 30+ wallets. Once the four assets have been thoughtfully defined, a careful research within the census has been conducted aiming at finding the drivers that would better describe them.

Once all the drivers have been identified, intervals/ranges have been defined for each of them. In fact, to assign a score to the drivers, an objective score-attribution process was required. This is why, for every driver, an analysis of the results within the census has been conducted. As an example, taking the driver "*number of clicks required to check balances"*, the numbers vary largely from wallet to wallet. Hence the need to define what interval would mean for example a high level of accomplishment and not a medium or even low one. Typically, the results present in the census have been divided into three thirds, assigning to each of them a meaning in terms of level of accomplishment. In case of binary results (i.e. 0/1, present/absent, ...), only a high and a low levels of accomplishment have been identified.

Once the drivers have been scored, an average of those results has been made to obtain the level of accomplishment for a certain asset. This process was conducted for simplicity, control and security. As assessment of the accomplishment of those three assets was made for each of the four typologies of operators, in order to have a view on how the different typologies score versus

the levels proposed by the Observatory of Digital Payments. The results of the four typologies have been averaged to generate an aggregated view of the results and allow a straightforward comparison of Observatory vs. thesis' model results.

Diffusion could not be evaluated via the census, as it is more related to the infrastructure, rather than to the single wallet. Therefore, the level of accomplishment for that asset has been evaluated via the insights gathered in the literature review and no view per single typology of operator could be created.

7. Value-Added Services

According to literature review's findings, VAS should be prioritized since they heavily enhance the customer experience. Furthermore, they have not been yet fully exploited by many companies, hence featuring a low accomplishment level.

Therefore, it is worthwhile investigating the best-practices related to value-added services. Best practices will be investigated as follows: for every VAS, the best you can find on the market is normally what every company should integrate in their own wallet to make sure they are offering the most up-to-date features. Therefore, the best technology, process, solution or visualizations for each of the adds-on will be studied and will be proposed as best practice. This has the objective to give to companies willing to launch or to update their wallet an idea of what is the best offered in the market, giving them already a direction not only regarding the types of adds-on that they should build in their wallets but also of what is the best way to build that very add-on.

The VAS that will be further studied are taken from the ones coming out of the census, so VAS that existing wallets are already offering to users. Important to say is that the wallets arising from the census are not a restricted view of what is possible to find on the market. In fact, the VAS discovered via the census are aligned to what arises from the literature.

First of all, it is worthwhile investigating the reasons why VAS are so important for mobile wallets to reach mass adoption.

As C. Augsburg and J. Hedman wrote,

"The literature proposes two reasons for attaching supplementary services to a core product:

1) To increase the perceived value of the core product, and

2) to make up for declining revenue from core product sales. Supplementary services are found to significantly influence the perceived value of a product and have been found to be an important driver of product adoption. As a supplementary service to mobile payments, we therefore propose that VAS will positively affect the perceived value of the mobile payment offering and thereby the intention to adopt mobile payments." [130] (Augsburg, 2014)

In fact, in terms on innovativeness, mobile wallets' payment options alone are not attractive enough to users. The incremental gain with respect to using a credit card or cash is not big enough to justify the full transition of payers to mobile wallets.

C. Augsburg and J. Hedman research on VAS impact on adoption of mobile wallets shows clear results. Their results "*show that VAS positively influences the intention to adopt mobile payments*." [131] (Augsburg, 2014) Furthermore, they affirm that "*consumers see the payment process being easier and more efficient when VAS are integrated with the mobile payment service.* " [132] (Augsburg, 2014)

[130] (Augsburg, 2014)
[131] (Augsburg, 2014)
[132] (Augsburg, 2014)

The two researchers also affirm that: *"consumers prefer a single payment device over carrying around an array of payment options; as VAS are integrated in the mobile payment technology, consumers can carry around less items. "* [133] (Augsburg, 2014)

To conclude, Augsburg and Hedman did not find any correlation between increased complexity of mobile payments and the presence of VAS. This certainly improves the likelihood of adoption.

7.1. VAS: best practices

Here follows the explanation of the best practices that should be followed by companies when creating new mobile wallet solution for their customers.

Mobile Ticketing

Talking about mobile ticketing, what users need is a simple and intuitive way to purchase their tickets within the perimeter of the wallet and then having it stored somewhere where they are easy to be picked up and to be showed to the cashier when using the service. Inspiration here is to be taken from specific airline companies that offer their tickets in their specific app. The final aim for a generic wallet should be to have an airlines' alike ticketing system which would work for every kind of merchant or service provider. Here follows a screenshot of a Ryanair's e-boarding pass.

[133] (Augsburg, 2014)

Figure 31 – Ryanair e-boarding pass

The extra mile for mobile ticketing is represented by additional services that are flawlessly integrated into the ticketing system. Examples are the navigation function to guide users towards the event or the booking of parking spaces and the direct entrance with the e-ticket. Here follow two screenshots taken from the mobile ticketing app *sweb.Wallet* showing how what just said should look like.

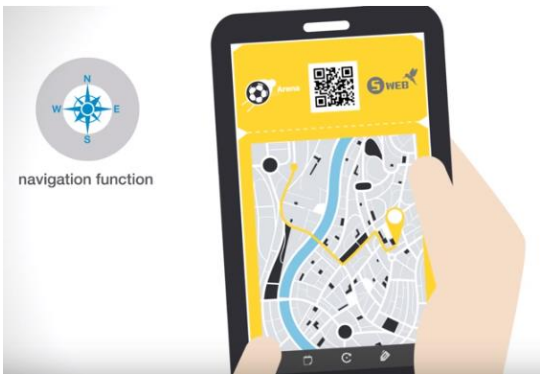

Figure 32 - Navigation function from sweb.Wallet [134]

[134] (sweb.Wallet, 2015)

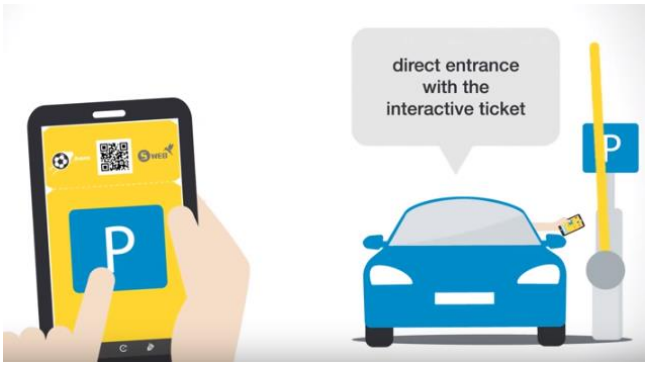

Figure 33 - Easy entrance to parking from sweb.Wallet [135]

Mobile Parking

This is an important VAS that aims at simplifying the parking experience. The app has to be able to register the user's car via a picture of the car plate or via manual filling, if the user prefers. When customers wants to park their car, the only information to be entered are the parking zone code and the parking time. Once those data are inserted, the payment must start in maximum one click considering that the wallet knows already all the payment information. The VAS needs to have some further functionality as the possibility to track and extend the parking period, to get notifications when the session is about to expire and keep track of the parking history.

e-Couponing and Loyalty Programs

The possibility to redeem in a simple and transparent way digital coupons is key to ensure their full entrance in the retail's marketing mix and therefore their full entrance in users' daily habits. The application has to be able to

[135] (sweb.Wallet, 2015)

instantaneously convert coupons received via a smartphone into discounts applicable to the final bill. Furthermore, it must automatically synchronize with the already existing apps of the merchants. The latter can generate and send coupons and promotion codes directly via their app and getting them automatically displayed on the wallet of the consumer. [136]

Figure 34 – Mobile Couponing

Loyalty programs represent an attractive solution for prospects, as they do not even require payment information per se. In fact, many customers are worried about digital payments' security and are unwilling to insert sensitive information into applications they do not fully trust. Hence, loyalty programs may represent the way to make users download the wallet and get acquainted with it. Once trust has been built, users will be willing to insert payment information and will start using the wallet at 360 degrees. Starbucks' loyalty program certainly represents the best practice in this field: they offer the consumer a certain number of stars

[136] (Redazione, 2017)

with respect to what they bought and after reaching a predefined threshold customers can claim a free beverage. [137] All this is presented to users in a simple, intuitive yet captivating manner.

Loyalty programs can be integrated with some other features, aiming at increasing their overall efficacy and performance. Examples are customers direct messaging, shopping checklists, product reviews and social sharing tools. [138]

The integration of loyalty program with the location of the device gives rise to potential to improve the user experience. In fact, the wallet should always be able to re-order the different coupons and loyalty cards in order to always show at the top of the list the ones closest to the user. This means that the loyalty card of the store in which the customer is situated will always appear as the card at the top of the list, streamlining and improving the experience of the user.

Geolocation

Talking about geolocation, a few best practices should be evaluated. Namely, these are geotargeting, geofencing and beaconing.

Geotargeting enables merchants to target a user wherever they go. Communications that can normally be sent are advertisements or other content such as push notifications based on location.

Geofencing is the technology that enables whatever actor to send push notifications, emails, engagement features and even coupons and security alerts

[137] (Samuely, 2016)
[138] (Dabbs, n.d.)

when a certain user enters in the perimeter of a virtually fenced area. Here follows how a geofenced communication should look like:

Figure 35 – Geolocation-based offer [139]

Beaconing is the third technology based on geolocation. Beaconing is composed by cheap and low-powered transmitters that are able to interact with devices located in the immediate proximity of the beacon itself. In fact, they work on Bluetooth technology, which is known for working only within certain distances. They represent the perfect deal if the aim is to send information, alerts and data to smartphones that are situated either into the store itself or in the immediate proximity (i.e. prospects/customers walking by the entrance of the store). [140]

Mobile Top-ups

Online mobile top-ups is a very common feature, present in almost 40% of the censed wallets. It is a very convenient factor for users who can make an online recharge without re-entering every time the bank details to conclude the operation. With mobile online recharging integrated in a wallet, many more

[139] (Geolocation based app development ideas 2018, 2018)
[140] (Geolocation based app development ideas 2018, 2018)

benefits should come with the recharge itself, if the functionality follows the best practice advices. As it is possible to see from the on-the-field testing, the best wallets offer, along with online recharging to top up phone credit in one single click, many other features. Mobile top-ups should offer seasonal discounts and offers when applicable as well as recharge plans, aimed at automatizing and simplify the recharge process. Cashback schemes can be integrated, too.

Invoice Settling

Invoice settling is a great way to simplify the invoicing process and to increase cashflows of businesses which are not anymore obliged to hand-write the invoice, mail it to the customer and wait for a bank transfer or a check. Invoice settling speeds up this process. If mobile wallets offer state-of-the-art e-invoicing, the overall process may become even quicker and simpler. In fact, invoicing templates and recurring payment options are the best practice every wallet should have integrated, if offering the e-invoicing feature.

Invoice settling has to be available and easily accessible 24/7 and from whatever location. This is because the quicker an invoice is emitted, the quicker cash will flow in. The wallet increases the flexibility that can be offered to customers: debit and credit cards, automated clearing houses, and bitcoins are all possible options. [141]

Furthermore, the invoice settling feature should have instant notification to keep the mobile wallet user always informed on what is happening with his/her

[141] (Rampton, 2017)

invoices. The Wave invoice settling application, sets the best practice with respect to notifications, giving an intuitive, simple and straightforward example, as it is possible to see from the following picture.

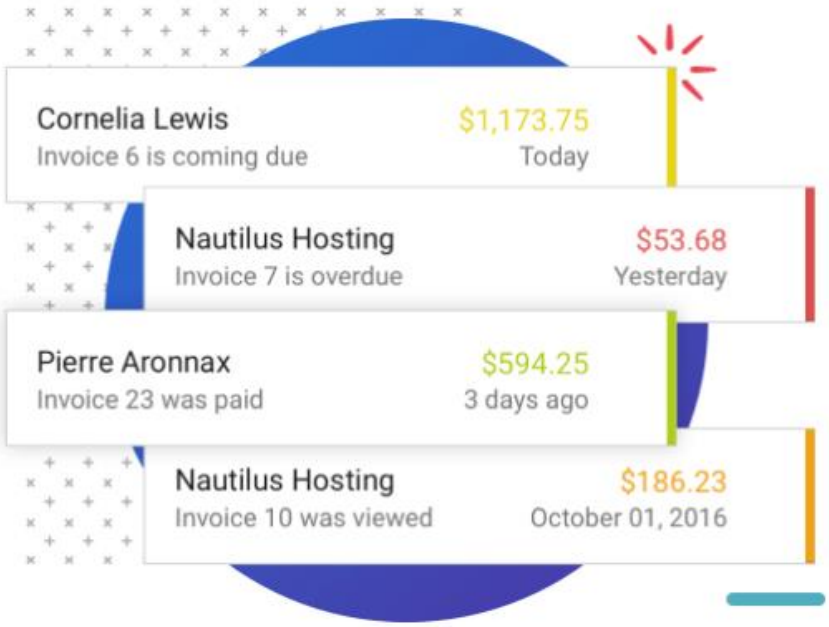

Figure 36 – Invoice settling visualization best practice

Mobile Ordering

Mobile ordering represents a chance for higher revenues, improved customer satisfaction and improved in-store experience if a few best practices are followed, as the *Apptentive Blog* affirms.

The idea is all about improving the in-store customer experience by making it faster, easier and more enjoyable. The function needs to let you order in a simple manner communicating how long it will take for the order to be ready. Domino's Pizza pushed this the limits by introducing the zero-clicks ordering function: customers only have to launch the application. Navigation to the store from

consumer's location is a must as well as the integration of the mobile ordering function and the store's loyalty program. The skip-the-line option offered for mobile orders should also be included. [142]

Digital Identity

Digital identity represents a must for the future, but the technology is nowadays still in its infancy with only a few solutions and platforms available in the market. However, as it is possible to read from a *Trulioo*'s article about the current situation on the online world, "*There are deep concerns about security, privacy, permissions and control of access. Mobile ID technology is vital to help ensure the highest levels of security and privacy protection are adopted.*"

Digital identity helps governments saving money as it reduces customer service costs and fraud costs while at the same time enhancing CX, as it is possible to read in an article written by *Trulioo*. [143]

The potential to positively impact the economy as well as to boost e-commerce worldwide is great as trust increases being able to prove your identity online. Cross-border travels will also benefit, as travellers are already using airlines' apps to purchase, store and show flight tickets and they could have in the same app also a digital identity functionality to streamline the overall process and boost international safety. [144]

[142] (SEFFERMAN, 2016)
[143] (Trulioo, Digital Identity Opportunities — The Value of Trust, 2018)
[144] (Trulioo, Mobile ID — Leave Your Wallet at Home, 2018)

Best practice here is represented by a system that can easily acquire several pieces of biometric information from the customer in a flexible way (i.e. a combination of iris scan, fingerprint and face scan) and that immediately communicates digital ID when requested.

e-Commerce

Talking about e-commerce, clear trends have been established regarding what mobile apps should offer to their users.

Shopify individuated a series of specific best practice to be followed while building an e-Commerce functionality within a wallet.

As far as navigation within the e-Commerce feature is concerned, Shopify's advice is to utilize "*a fixed navigation bar in the header, a retracting footer navigation for top collections, and an extendable slider navigation on the side*". [145]

To increase conversion rates, Shopify encourages a series of scripts. These are automated discounts, dynamic pricing and omni-channel integration. Talking about the omni-channel integration strategy, it is important to offer in a consistent way the same level of service and experience across all the devices and channels a customer could use to make the purchase.

Regarding the key moment of the checkout, Shopify gives some further suggestions, affirming that for that precise matter, "*less is more*". The article then continues affirming that "*fewer clicks, fewer screens, fewer fields, fewer*

[145] (Wahbe, 2018)

taps, clicks, and swipes all add up to one thing: more customers". Once the app starts to know customers' preferred payment options, it should be able to put those in evidence and leave all the others in the background or as secondary options in order to further streamline the checkout process.

Financial Services

As an article from *dynamicleap* reads, "*Fintech is providing individuals and businesses with ways to save money, get paid faster and manage their money more efficiently. They are finding new ways to provide personalized services anytime, anywhere, and on any device*". [146] Mobile financial services represent in fact the future of financial services and a great value-added service to be offered within a mobile wallet.

The article continues: "*Simplicity of design, the removal of friction, and the ability to improve the customer experience are key ingredients to a successful app*". [147]

A simple design is therefore very important to ensure maximum customer experience, but this should not come at the disadvantage of what the customer can do with the app itself. In fact, the top-rated mobile financial services apps in the various app stores worldwide, as the *dynamicleap* article reads, are all giving the customer the feeling that they can do everything they need with the app.

[146] (LEAP, 2017)
[147] (LEAP, 2017)

Exploiting new technologies such as Artificial Intelligence, predictive analysis, simulation and big data analytics, the apps should be able to personalize the service to the customer's needs. In fact, the best user experiences are those built and shaped on the needs of the users.

Receipts Storing

Receipts storing is an interesting feature for companies selling products, for which the creation of receipts is mandatory. Typically, when receiving a receipt at a store, customers feel discomfort as it is always difficult to store the change and the receipts in their physical wallet. Digital receipts storing increases the customer experience, by simplifying and automatizing the receipts storing process. After every transaction, receipts have to be stored automatically and the user needs to have the possibility to search in a smart way previous receipts. The VAS needs to store receipts allowing different filtering options such as per store, per city/province/region/country or per range of expense amount. This will enhance the control users have on their purchases.

8. VAS – Descriptive Variables

Now that all the value-added services have been described and their relative best practices in terms of implementation and offering explained, it is time to define descriptive variables (DV) for each of them.

The DV are aimed at understanding what are the factors that drive the natural adoption of a certain VAS. The rationale behind this process is that not all the VAS naturally fit a certain typology of operator. In fact, every typology of

operators has its own set of VAS that better fits their wallet. The objective is to determine what are the set of features that naturally meet a specific typology of operators' characteristics, remaining as close as possible to their core businesses.

This match is done by identifying a series of variables that either describe or should be present in a certain operator if they are willing to offer that specific service. These identified variables will then be matched against the characteristics of the operators and the end result will be a model assigning to each typology of operators the best-fitting set of VAS.

The following table presents the list of all the variables that have been identified and the explanation of why they are deemed to be key descriptive variables. Annex 1 shows a more complete table, with more detailed explanations for each descriptive variable.

VAS	Descriptive Variables	Explanation
Mobile Ticketing	Ticket based	A business that naturally sells tickets could heavily benefit from a mobile ticketing system.
	Cross Selling	Big players selling a great array of different services have the possibility

		to exploit mobile ticketing for cross-selling opportunities.
	Loyalty Program	The presence of a loyalty program increases the advantages coming from a mobile ticketing system as it allows better sales tracking.
Mobile Parking	Access to Infrastructure	To enter the business, creation or ownership of parking lots is a pre-requisite. Operators that own data on cars on the national roads and have access to the infrastructure have an edge over other operators.
	Ownership of Brick and Mortar Stores & Customer Volume	The ownership of physical stores is a key variable as giving the possibility to a customer to check, reserve and pay for the parking in the immediate proximity of the shop itself is an extremely effective customer experience enhancer. Such a consideration is only valid if the operator deals with big volumes of

		customers. This is because the investment is only justified with big volumes and potential agreements with city halls or the government are easier when negotiating with big volumes.
e-Couponing	Switching Costs	If switching costs are structurally low, there may be the need of increasing those by offering an e-Couponing service to customers.
	Product/Service Repurchase Frequency	e-Couponing programs are more effective with products or services to be frequently repurchased over time.
	Product Perishability	Businesses selling perishable products can take advantage of e-Couponing, as they can easily drive up sales when needed by sending coupons to customers and ensuring a higher-than-usual sales rate.
	Switching Costs	If switching costs are structurally low, there may be the need of

Loyalty Programs		increasing those by offering an e-Couponing service to customers.
	Product/Service Repurchase Frequency	Loyalty programs are more effective with products or services to be frequently repurchased over time.
	Mobile Ticketing	The presence of mobile ticketing increases the advantages coming from a mobile ticketing system as it allows better sales tracking.
Mobile Top-ups	Customers Volume & Agreements Creation Likelihood	If mobile top-ups do not represent the core business and the company is not a start-up, featuring a high customers volume is a must as this enhances the likelihood of an agreement with a telco operator.
	Service Based	A user will expect to find the mobile top-ups service within the wallet of a company offering services.
Invoice Settling	Invoices	Offering an invoice settling service (to pay taxes, fees, ...) as a standard practice of the business is a key

		reason for implementing an invoice settling system.
	Service Based	A user will expect to find the invoice settling service within the wallet of a company offering services.
Mobile Ordering	Physical Presence	Physical presence is a key pre-requisite to offer a mobile ordering service as it enhances the in-store experience. This will help managing the flows of customers and balancing the overall workload.
	Different Cashiers	When offering mobile ordering, differentiating the flows of customers within the store is important to maximize the customer experience.
	Quick-Service Industry	Being in a quick-service industry increases the need of a mobile ordering system as it allows for a quicker service. Mobile ordering lets

		clients focus on more value-added activities while the order is prepared.
Geolocation	Physical Presence	Physical presence is a key pre-requisite to offer a geolocation service as it is thought to send communications and promotions to customers passing by (or close by) your brick-and-mortar store.
	Promotions	Offering promotions under the form of e-Couponing or loyalty programs is an enabling driver for the adoption of geolocation as those services perfectly fit together.
Digital Identity	Market Saturation	Only few, big and entrusted players will have the possibility to offer such a service. Hence, the market for digital identity will easily saturate. Once the market is saturated, the VAS cannot be added to any further wallet.

	Government Agreements Creation Likelihood	Players that typically have connections to governments or that are big enough to create those connections are more likely to offer a digital identity service to their customers.
	Technological Expertise	Digital identity requires a series or technologies to run in a trustworthy manner. In particular, blockchain is a key technology able to guarantee, legally track and provide the digital identity of a certain person (and even a certain good). This process needs to pass through many safety steps and it is certainly presenting a high level of technological complexity and savviness.
e-Commerce	Online Sales	Businesses already having online sales are those that could potentially benefit the most out of an e-Commerce app within their wallets

		as users are more and more multichannel.
	Product Based Business	Product-based businesses are more likely to offer an e-Commerce functionality within their wallets.
Financial Services	Access to Customer Data	Access to customer data is a key prerequisite to offer financial services as each financial service is built on the needs of the single, specific customer.
	Online Financial Services	Businesses already having online financial services are those that could potentially benefit the most out of a financial service feature within their wallets as users are multichannel, even when approaching financial institutions.
	Capital Availability	Access to capital is key to be able to offer financial services. This is simply because to lend out money to

		customers you need to have those money beforehand.
	Customer Volumes	Access to big volumes of customers is another prerequisite to successfully launch a mobile financial service feature. This is because due to the high capital needs, access to huge amounts of customers helps reducing the structural risk of the business.
Receipts Storing	Product Based Business	Product-based organizations use of receipts as a proof of payment.

Table 8 - Descriptive variables for VAS

Based on the descriptive variables just identified, the fit between a certain typology of operators and a specific value-added service will be investigated. A score from 1 to 10 is assigned to every descriptive variable and the assigned scores will then be averaged. Every typology of operator has its own score with respect to a specific VAS All the results will then be ranked and the five highest-ranked adds-on will be selected as the best mix for a specific typology of operator.

The number of VAS initially offered should not exceed five, as users need to get acquainted with the services. After a period that varies from case to case, it

is advised to increase the number of VAS in order to introduce a further element of originality and interest for customers. This will increase retention over time.

9. The four assets to compete vs. traditional payments

According to the model developed by Politecnico di Milano in a joint effort with Kantar TNS, there are four assets linked to the payment side of a wallet that are enablers for a successful competition versus traditional payment systems and methods.

These four assets are diffusion, control, simplicity and security. In the following table it is possible to see the definition of each of the four assets.

Diffusion	D*iffusion* does not refer to the number of users a certain wallet has or to the number of wallets present in the market. Rather, *diffusion* refers to the capillarity of the infrastructure at the base of digital payments. In particular, it refers to the number of stores that have a POS able to accept a digital payment via a mobile wallet.
Control	*Control* is simply a measure of how easy it is to check certain payment-related information. These are balances and past transactions of bank accounts and cards registered to the app. When this information is easily available within the wallet, it gives the users a feeling of control on what is happening with their accounts. When the wallet presents shortcuts to access even

	more easily key data, the level of perceived control increases. Widgets are a good example of control-enhancing feature.
Simplicity	*Simplicity* is another key enabler for the mass diffusion of a new payment system and a key lever to win against traditional ones. This asset sounds trivial but in fact it is not. *Simplicity* is one of the main drivers for a good CX, which is the aspect that users and customers worldwide are mostly looking at nowadays. This is simply because, as living conditions are raising more and more on a global scale, customers tend to choose products and services that make them live the most enjoyable experience. If a wallet results too complex to be used and not convenient during daily operations (i.e. paying at the supermarket or navigating the wallets' features, ...), users will always prefer to use more intuitive and user-friendly options (typically the ones that they know already – traditional payment systems in this case). A wallet that results overcrowded (i.e. featuring too many options, menus and functionalities) will result as too complex and hence less attractive to customers.
Security	Mobile wallets are responsible for dealing with users' money. Money are, whether we like it or not, among the most important resources people have. Hence, it is paramount for the mass diffusion of mobile wallets and for their success against

	traditional forms of payment to ensure the highest possible levels of security, or at least a higher level than traditional systems.

Table 9 – Four digital payment assets to compete against traditional systems

In order to make as assessment on the level of accomplishment for these four assets, a series of variables should be defined to render the approach as structured as possible. The updated census will be a key input to evaluate the level of accomplishment of the variables composing the assets and hence the accomplishment of the assets themselves.

Three out of the four assets are operator-specific, hence different assessments on the levels of accomplishment will be attributed to four studied typologies of operators. Concerning the fourth one (i.e. diffusion), only general considerations can be made, as it is not directly affected by the single operator or typology of operators, but it is rather an infrastructural element.

To define the level of accomplishment of these assets via the aforementioned variables, ranges for every variable should be identified. These ranges serve as indication of low (L), medium (M) and high (H) levels of accomplishment.

Control	# of clicks to check balance	≤1	H
		2-3	M
		≥4	L

	# of clicks to check past transactions	≤1	H
		2-3	M
		≥4	L
	Presence of a widget	Present	H
		N/A	M
		Absent	L
Simplicity	# of steps to register to the wallet	≤5	H
		6-10	M
		≥11	L
	Social login	Present	H
		N/A	M
		Absent	L
	Online payment – # of required steps	≤4	H
		5-7	M
		≥8	L
	Proximity payment – # of required steps	≤4	H

		5-7	M
		≥8	L
	P2P payment – # of required steps	≤4	H
		5-7	M
		≥8	L
	# of VAS present in the wallet	≤6	H
		7-10	M
		≥11	L
Security	Presence of biometry-based features	Present	H
		N/A	M
		Absent	L
	Presence of secure element/tokenization/session key	Present	H
		N/A	M
		Absent	L
Diffusion	Insights gathered in literature review on the infrastructure	N/A	N/A

Table 10 - Drivers of the payment assets

CHAPTER 3 – RESULTS

10. Analysis of the available payment solutions

The on-the-field analysis is based on the census conducted in 2017 by Politecnico's Observatory, previously presented in the literature review (*Current players solutions)*. The census has been completely updated during March 2019 to ensure the analysis considers the most up-to-date information. It is worthwhile investigating where different types of operators (i.e. merchants, banks, ...) put their focus in terms of additional functionalities they offer. Additional functionalities means everything that is offered which is not the payment feature, which represents the core offering of a wallet.

As previously explained in the methodology section, a total of 10 different types of operators have been initially considered. The initially included typologies were the following ones:

- Telecommunication companies
- Posts
- Banking consortiums
- Agencies
- Retailers
- Dotcoms
- Start-ups
- Over-the-top (OTT) companies
- Service providers
- Banks

The following graph shows what percentage of the 32 analysed mobile wallets (Reduced to 30 after the census update, as two wallets have been shut down in the meantime) comes from a certain typology of operators.

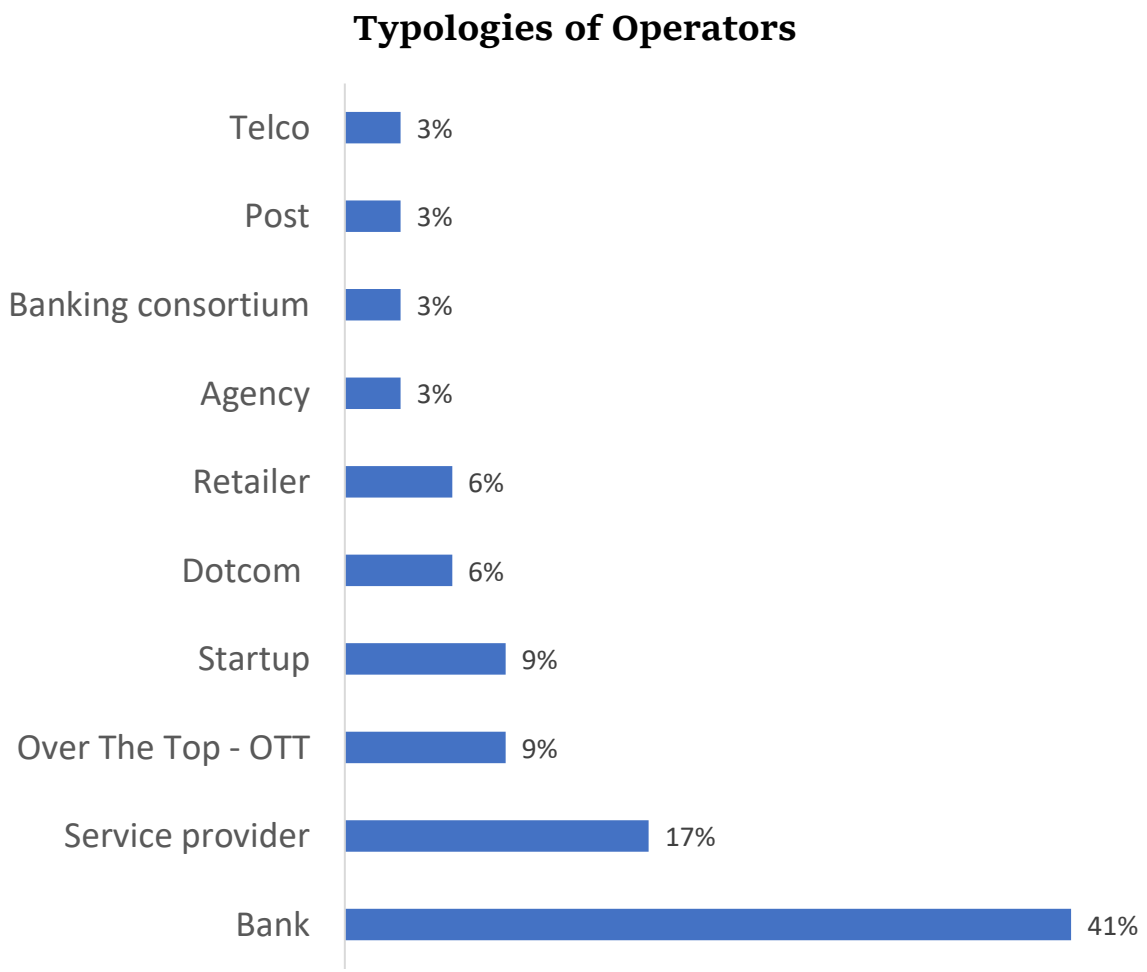

Figure 37 - Typologies of operators studied - first proposal

As it is possible to see, the majority of the wallets comes from the Banking sector, with other operators offering way less wallets, reducing the usefulness and statistical relevance of the analysis.

In order to render the analysis more significant, at a later stage of the work a different choice has been made regarding the typologies of operators to include.

In fact, the number of different typologies has been reduced from 10 to 4, aggregating together some of them. The four typologies that have been eventually identified are *Banks, Merchants, Service Providers and Start-ups*.

Here follows what the new aggregated categories contain:

- The *Banks* typology includes banks and bank consortiums. No distinction is made with regards to retail banks (i.e. mainly dealing with end users) and merchants banks (i.e. mainly dealing with merchants).
- The *Merchants* typology includes retailers, shopkeepers and supermarket chains.
- The *Service Providers* category includes postal service providers, telco, dot coms and agencies in addition to pure service providers. In fact, the definition of service provider is very ample, including every company that offers any kind of service, being it consulting, legal, real estate, communications, storage, processing, telco, application, storage or IT. The category is overall very heterogeneous.
- The *Start-ups* typology potentially includes every company that just started its operations and that could be defined as a start-up. Nonetheless, all the companies censed within the start-ups category are full-fledged service providers. The only element that distinguishes them from the service providers category is represented by the customers

volumes they manage and the capital availability, which are both significantly lower than the average service provider.

The following graph shows what percentage of the 30+ analysed mobile wallets comes from each typology of operators with the new classification.

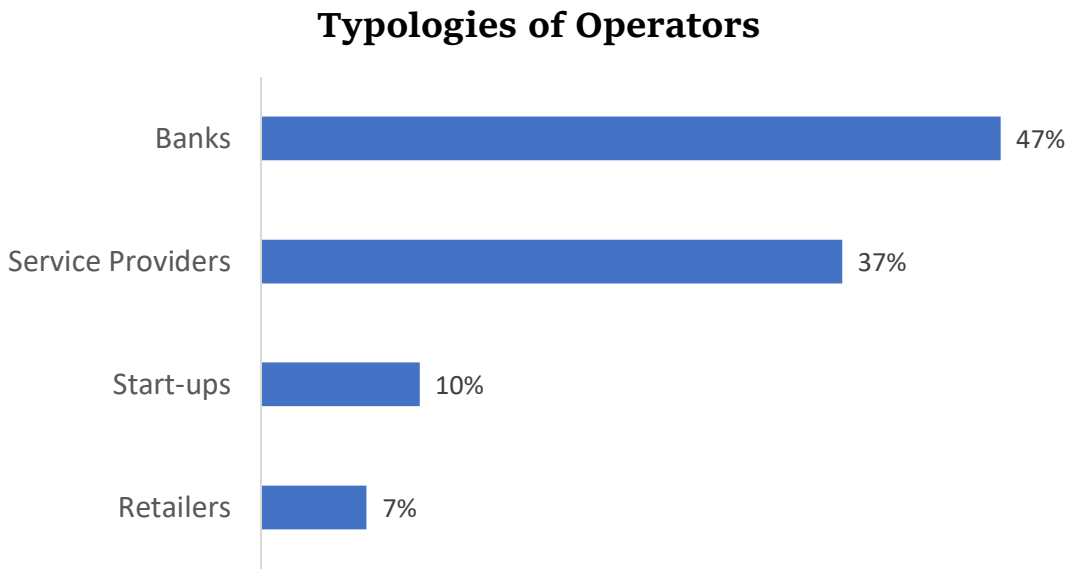

Figure 38 - Typologies of operators studied - final proposal

In the remainder of the chapter, the thesis will focus on presenting what every typology of operator is currently offering to their customers. This aims at clarifying and highlighting the main characteristics of a certain operators' wallets and the discrepancies with other typologies, if any. The analysis will be made based on the aforementioned drivers of customer experience.

10.1. Banks

As far as access and security are concerned, 93% of the analysed banks offer biometry features. Only 14% of the wallets give free access to users, meaning

that they can access the wallet without having a bank account or payment card already open. Only 21% of the banks offer a widget to their users to simplify the use of the wallet and increase user experience.

Concerning payment instruments, 71% of banks offer the possibility to use payment cards (credit/debit). Interesting is to see that 70% of the banks offering the possibility to pay with a card will in fact only allow users to use that very bank's card. 54% of the banks offer the possibility to pay with a bank account but, once again, only if that account is opened in that very bank (87.5% of the cases). At the end, 43% of the wallets appear to be exclusive, meaning you can only use them if you are using services provided by that specific bank.

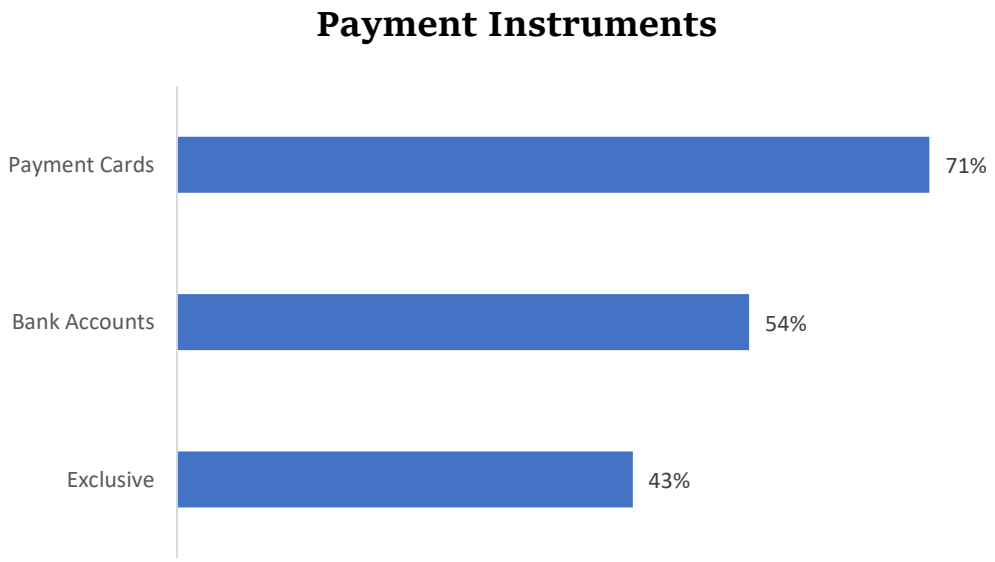

Figure 39 - Allowed payment instruments - banks

Continuing the analysis, the focus will now be moved to the registration process. During registration, users are asked to insert the payment instrument(s). On this matter, the scenario changes from bank to bank: 57% of

the banks know that information already and do not ask it again to the user during the registration, while the remaining 43% of analysed wallets ask the user to insert that information if they want to use the wallet; 36% of the banks' wallets ask you to input it during the registration process, while the remaining 10% ask you to input that information only at a later stage. The following graph helps the reader visualizing what just mentioned:

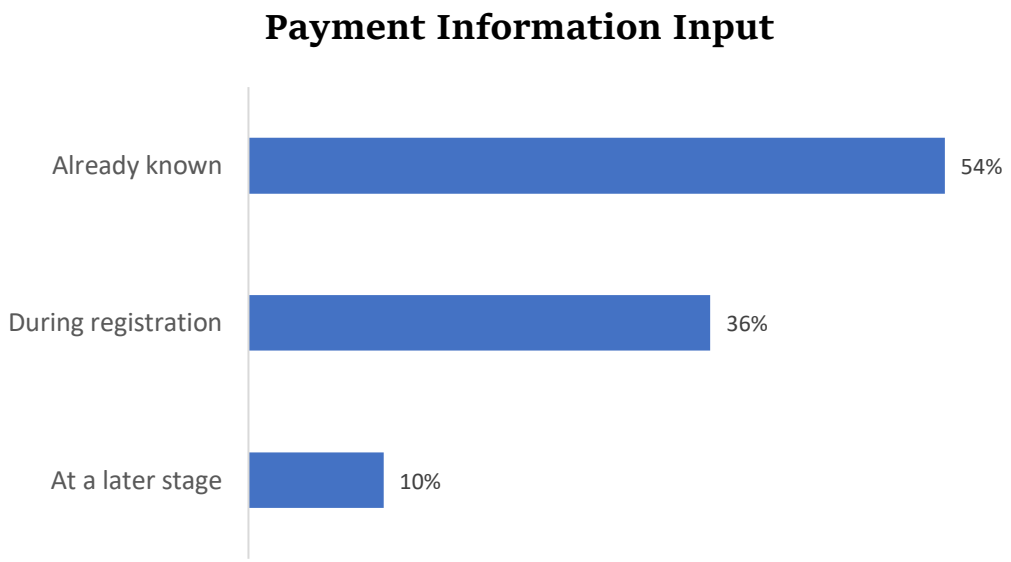

Figure 40 - Payment information input

Interesting is to see that only 7% of the wallets let users login via social media accounts. In terms of activation lead time, all banks put their efforts in offering extremely quick activation procedures, with 85% of the wallets active the same day of the registration and only the remaining 15% require one day for the activation.

Almost one third of the banks offer financial incentives of €5/10 to attract prospects via activation promos or referral programs.

Talking about how to recharge the wallet, only 23% of the banks allow users to recharge it using a payment card not linked to the wallet or a bank transfer from another bank account. This emphasizes the fact that banks want their users to be locked to their own offers, making it as exclusive as possible.

Let's now analyse what has been offered in the following three payment environments: online, proximity and P2P (person to person).

As it is easy to imagine, the majority (86%) of the wallets offer the online payment functionality and out of those, 17% have the possibility to scan a QR code to complete the online payment. The main digital payment services accepted for these online operations are Masterpass, Apple Pay or proprietary ones. The number of steps required to complete an online purchase, varies from operator to operator, ranging from 3 to 7 steps with an average or 5.5 steps to get to the end of the purchase process.

Things change regarding proximity payments. A broader variety of technologies and features is present here. 36% of wallets offer the QR scansion functionality, 7% let users generate QR codes themselves that will be read by QR enabled POS, 43% offer geolocation services and, to conclude, 50% support the NFC technology. At the end, proximity payment is offered by an astonishing total of 93% of the operators, with many of them offering multiple proximity payment options, like Intesa Mobile that is offering to their users 4 features. In fact, 33% of the operators offer multiple proximity payment features, giving their users a higher degree of flexibility and hence a better customer experience.

As far as P2P is concerned, some players offer a proprietary solution, while others trust third parties' P2P solutions. To be precise, 36% of the banks offer their own P2P solution while the remaining ones are based on either Jiffy or PayPal. Overall, 71% of the players is offering P2P solutions and the most used solutions for P2P money exchanges are either text messages or e-mails.

To wrap up the payment services discussion, the most adopted payment service is Proximity, with an astonishing 93% of the bank wallets featuring it. Also online payments and P2P are present in many wallets: respectively 86% and 71% of the apps feature both or either of the two. Here follows a graphical overview of offered payment services.

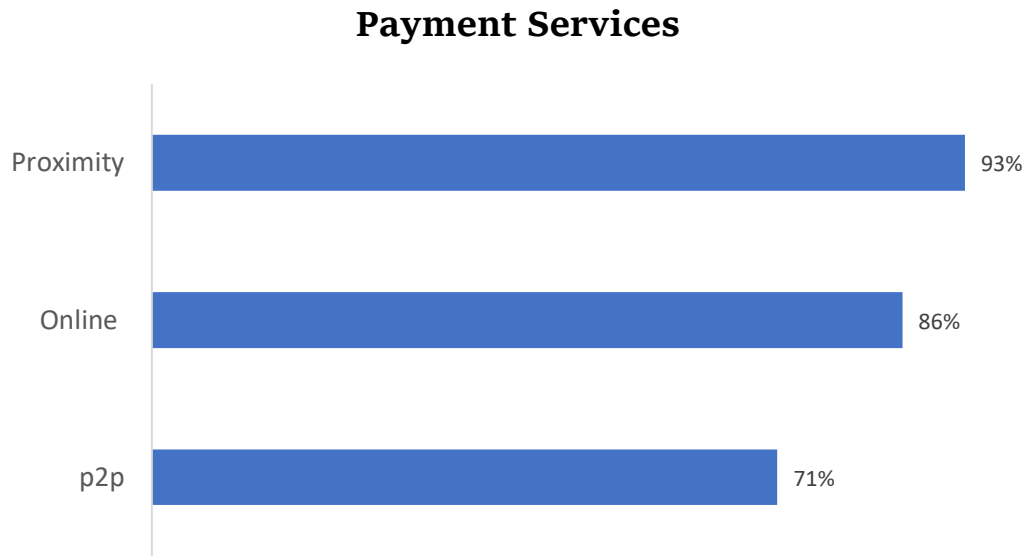

Figure 41 – Payment Services

57% of the banks offer all the three functionalities, while only 36% of them limits their offer to two payment services. The remaining 7% offer just one functionality and, as it is easy to imagine, there is no bank offering none of the

functionalities. Hence, at least one service is present in every bank's mobile wallet being payments a central topic for banks.

One of the key factors affecting customer experience is how easy it is to make simple operations, as checking the balance of your bank account or the latest operations. A straightforward way to measure those is to count how many clicks are required to conduct those operations. Many wallets do not require any clicks to access the money availability information, as it is an information normally easily retrievable from the homepage. To see the list of past transactions, on average no more than one click is required, with many wallets giving this information directly from the homepage and many others requiring just one or two clicks. This is no surprise, as from a bank's wallet you would expect to have bank-related data readily available.

To finish the analysis on banks' wallets, the focus will now be on adds-on/value-added services (VAS). These are particularly interesting as they have a low level of accomplishment (i.e. few actors focused their attention on VAS when launching their wallets, resulting in different strategies and decisions), while they significantly increase the user experience and they should therefore be prioritized. This statement, taken from the findings of the literature review, is confirmed by our census of the existing solutions on the market.

Out of 27 different VAS present in the censed wallets, 8 have not been implemented by any of the analysed banks. All the other adds-on present an adoption rate inferior to 30-35%. The VAS with the highest adoption rates are geolocation, e-Couponing, mobile top-ups, invoice settling and financial services.

10.2. Merchants

The second typology of operators that will be covered in this on-the-field analysis is merchants. Unfortunately, merchants do not have many censed wallets, so the attention will be drawn to the most interesting findings coming out of the exercise without spending too much time on every driver for customer experience.

Concerning access and security, merchants are very keen in installing biometry-based features. In order to increase the immediateness of access to the app, widgets are sometimes offered to users. None of the merchants' wallets let users login via social networks.

Regarding payment instruments, wallets mainly ask users to use prepaid accounts, which sounds logical, as merchants do not provide bank accounts or payment cards, contrary to banks.

Users can recharge their wallets using different methods as card, bank transfer, PayPal or physically recharging via cash at the store.

Very interesting is to see that all the wallets let users perform online payments (even though for Starbucks online payments are not available in Europe), sometimes simplifying the operations at the store itself. Proximity payment is possible with all the wallets as well and the technology used is the QR code. In fact, users are always asked to use the QR code either generating it themselves or scanning it at the POS during payments. P2P transactions are not always possible with merchants' wallets since they think about the digital wallet as an

opportunity to have a flawless customer experience during payment operations for products or services linked to the store's activities.

Out of the 27 VAS censed, only 6 have been implemented by some merchants. They have been focusing on the use of the wallet as a loyalty instrument, giving the users the possibility to adhere to points-based programs and an in-app prizes retrieval. But the real strength of mobile wallets for merchants is the mobile ordering. This fastens the ordering, retrieval and purchase processes as users can start ordering before even entering the store. Geolocation, e-Commerce and store receipts complete the list of most-used VAS for merchants.

10.3. Service Providers

The third typology of operators that will be analysed are service providers.

Concerning access and security, 91% of the players make use of biometry features to let users access the app. Interesting is to notice that only 9% of the wallets offered by service providers gives the users the possibility to access via a widget, which would streamline the access to the wallets' information and features.

Concerning payment instruments, 73% of the wallets let users pay via payment cards (i.e. credit and debit payment cards) and 36% of them allow users to pay directly from a bank account. The use of prepaid accounts is also another mainstream solution adopted in 64% of the cases. Other payment instruments as phone credit or PayPal are not considered by service providers.

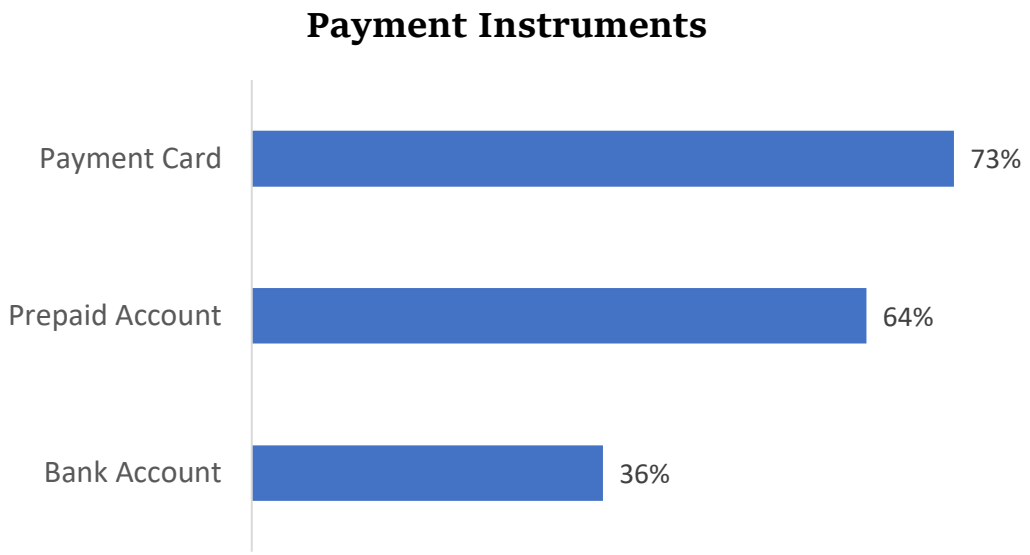

Figure 42 - Allowed payment instruments - Service providers

Concerning the registration process, it is interesting to see the different strategies adopted by different service providers. The scenario is divided in two halves, with one half asking users to go through around 10 steps to complete the registration process, and the other half trying to streamline this process only asking users to complete maximum two steps. Half of the wallets ask for payments data during the registration process, whereas the other half asks at a subsequent stage.

Talking about the way users can recharge their wallets, the majority of the service providers allows them to use payment cards or make a bank transfer (in 55% of the cases). Many wallets give the users the possibility to choose which of the two options they prefer, offering them both options at the same time.

As far as online payments are concerned, 73% of the service providers offer it, giving the possibility to pay via QR code scansions in 27% of the cases.

Concerning proximity payments, the functionality is also offered in 73% of the analysed wallets. Service providers heavily rely on the QR technology for proximity payments. In fact, half of them offer a QR scan functionality and almost half of those offer also the QR generation option to let users choose whether they prefer using their smartphones as a scanner or as a code generator. 36% of the wallets present an NFC-based proximity payment functionality. 9% of the wallets offer proximity payments via Magnetic Secure Transmission (MST). The number of steps required to make a proximity payment ranges between 3 and 6 steps. P2P payments are offered in 64% of the wallets. All the P2P solutions are proprietary. For service providers' wallets, text messages or e-mails are the most common P2P transfer options. The number of steps to conclude a P2P operation is quite high, ranging from 5 to 8.

Here follows an overview of what is offered by service providers in terms of payment services:

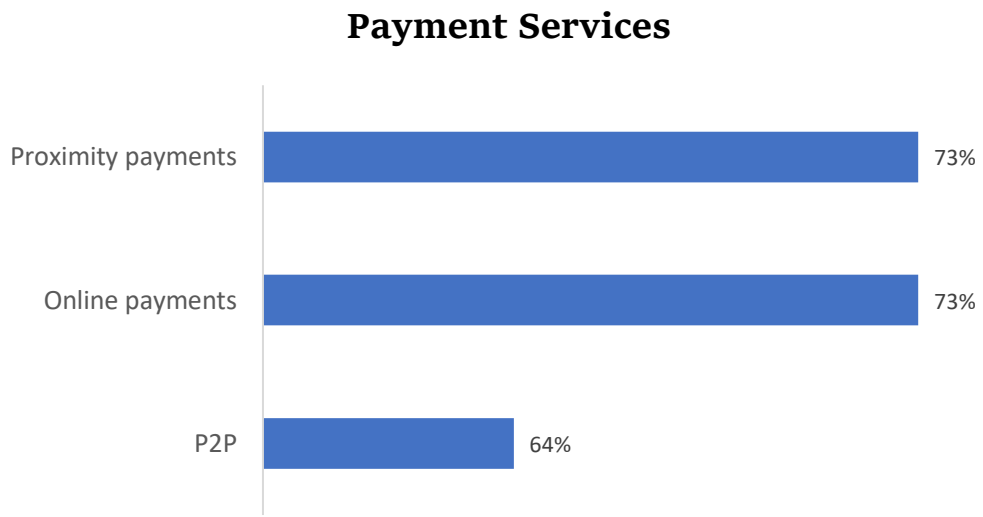

Figure 43 – Offered payment services

36% of the service providers offer all the three abovementioned payment services.

Different service providers have a completely different approach regarding value-added services. Many companies are offering several VAS at the same time, reaching a total of 8/11 VAS, while many others decided to offer none or just a maximum of two VAS. Amongst the most common adds-on there are mobile top-ups and invoice settling, both offered in 55% of the cases. e-Couponing, geolocation and mobile ticketing complete the list of the 5 most common VAS implemented by service providers.

10.4. Start-ups

As for merchants, the start-ups category is not as populated as the service providers and the banks' ones.

As far as access and security are concerned, biometry-based features to access the app content are always present, whereas none of the wallets offer widgets. Contrary to other typologies of operators, start-ups let users sign up via social login in 67% of the cases.

Two thirds of the wallets offer users the possibility to pay via credit or debit payment cards and prepaid accounts, while only 33% of start-ups' wallets ask users to pay (also) via a bank account.

The number of required steps to complete the registration process largely varies from operator to operator, with a number of steps ranging between 2 and 13.

Interesting is to see that one third of start-ups offer activation promotions and the majority offers referral programs. This certainly highlights the fact that start-ups are not known from the large public and they need incentives to go mainstream.

Online payments are offered by two thirds of the operators which offer a proprietary solution and are not based on third-party solutions. Proximity payment is offered as well by two thirds of the wallets which let users complete their transactions thanks to geolocation and QR code generation technologies. None of the start-ups offers multiple solutions at the same time, as they are typically budget constrained, and they have to focus their efforts on a limited number of features. P2P transactions are offered in 67% of the cases with proprietary systems and the transactions are usually done via text messages.

To summarize the findings on payment services, each of them is offered by two thirds of the operators and there is no player offering none of the payment services. In fact, each player offers at least one payment service and the others offer multiple services.

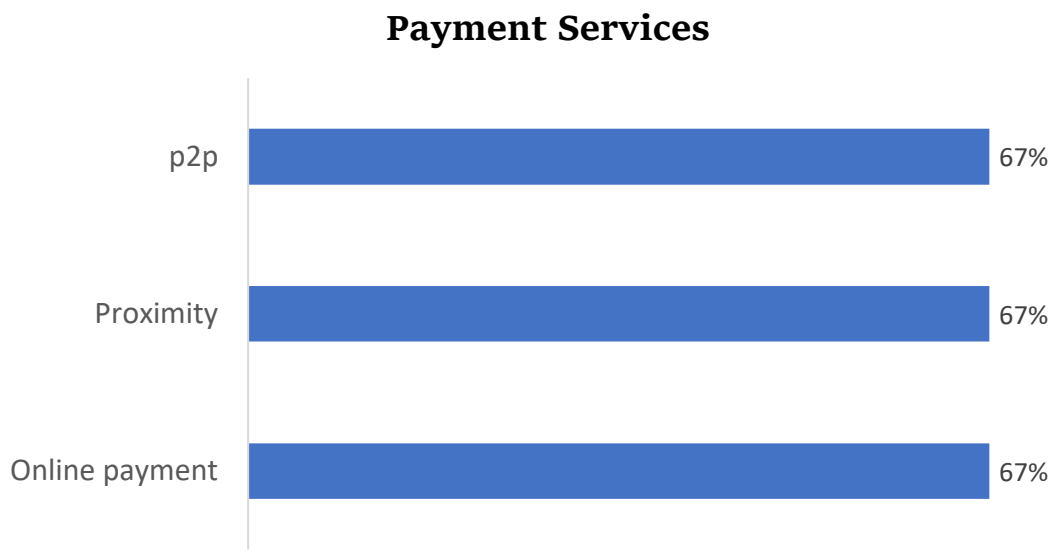

Figure 44 - Offered payment services

All the start-ups focused their efforts in offering wallets that made it easy for users to consult their balances and their past transactions. In fact, all the apps ask zero or, in all cases, no more than one click to access that information.

Regarding VAS, some wallets present up to 6 of them. Examples of VAS that can be found on wallets launched by start-ups are e-couponing, loyalty programs, geolocation-based services, mobile top-ups and invoice settling.

11. Final rankings per typology of operator

In this section, the results of the scoring process for all the descriptive variables will be presented on a per typology of operator basis. The results shown hereafter are the average of all the descriptive variables characterizing each VAS of each typology of operator. In the Annex 2, it is possible to find a more detailed

view of the scoring process that shows also individual scores that compose the final result (i.e. the scores of the single descriptive variables that will be factored in the average of every VAS).

Banks

Here follows the summary table of the results for banks:

	Banks
Mobile Ticketing	3.3
Mobile Parking	3.0
e-Couponing	5.5
Loyalty Program	4.8
Mobile Top-ups	8.0
Invoice Settling	8.5
Mobile Ordering	3.7
Geolocation	4.0
Digital Identity	4.0
e-Commerce	4.0
Financial Services	7.5
Receipts Storing	2.0

Table 11 - Summary table of the results for banks

Mobile ticketing low score is mainly due to the fact that banks are not per se ticket-based businesses and they are not likely to offer loyalty programs as their services do not require repetitive and frequent repurchases.

Mobile parking scored a low result as well, as banks do not have an integrated infrastructure, nor access to a census of the cars on the territory. Moreover, the flow within stores is not high. This is mainly due to the digitalization of the banks and the low-frequency services they offer.

e-Couponing received an overall good score. Switching costs are low (and therefore a high score was assigned). However, repurchase frequency is low – even if many services require a more frequent interaction with the banks – and the concept of product perishability is hardly applicable to the banking sector and hence it needs to be reinterpreted with the concept of services that require a certain repurchase or reactivation frequency.

Loyalty programs scored a 4.8 out of 10 for the banks. Once again, this is because of the switching costs and repurchase frequency factors just explained along with the low likeness for a mobile ticketing system to be implemented in the wallet. In fact, as already mentioned, mobile ticketing would positively influence the introduction of a loyalty program. Overall the assigned score is a positive one.

As far as mobile top-ups is concerned, it received a very high score as banks are service based and mobile top-ups would be an easy-to-fit additional service to be offered to their clients. Moreover, banks deal with high volumes of customers which grants them a higher likelihood of creating agreements with telecommunication companies.

Invoice settling received an excellent score of 8.5/10 thanks to the fact that banks are both a service-based business and the typical go-to operator to settle invoices, along with postal offices. Hence, excellent scores have been attributed to both the descriptive variables of this VAS for banks.

With regards to mobile ordering, banks received a good score of 3.7 out of 10. This result is mainly due to physical presence of banks' branches, even though they are getting reduced over time for cost cutting reasons and for the digitization trends present in the industry. Furthermore, bank branches are normally able to differentiate cashier lines to guarantee different services to their customers: customers that ordered via mobile app have their own preferential lane and other customers continue using normal lanes. However, banks are not a quick-service industry and there is little to nothing that should be prepared upfront, before customers arrive in order to speed up the service. Therefore, mobile ordering does not fit the banks' business model.

A good score has been achieved also by geolocation, which is well suitable for the fact that banks have a physical presence and are spread all over the territory. Banks do not typically rely on promotions, even if nowadays banks see an attraction for loyalty programs and e-couponing, showing the increasing interest for promotions.

Digital identity received a good average score of 4 for banks. This is because, considering the power of banks and the privileged position they held with respect to governments all over the world, banks cover the perfect position to create new agreements with governments. In terms of technological ability banks do not excel but they can anyway outsource the knowledge. However, the market for digital identity is saturated, as there are operators that already took the few available spots in the market for this VAS. Intesa San Paolo and Poste Italiane are two examples of operators that already present digital identity in their wallets.

An average score of 4.5 has been assigned to e-Commerce. This comes from the fact that banks already have online sales, as customers can already exploit and activate many banks services via the online bank portals. However, being e-Commerce strictly related to product sales, banks are heavily penalized and do not have the requisites to launch an e-Commerce add-on within their mobile wallets.

Concerning financial services, banks scored an outstanding 7.5 out of 10. This is because, as already discussed, banks have large access to customer data due to their core business. Furthermore, banks already offer online financial services via their branches and online websites making the decision to introduce a financial services' value-added service within their mobile wallets a no-brainer. Easy access to capital and high customer volumes are other two descriptive variables that act as enablers for the launch of a financial services VAS in the banks wallets.

A low score has been attributed to banks concerning the receipts storing. In fact, banks are not based on products and they do not release receipts after the customers purchase/activate one of the company's services. Hence, no match between banks and receipts storing could be identified.

Merchants

Here follows the summary table of the results for merchants:

	Merchants
Mobile ticketing	3.7
Mobile Parking	4.7

e-Couponing	7.0
Loyalty Program	6.2
Mobile Top-ups	3.3
Invoice Settling	2.0
Mobile Ordering	7.3
Geolocation	7.5
Digital Identity	3.0
eCommerce	8.0
Financial Services	4.3
Receipts Storing	9.0

Table 12 – Summary table of the results for merchants

Concerning merchants, they have been assigned with a low score for mobile ticketing as they are normally not based on ticket sales. However, merchants could benefit from cross-selling opportunities. Moreover, they heavily rely on loyalty programs to attract and retain customers during the years. In any case, being merchants not based on tickets, they do not present the required characteristics to implement a ticketing value-added service.

Mobile parking received a good score of 4.7 which mainly comes from their physical presence. In fact, merchants are typically capillary spread throughout the territory, especially big retailers' chains. Another good score is assigned on the basis of the customer flows, where merchants see big numbers of customers visiting their shops on a daily basis. However, the numbers needed to make this service not just a benefit for your customers, but a profitable business are way higher than the one merchants have. Moreover, merchants do not have access to the parking infrastructure and to cars data.

Talking about e-Couponing, the score is a very good one as for merchants the presence of coupons seems to be a must-have. This is due to high scores received on all the three descriptive variables. Regarding product perishability, this is a variable only applicable to certain categories of merchants, resulting in very high scores in some cases and lower scores in some others. However, for the scope of this analysis, an average score of 6 out of 10 has been attributed to the product perishability variable which could in fact be higher for certain typologies of merchants. In terms of repurchase frequency, merchants present a high score since they normally deal with products that satisfy daily needs of customers and typically require to be repurchased after they finish (i.e. speaking about food-related merchants), they wear out or do not satisfy anymore the taste of the consumers (i.e. speaking about the fashion-related merchants). A high score has been attributed to switching costs as well, meaning that they are low. In fact, merchants do not normally present high switching costs for the way the industry is structured: consumers can pass from one merchant to the other with no particular issues and at almost no cost (intended both from a financial and a mental perspective). Relatively low switching costs imply the need for systems to try and to lock-in consumers. Hence, the high score attributed to the *switching cost* descriptive variable.

In regard to loyalty programs, a good 6.2/10 has been assigned to merchants considering that switching costs and repurchase frequency received good evaluation which has already been described in the e-Couponing section. Considering the good synergies present between loyalty programs and mobile

ticketing, the latter has been inserted as a descriptive variable for the adoption of loyalty programs. The score attributed is the average score assigned to mobile ticketing's descriptive variables.

About mobile top-ups, merchants did not receive a good score. This is because there is no fit between the typology of service offered by this VAS and the core business of a merchant. This intuitive statement gets confirmation from the descriptive variables scores for the mobile top-ups. In terms of overall customer volumes, merchants typically deal with lower volumes than banks or service providers. This increases the difficulty for merchants to stipulate agreements with telco operators. Furthermore, merchants are not service-based, which heavily impacts the overall score, decreasing it to 3.3 out of 10.

Invoice settling scored an appalling 2 out of 10. In fact, both descriptive variables were given bad evaluations as merchants do not typically make use of invoices to run their businesses and cash in payments and they are certainly not likely to offer this kind of service to other companies (i.e. offering a platform for mobile invoicing to settle other companies payments), as they are typically not service-based, but product-based and offering a service to others would strongly deviate from their core business.

Mobile ordering is among the top ranked value-added services as it received positive scores on all the dimensions. This is because merchants can exploit their physical presence, which is especially true for hefty merchants' chains made of thousands of physical locations which can also easily offer different cashiers to keep up with their customers' expectations. Regarding the possibility to offer

different cashiers, the situation may differ based on the size of the merchants. In fact, for bigger ones it will be easier to discriminate the flows of customers adding new resources for extra lanes dedicated to mobile ordering. However, a positive average score of 6 has been attributed to the variable to factor in this variability. In terms of service, customers expect it to be quick as they expect to find what they want to buy waiting them for their arrival.

Talking about geolocation, the score is once again very positive. This is the result of the physical presence of merchants which is a must if the aim is to offer a service based on the geographical location of clients. This is because there should be a match between the location of the store and that of the client (or prospect). Another positive point in the evaluation comes from the second and last descriptive variables: *promotions*. In fact, merchants typically offer various promotions to their customers to try and retain as many of them as possible, since retaining a client is cheaper and more convenient than acquiring new ones. As already said, switching costs for merchants are structurally low and hence the need to artificially boost them via, for example, promotions. Geolocation represents the perfect tool and enabler for presenting customers with new promotions when they walk or drive in the proximity of the store.

Digital identity received a scarce final evaluation for merchants. Between merchants and this value-added service there is in fact a poor fit for several reasons that will be explained hereafter. Regarding the possibility to make agreements with governments, merchants do not typically hold a strong position with governments. Thus, it is unlikely for them to create strong agreements and

the service is more likely to be offered by other typologies of operators. Merchants can exploit them as a functionality to enhance the performance of their business but are not in a strong position to offer the service themselves. In terms of technological ability, merchants are not strong players, but the knowledge can however be outsourced. Furthermore, a very important driver for this choice is the market saturation. As digital identity is offered already by some operators, there is no room for new players in that market.

As far as e-Commerce is concerned, it absolutely fits merchants as a typology of operators for many reasons. A very strong enabler is being based on products. As already discussed, merchants are more likely to sell products rather than services and, being e-Commerce also based on products rather than on services, there is a perfect match between the two. Furthermore, if merchants are already offering online sales to their customers, it is a logical step to start offering their items via another channel. This would result in an increased customer experience mainly due to the integrated multichannel experience.

Talking about financial services, the score assigned is an average-to-low one. This is mainly due to the limited access to customer data which has already been discussed previously in this paragraph and the fact that merchants do not offer financial services within the scope of their core business. Another negative factor is the limited access to capital, especially for small and medium merchants. A better score was attributed to *customer volumes*. In fact, as already discussed, merchants can arrive at dealing with important amounts of customers.

Receipts storing is a strong customer experience enhancer for merchants. The good score assigned fully explains this fit. In fact, as merchants give receipts as a proof of payment to their customers, having those receipts in a digital form streamlines the operations at the cashier. Especially with long queues, getting receipts (and cash) and storing them in the physical wallet may be felt as a stressing operation. With digital receipts (and virtual cash) the hands are free and the operations at the cashier simplified.

Service Providers

Here follows the summary table of the results for service providers:

	Service Providers
Mobile ticketing	5.3
Mobile Parking	3.7
e-Couponing	4.0
Loyalty Program	4.4
Mobile Top-ups	8.3
Invoice Settling	7.5
Mobile Ordering	3.7
Geolocation	3.0
Digital Identity	4.7
eCommerce	4.0
Financial Services	8.0
Receipts Storing	2.0

Table 13 - Summary table of the results for service providers

As far as service providers are concerned, here follows the explanation of the assigned scores.

Regarding mobile ticketing, as service providers are a broad category, there are different scenarios to be considered. Therefore, the score attributed may vary on the nature of the service provider itself. As a matter of fact, many service providers offer some forms of tickets to their customers while others do not offer any ticket-based service. The final score attributed to this descriptive variable is a 7 which may however change from company to company. If a specific company offers a service that is based on any form of tickets exchange, then the final score will certainly be higher, and the company should invest in this add-on including it within their mobile wallet as it would be highly related to the core business dynamics. Cross-selling represents another point of strength for service providers as they normally offer several services. Hence, service providers can take advantage of the sale of a ticket to put on the ticket itself some links or other forms of cross-selling techniques to drive the customer towards its next purchase. However, service providers do not typically have loyalty programs for customers' retention, strongly negatively affecting the average score.

In regard to mobile parking, service providers received a bad score. In fact, service providers are not typically physically present (to the eye of the final consumer), or their physical presence is limited, as in most cases they offer services directly via virtual platforms. Hence, the physical flow of customers within their shops is limited as well, giving no reason for implementing such a service. However, certain typologies of service providers may have an edge regarding the access to infrastructure and to car census. Hence, rather than offering the service to their own customers to easy the access to their facilities,

the service could be offered giving customers a platform that can be used to find parking spots all over the territory (i.e. one country – Telepass is a good example of this).

Concerning e-Couponing, service providers received an overall low result as all the descriptive variables have been poorly scored. Switching costs for service providers are on the average, with some typologies of service providers presenting higher than the average and others lower than the average switching costs. In terms of repurchase frequency, service providers received a low score as they typically do not offer services that should be repurchase with high frequency. Moreover, as they offer services and not products the product perishability is certainly not applicable as a descriptive variable and was assigned with a low mark.

In terms of loyalty programs, the score is a meagre 4.4 out of 10. This result comes from the already explained switching costs, repurchase frequency and from mobile ticketing which do not feature great marks. The value given to mobile ticketing comes from the average of the descriptive variables of mobile ticketing itself.

As far as mobile top-ups are concerned, a great score of 8.3/10 has been achieved. In fact, service providers typically deal with huge quantities of customers that benefit from their services. This represents an advantage, since telco companies will be more likely to make agreements with operators dealing with big volumes as the benefits will be higher. Hence, an excellent score is also assigned to the *agreements likelihood* variable. Furthermore, service providers

are, as their name suggests, operators based on services. A good fit is therefore present between the mobile top-ups VAS and service providers.

Invoice settling is another add-on that received an excellent overall evaluation. Service providers, considering that they offer services as part of their core business, should think about implementing this feature in their wallets to let their customers settle invoices. A good example of an operator that has a good fit with this VAS are postal offices.

About mobile ordering, the final result of 3.7 is the average of very different scores. In fact, the three descriptive variables give very different outputs when reasoning on the fit between the *mobile ordering* VAS and service providers. In particular, service providers do not typically have a strong physical presence giving them also a poor score on the *different cashiers* descriptive variable. However, a good score was attributed to the last variable: *quick service*. As a matter of fact, even if the interaction does not take place in person, customers expect the service to be quickly delivered, as they do not like to wait.

Geolocation has also been assigned to a bad 3 out of 10. This result comes once again from the little physical presence of service providers which makes the geolocation a rather useless service, as promotions or other communications may be sent over-the-air. Moreover, on average service providers do not strongly rely on promotions to make their customers purchase more and more frequently.

Digital identity received a score of 4.7. Service providers are expected to be influential with respect to governments, as they deal with big customers'

volumes and they normally exercise a certain amount of power. In terms of technological ability, these operators are not expected to excel but they are expected to be able to outsource the technological knowledge to third parties with no particular issues, hence receiving a more than sufficient evaluation also on this variable. However, a big showstopper is represented by market saturation. In fact, as this market is already saturated, no other player can enter this market. Interesting is to see that one of the operators offering digital identity is Poste Italiane, a service provider. This shows that the other two descriptive variables (i.e. government agreements and technological ability) for this VAS are directionally correct, as they were assigned with positive scores.

With respect to e-Commerce, the average result is the product of greatly and poorly evaluated variables. In fact, service providers are expected to be strong on online sales, receiving a good mark on that variable. On the contrary, as they are based on services, they received a bad score on the *product based* descriptive variable. This is due to the fact that e-Commerce only works with product sales thus making service providers not a good fit for this VAS.

As far as financial services are concerned, an outstanding score of 8 out of 10 has been assigned. This result comes from the four scores given to the descriptive variables which proved to be consistently excellent. As already discussed, service providers have access to many information related to their customers for their core business. Therefore, it will be relatively easier for service providers to get access to further customer data. In most cases, service providers offer financial services as their core business and the implementation of this VAS results even

more logical. If the company offers already financial services and they are interacting with customers also with an online channel, which is likely to be the case for a big chunk of service providers, it makes further sense to implement this add-on within their wallet. This is because customers expect to find the desired services on as many channels as possible, hence offering an omnichannel experience to the customers is a winning strategy that greatly enhances the customer experience. Capital availability received a good score as well, as big service providers are expected to find no issues in regard to accessing capital. Regarding the overall customer volumes that service providers deal with, the expectation is to find huge volumes accessing the services offered by service providers.

Receipts storing received a poor score as service providers rarely provide customers with receipts for the services they offer. Moreover, service providers are not based on product sales, which normally bring along the need for papery receipts.

Start-ups

Here follows the summary table of the results for start-ups:

	Start-ups
Mobile ticketing	4.3
Mobile Parking	2.3
e-Couponing	6.0
Loyalty Program	5.4
Mobile Top-ups	5.3
Invoice Settling	6.5
Mobile Ordering	3.7
Geolocation	4.0

Digital Identity	3.7
eCommerce	4.5
Financial Services	5.8
Receipts Storing	2.0

Table 14 - Summary table of the results for start-ups

Here follows the explanation of the results obtained on the various value-added services by start-ups.

Regarding mobile ticketing, start-ups achieved a mediocre score of 4.3/10. This comes from very different scores attributed to the three variables describing mobile ticketing. Start-ups may certainly be ticket-based, being essentially service providers in their earlier stages of life. Even if the concept of start-up is potentially applicable to every field and typology of operator in its infancy it is to be reminded that for the scope of this analysis, start-ups are only service providers in their earlier stages of development. Hence, many considerations that will be made hereafter will draw on what already explained for service providers. That is the reason why the *ticket-based* variable received the same score as for service providers. Regarding instead cross-selling opportunities, these received a medium score as start-ups are not expected to have already many different services which they can offer as cross-sales. Start-ups are expected not to have spent time and resources on loyalty programs yet, which is the reason this variable received a poor score.

As far as mobile parking is concerned, a low score has been assigned. Access to capital represents one of the key issues for start-ups, as they typically struggle

to access funds to sustain their growth and their core activities. Furthermore, these service providers in their earlier stages of growth are expected to have an even lower physical presence than full-grown service providers, hence another bad score. Same goes for the last descriptive variable, *customers volume*. In fact, the number of customers expected to flow in and out of start-ups' physical stores is certainly low.

e-Couponing received a good 6.0 out of 10 when related to start-ups. Switching costs are in fact high, as it is difficult for start-ups to 'steal' clients from incumbents and hence the need to have incentives to attract prospects. Repurchase frequency is set at service providers levels (average result), as dynamics do not change regarding this variable with respect to the stage of growth of the company, but it is more based on the typology of operator that is analysed (Start-ups have been defined as service providers in their earlier stages of growth). The concept of product perishability does not apply to start-ups, being based on services.

Concerning loyalty programs, the score is still a good one. This is because of the excellent mark given to switching costs and the good one assigned to repurchase frequency that have already been explained talking about the e-Couponing feature. Concerning mobile ticketing, the assigned score is the same as the average of the scores assigned to the descriptive variables of the mobile ticketing feature.

In regard to mobile top-ups, a positive score of 5.3 was achieved. This grade is the result of very different scores associated to the different variables. Start-

ups do not benefit from high customer volumes, as they are at the beginning of their operations and typically are not known by the mass market and they can only rely on a limited number of clients as they rump up their business. This negatively influences their ability and likelihood to make agreements with telcons, as little customer volumes are not attractive to big telcons that are forced to set up many more agreements than required. However, big telcons recognise the potential of new start-ups as they typically represent a threat for incumbents. Hence, in terms of *agreements likelihood,* the final result sits at the middle of the range, getting a 5.3 out of 10. The greatest pro is the nature of start-ups: little service providers. In fact, there is a strong fit between service-based companies and this feature, as this is typically a service that is offered for another telco operator.

Invoice settling received a positive score of 6.5. This comes from the fact that start-ups are service based. However, typically start-ups do not offer invoicing settling services even though there is no barrier for them to start offering the service to their customers. The final result is an average of a good and an average score associated to the two descriptive variables for this VAS.

As far as mobile ordering is concerned, the overall score is a meagre one. In fact, start-ups are expected not to have many stores, both for the fact that they are expected to interact mainly via online channels with their customers and for the fact that they are just at the beginning of their operations, hence they do not own lots of real estate. However, a good result has been received on the *quick service* descriptive variable, which is exactly what customers expect. In fact, no

discount is given to companies on the service customers expect to receive, not even in the earlier stages of growth.

Geolocation is assigned to a mediocre score of 4 out of 10 mainly due to a bad mark received in the *physical presence* variable. As a matter of fact, start-ups are in fact not very present on the territory with brick-and-mortar shops for the reasons just described in the mobile ordering paragraph. However, start-ups are expected to offer promotions to publicize and advertise their business aiming at increasing their customer volumes and profitability.

Regarding digital identity, a poor score of 3.7 resulted out of the descriptive variables' averaging. This result comes from one well-rated variable and two negative ones. In fact, start-ups are typically tech-savvy companies which threaten bigger players in the industry because of their advantaged position in terms of technological ability. However, due to small volumes and their little influence on governments, this typology of operator is not expected to excel in creating agreements with governments. Furthermore, the market saturation represents a big obstacle for the introduction of this VAS. In fact, as already discussed, the few available spots to enter this market are already taken by a few first comers.

e-Commerce is rated as 4.5/10. As for service providers, they rated very good on the *online sales* variable, while they performed badly on the *product-based* driver. In fact, as already said, start-ups should be tech-savvy companies offering services mainly exploiting the online channel, as they do not have yet the resources to extend their physical presence. Hence the good score on the first

variable. Nonetheless, for the scope of this analysis, start-ups are intended to be based on sales of services. That is the reason of the low rating for the second driver.

Looking at financial services, the result is a good 5.8. As already discussed, start-ups can access customer data without encountering particular difficulties. Moreover, they are likely to offer financial services as part of their core activities. Thus, these operators are well suited to offer financial services via online channels and especially via a value-added service within their wallet. Nevertheless, in terms of capital availability, start-ups are expected to encounter deadlocks when asking access to new capital, as these operators are typically financially tight. Another disadvantage of start-ups is given by their customer volumes that are not comparable to more mature competitors.

In terms of receipts storing, start-ups received a bad score as they do not typically offer receipts for their services and they are not product-based businesses.

12. Suit of best-fitting VAS per typology of operator

Now that the rationale behind all the scores assigned to every VAS for the four typologies of operators is clear, the suggestion of what set of VAS each operator should adopt will be given.

12.1. Banks

All the results have been re-ordered and here follows the table for banks:

	Banks
Invoice Settling	8.5
Mobile Top-ups	8.0
Financial Services	7.5
e-Couponing	5.5
Loyalty Program	4.8
Geolocation	4.0
Digital Identity	4.0
eCommerce	4.0
Mobile Ordering	3.7
Mobile ticketing	3.3
Mobile Parking	3.0
Receipts Storing	2.0

Table 15 – Re-ordered results for banks

According to the results obtained, banks' top value-added services are invoice settling, mobile top-ups, financial services, e-couponing and loyalty programs.

It is now interesting to compare these results with the census done by the Observatory of Politecnico di Milano. Here follows the list of value-added services currently offered by banks. The VAS that ranked higher are the ones that are present in a higher number of wallets.

Banks
Geolocation
e-Couponing
Mobile Top-ups
Invoice Settling
Financial Services
Loyalty Program
Mobile Parking
E-Commerce
Digital Identity
Mobile Ticketing

Mobile Ordering
Receipts Storing

Table 16 - Ranking according to census

It is very compelling to notice how the result of the structured procedure used to arrive at the best 5 VAS for banks resembles what is currently offered by the banks.

Banks: comparison between analysis results and current offering		
Results		**Current offering**
Invoice Settling		Geolocation
Mobile Top-ups		e-Couponing
Financial Services		Mobile Top-ups
e-Couponing		Invoice Settling
Loyalty Program		Financial Services

Table 17 - Comparison results vs. current offering for banks

In fact, as it is possible to see from the above comparison, 4 out of the 5 proposed best-fitting value-added services are already offered by banks. These are invoice settling, mobile top-ups, financial services and e-couponing. The only difference is represented by the fifth VAS. The proposed VAS coming out of the tool is loyalty program (highlighted in blue in the above table on the left-hand side), while banks are currently offering geolocation (highlighted in blue in the above table on the right-hand side). The reason why the tool makes this decision is that nowadays banks are facing an even fiercer competition from their competitors and newcomers proposing fresher solutions. Therefore, banks need

to prioritize the creation of loyalty programs as customers retention become more and more difficult and critical.

12.2. Merchants

Here follows the re-ordered table for merchants:

	Merchants
Receipts Storing	9.0
e-Commerce	8.0
Geolocation	7.5
Mobile Ordering	7.3
e-Couponing	7.0
Loyalty Program	6.2
Mobile Parking	4.7
Financial Services	4.3
Mobile ticketing	3.7
Mobile Top-ups	3.3
Digital Identity	3.0
Invoice Settling	2.0

Table 18 - Re-ordered results for merchants

The output of the ranking process sets for merchants the following list of best-fitting adds-on for their mobile wallets: receipts storing, e-commerce, geolocation, mobile ordering and e-couponing.

Here follows the table reporting the current adoption of VAS by merchants:

Merchants
Loyalty Program
Mobile Ordering
Geolocation
e-Commerce
Receipts Storing
Mobile Parking

Mobile Ticketing
Digital Identity
e-Couponing
Mobile Recharging
Financial Services
Mobile Invoicing

Table 19 - Ranking according to census

It is once again valuable making a comparison between the output of the analysis and the current offering. Here follows the comparison table:

Merchants: comparison between analysis results and current offering		
Results		**Current offering**
Receipts Storing		Loyalty Program
e-Commerce		Mobile Ordering
Geolocation	⇨	Geolocation
Mobile Ordering		e-Commerce
e-Couponing		Receipts Storing

Table 20 - Comparison results vs. current offering for merchants

Similarly as for banks, merchants' currently offered VAS are mostly aligned to the output of the model created within the scope of this thesis. Receipts storing, e-commerce, geolocation and mobile ordering are aligned. The fifth variable proposed by the model is e-couponing (highlighted in blue in the above table on the left-hand side), whereas the fifth most common VAS currently offered are loyalty programs. Interesting is to notice that loyalty programs are the sixth choice of the tool, highlighting once again the alignment of the tool results to the average current offer. e-Couponing represents a strong asset for merchants as they have very low switching costs. Therefore, they strongly need a service to

make their customers feel special via reception of special and personalized offers and coupons. Furthermore, e-couponing would also benefit the merchants since the primary effect is boosting sales and hence increasing the repurchase frequency from customers.

12.3. Service Providers

As far as service providers are concerned, here follows the re-ordered table:

	Service Providers
Mobile Top-ups	8.3
Financial Services	8.0
Invoice Settling	7.5
Mobile Ticketing	5.3
Loyalty Program	4.4
Digital Identity	4.3
e-Couponing	4.0
e-Commerce	4.0
Mobile Parking	3.7
Mobile Ordering	3.7
Geolocation	3.0
Receipts Storing	2.0

Table 21 – Re-ordered results for service providers

The output of the ranking process sets as the best-fitting VAS for wallets offered by service providers the following ones: mobile top-ups, financial services, invoice settling, mobile ticketing and loyalty programs.

Here follows the table reporting the current adoption of VAS by service providers arising from the on-the-field census:

Service Providers
Mobile Top-ups
Invoice Settling
e-Couponing
Geolocation
Mobile Ticketing
Mobile Parking
Financial Services
e-Commerce
Digital Identity
Loyalty Program
Mobile Ordering
Receipts Storing

Table 22 - Ranking according to census

In order to facilitate the comparison between the top ranked VAS, here follows a more concise comparative table:

Service Providers: comparison between analysis results and current offering		
Results		**Current offering**
Mobile Top-ups	→	Mobile Top-ups
Financial Services		Invoice Settling
Invoice Settling		e-Couponing
Mobile Ticketing		Geolocation
Loyalty Program		Mobile Ticketing

Table 23 - Comparison results vs. current offering of service providers

The alignment between results and current offering is slightly weaker for service providers. The currently offered geolocation and e-couponing (highlighted in blue on the right-hand side of the above table) are in fact not

present in the best fitting adds-on according to the model. Instead, the model proposes financial services and loyalty programs. Financial services are deemed to be an important VAS to be offered by service providers, seeing the high alignment between the VAS's value proposition and the core business of service providers. Loyalty programs are proposed by the model due to the medium-to-low switching costs for service providers and due to the good synergies that this VAS has with mobile ticketing.

12.4. Start-ups

To conclude the presentation of the results, here follows the re-ordered table for start-ups:

	Start-ups
Invoice Settling	6.5
e-Couponing	6.0
Financial Services	5.8
Loyalty Program	5.4
Mobile Top-ups	5.3
eCommerce	4.5
Mobile ticketing	4.3
Geolocation	4.0
Mobile Ordering	3.7
Digital Identity	3.7
Mobile Parking	2.3
Receipts Storing	2.0

Table 24 – Re-ordered results for start-ups

Concerning start-ups, the best-fitting adds-on are invoice settling, e-couponing, financial services, loyalty programs and mobile top-ups. However, start-ups are advised to tighten as much as possible their adds-on offering if

budget-constrained. In fact, customers nowadays expect high-quality services, as the market educated them to expect ever increasing standards, and they would rather choose a solution that focuses on quality, not being particularly attracted by quantity anymore. Thus, start-ups are advised to focus on three to maximum four wallets – quality beats quantity.

Here follows the table depicting the AS-IS situation for start-ups:

Start-ups
e-Couponing
Loyalty Program
Geolocation
Mobile Top-ups
Invoice Settling
Mobile Parking
Mobile Ticketing
Digital Identity
Financial Services
Mobile Ordering
E-Commerce
Receipts Storing

Table 25 – Ranking according to census

It is now interesting to see how the suggestion made by the model and the current offering compare. The following table helps with the comparison:

Start-ups: comparison between analysis results and current offering		
Results		**Current offering**
Invoice Settling	→	e-Couponing
e-Couponing		Loyalty Program
Financial Services		Geolocation
Loyalty Program		Mobile Top-ups

Mobile Top-ups	Invoice Settling

Table 26 - Comparison results vs. current offering for start-ups

Concerning start-ups, four of the five model suggestions corresponds to the current offering. The matching VAS are invoice settling, e-couponing, loyalty programs and mobile top-ups. As fifth VAS, the model proposes financial services (highlighted in blue in the above table on the left-hand side) which are believed to be another key feature for start-ups as many new fintech companies are making their way into the financial world and the start-ups considered for this analysis are service providers in their early stages of life. An example of growing trend for start-ups in the financial services world is micro-insurance.

13. Payments: assessment of the four competitive assets

In the previous chapter, a series of variables have been identified with the aim of assessing the accomplishment on the four competitive assets for the different typologies of operators. For each variable, ranges have been established to assign a score representative of low, medium or high levels of accomplishment for every variable. When the level is low, a score of 1 is attributed, which becomes 2 or 3 respectively for medium and high accomplishment levels. Once the score are assigned based on the results of the updated census, an official final score is assigned for each typology of operator.

13.1. Banks

In the following table it is possible to see the results of the assessment on accomplishment for banks.

Assets	**Variables**	**Average**	**Variable's Score**	**Asset's Score**
Control	# of clicks to check balance	1	H	**H**
	# of clicks to check past transactions	1.27	H	
	Presence of a widget	Absent	L	
Simplicity	# of steps to register to the wallet	5.86	M	**M**
	Social login	Absent	L	
	Online payment – # of required steps	5.65	M	
	Proximity payment – # of required steps	3.36	H	
	P2P payment – # of required steps	5.8	M	
	# of VAS present in the wallet	3.5	H	

Security	Presence of biometry-based features	Present	H	**H**
	Presence of secure element/tokenization/session key	Present	H	
Diffusion	Insights gathered in literature review on the infrastructure	N/A	N/A	**N/A**

Table 27 - Results of the assessment on accomplishment for banks

As the above table shows, the results have been the following:

- *Control*: high accomplishment
- *Simplicity*: medium accomplishment
- *Security*: high accomplishment
- *Diffusion*: N/A

The results obtained from the banks are mostly aligned to the model proposed by Politecnico di Milano's Observatory on digital payments. However, *control* presents a high accomplishment level whereas the previous research showed a medium accomplishment for the industry.

13.2. Merchants

The following table shows the results of the assessment on accomplishment for merchants.

Assets	Variables	Average	Variable's Score	Asset's Score
Control	# of clicks to check balance	N/A	N/A	**H**
	# of clicks to check past transactions	N/A	N/A	
	Presence of a widget	Present	H	
Simplicity	# of steps to register to the wallet	6	M	**M**
	Social login	Absent	L	
	Online payment – # of required steps	7	M	
	Proximity payment – # of required steps	5	M	
	P2P payment – # of required steps	N/A	N/A	
	# of VAS present in the wallet	4	H	
Security	Presence of biometry-based features	Present	H	**H**

	Presence of secure element/tokenization/session key	Present	H	
Diffusion	Insights gathered in literature review on the infrastructure	N/A	N/A	**N/A**

Table 28 - Results of the assessment on accomplishment for merchants

As the above table shows, the results have been the following:

- *Control*: high accomplishment
- *Simplicity*: medium accomplishment
- *Security*: high accomplishment
- *Diffusion*: N/A

The results obtained from the merchants are mostly in line with Politecnico's model. However, merchants present a high level of accomplishment regarding *control*, whereas previous research suggests a medium accomplishment in the whole industry. The remaining results are aligned with previous research.

13.3. Service providers

The following table shows the results of the assessment on accomplishment for service providers.

Assets	Variables	Average	Variable's Score	Asset's Score
Control	# of clicks to check balance	1	H	**M**
	# of clicks to check past transactions	1.9	M	
	Presence of a widget	Absent	L	
Simplicity	# of steps to register to the wallet	7	M	**M**
	Social login	Absent	L	
	Online payment – # of required steps	3,8	H	
	Proximity payment – # of required steps	6	M	
	P2P payment – # of required steps	4.8	M	
	# of VAS present in the wallet	4.8	H	
Security	Presence of biometry-based features	Present	H	**H**

	Presence of secure element/tokenization/session key	Present	H	
Diffusion	Insights gathered in literature review on the infrastructure	N/A	N/A	**N/A**

Table 29 - Results of the assessment on accomplishment for service providers

As the above table shows, the results have been the following:

- *Control*: medium accomplishment
- *Simplicity*: medium accomplishment
- *Security*: high accomplishment
- *Diffusion*: N/*A*

The results obtained from the banks are in line with the model proposed by Politecnico di Milano's Observatory on digital payments.

13.4. Start-ups

The following table shows the results of the assessment on accomplishment for start-ups.

Assets	**Variables**	**Average**	**Variable's Score**	**Asset's Score**

Control	# of clicks to check balance	0	H	**H**
	# of clicks to check past transactions	0.3	H	
	Presence of a widget	Absent	L	
Simplicity	# of steps to register to the wallet	6.7	M	**M**
	Social login	Absent	L	
	Online payment – # of required steps	5	M	
	Proximity payment – # of required steps	5	M	
	P2P payment – # of required steps	1.5	H	
	# of VAS present in the wallet	4	H	
Security	Presence of biometry-based features	Present	H	**H**

	Presence of secure element/tokenization/session key	Present	H	
Diffusion	Insights gathered in literature review on the infrastructure	N/A	N/A	**N/A**

Table 30 - Results of the assessment on accomplishment for start-ups

As the above table shows, the results have been the following:

- *Control*: high accomplishment
- *Simplicity*: medium accomplishment
- *Security*: high accomplishment
- *Diffusion*: N/A

The results obtained from the start-ups are mostly in line with Politecnico's model. However, start-ups present a high level of accomplishment regarding *control*, whereas previous research suggests a medium accomplishment in the whole industry. The remaining results are aligned with previous research.

13.5. Aggregated view of the assessment

The results of the model are in some cases aligned to previous research, whereas in some other cases they differed.

The first asset, *control*, received three high and one medium assessment of the level of accomplishment. Hence, it can clearly be ranked as *high level of accomplishment*.

Simplicity received 4 medium grades. Therefore, this asset will be assigned to an aggregated *medium level of accomplishment*.

With regards to the third asset, *security*, it always received high grades. Therefore, this asset will be assigned to an aggregated *high level of accomplishment*.

As far as *diffusion* is concerned, in the *Overview of the infrastructure in Italy* and *Overview of the infrastructure in Belgium* sections of the literature review it is possible to retrieve some key insights on this asset. The infrastructure sustaining digital payments is improving, however being still limited as the percentage of POS accepting mobile wallets remains lower than 25%. The main issue regarding diffusion is the fragmentation of the services offered. In fact, even if overall the number of POS that accepts mobile payments is one fourth of the total, not all the POS accept all the mobile wallets circuits. Fragmentation of the offered infrastructure is one of the main showstoppers, as – according to what arose from an interview with Zaid Jwad, digital project manager at Mediolanum bank – payment systems that work are *diffused, accepted* and *simple*. Nonetheless, *diffusion* is certainly improving and cannot be considered as low accomplishment. Hence, *diffusion* will be assigned to an aggregated *low-to-medium level of accomplishment*.

The following table shows an aggregated view of the results.

Assets	Level of Accomplishment
Control	High level of accomplishment
Simplicity	Medium level of accomplishment
Security	High level of accomplishment
Diffusion	Low-to-medium level of accomplishment

Table 31 - Aggregated view on levels of accomplishment

In the following graph, it is possible to see how the output of this assessment relates to previous research:

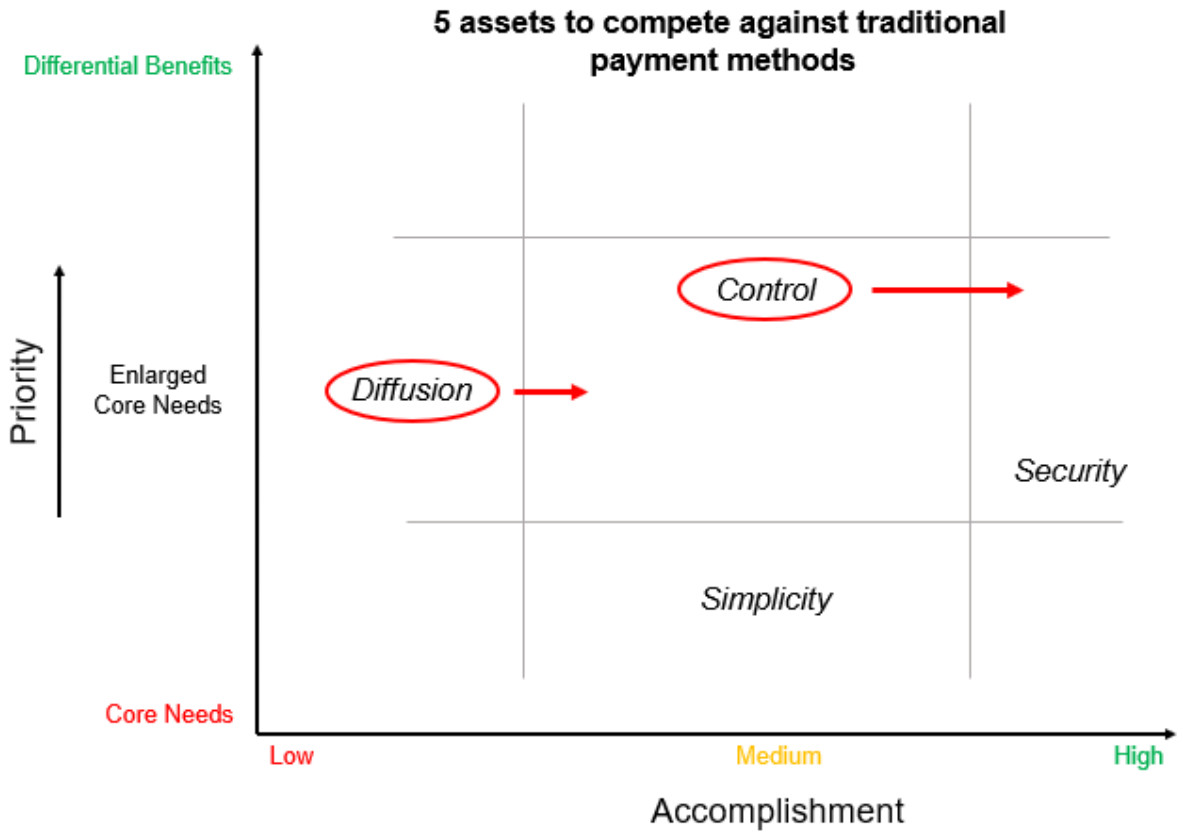

Figure 45 – Comparison of model output vs. prior literature

Therefore, security and simplicity are aligned to previous research. However, diffusion and control improved, even if with different strengths, their level of accomplishment from when the research has been made by Politecnico's Observatory.

14. Interviews to experts

At an advanced stage of the work, two interviews have been made to validate assumptions, variables, drivers and final results of the two models built for the thesis.

Zaid Jwad was interviewed in the name of Mediolanum Bank and Monica del Naja in the name of Sisal. The former represented the banks while the latter was the representative of service providers.

Both interviews have been very useful to understand the correctness of the assumptions and the results. However, the most interesting thing was to listen to experts talking about the field in which they are passionate. They were keen in sharing industry trends and other interesting and useful considerations to develop in the best possible way this dissertation.

Mr. Jwad was available and willing to help. He stressed the importance of customer experience. According to him, CX will be one of the most important drivers of success in the future for banks, hence the high value of a dissertation focusing on CX. As service offerings are similar from bank to bank, Mr. Jwad believes that nowadays CX is already the main driver for a customer when choosing a bank. Furthermore, Mr. Jwad could not help but saying that a payment system could only be successful if diffused, accepted and simple. The bank expert was satisfied with the model output, confirming that the results reflect the reality in terms of current offering and trends for the future. However, he highlighted that banks are very different from one another. In fact, there are banks that can be considered merchants banks and others that can be considered retail banks. These two categories have different needs, wants and objectives. For future research, it would be valuable to make a distinction between the two. Mr. Jwad was pleased with the descriptive variables chosen to evaluate the best-fitting VAS and he suggested that it would be interesting for future research to

have the same descriptive variables for every VAS. This would help testing the robustness of the variables chosen.

Mrs. Del Naja particularly stressed the importance of thinking about the payment world as a two-sided ecosystem. On the one side there are buyers, which represent the final users of mobile wallets in most of the cases, whereas on the other side there are sellers, which are mainly accountable for enhancing the infrastructure and are typically reluctant in joining innovative trends. The expert was satisfied with the ranking proposed by the model and confirmed that by making examples not only of VAS currently offered by Sisal but also of new projects that are currently in the pipeline for approval and implementation. Mrs. Del Naja was particularly happy about the positioning of digital identity, which did not make the top 5 for any of the operators but that always obtained a good position in the ranking. This is because nowadays many discussions on digital identity are going on in global forums and especially in the US. Hence, market saturation will go down in the future as new platforms and solutions will be available and the digital identity will become more and more interesting. The model, thanks to the descriptive variables identified, is perfectly able to capture this trends since one of the descriptive variables is saturation.

15. Conclusions

15.1. Core findings and traits of originality

This thesis aims at investigating an area that remains so far rather unexplored from a literature standpoint. Mobile wallets are amongst the most utilized means

of payment in Asian countries, but they have not been mass adopted in Europe so far. However, many operators are already offering solutions in European countries. What clearly arises analysing those solutions is that there is no alignment among operators. Thinking about the mobile wallet as composed by two synergetic sides which are payments and VAS, the misalignment is on both. Certainly, the functionalities needed are not the same if the typologies of operators offering the wallets are different. However, what arises from the analysis made on current offerings is that even companies belonging to the same category are offering different solutions. Hence, there is a clear need to develop further literature insights in order to boost the alignment between operators, aiming at proposing the highest possible CX.

With a very pragmatic, on-the-field research, this thesis aims at shedding a light on these differences while extending the literature at the same time. This creates new insights, helping companies to raise awareness on competitors' solutions. All this is done by analysing, processing and aggregating the data gathered via a census of 30+ wallets to build insights and intelligence that could not be found in the literature prior to this research, representing the first trait of originality.

Focusing on the VAS, it is stunning to see how differently the same VAS could be presented to users. The second objective and trait of originality of this thesis is to give guidelines to companies on how to create a certain VAS aiming at maximizing the CX. In fact, so far it is not possible to find structured best-practices to build certain VAS. This dissertation aims at creating these best-

practices by investigating what is currently offered on the market via both on-the-field testing and online searches. The combination of the most CX-enhancing features composes a best-practice.

The third element of originality comes from the first model created in the framework of this dissertation. In fact, it is the first time a structured model is built to suggest operators which types of VAS they should install in their wallets. The strength of the model is its flexibility and adaptability. As the scores are based on the fit between a number of variables and a typology of operators' characteristics, the model is potentially deployable for whatever typology of operator the user of the model is eager to investigate. In fact, should a company belonging to a typology of operators not included in this dissertation be willing to understand its own suit of best-fitting VAS, the only thing that should be done is giving scores to all the descriptive variables and the model automatically outputs the best choice. This represents a solid and well-structured tool that companies could use to offer the highest possible customer experience. Another key strength of the model is certainly its transparency as per the underlying descriptive variables concurring to the final VAS ranking. Just to give an example, digital identity was not chosen by the model for any of the operators. The reason is that, despite good scores obtained on average on two out of three descriptive variables, the third one – saturation – consistently received bad marks. This is because this technology is not yet wide spread and only a handful of solutions are present in the market. As soon as new solutions and platforms will be launched and saturation will decrease, operators can easily change the score

assigned to saturation. This will certainly change the results of the model, potentially having digital identity in the list of the top 5 VAS. Interesting is also the fact that operators can use this model to run sensitivities on the model's output. In fact, operators can test future scenarios and their implications to the VAS choice simply by playing with the scores assigned to the descriptive variables and seeing how the results change in terms of best-fitting VAS.

Finally, the fourth trait of originality comes from the second model built. It aims at assessing the accomplishment of simplicity, control, security and diffusion, the four digital payment assets to compete versus traditional payment systems. It is the first time that a model based on an on-the-field census is built to evaluate in a structured and scientific way the level of accomplishment of such assets. For future research, by updating the census, it will be possible to easily test again the accomplishment of the four assets just by feeding the model with the updated findings.

15.2. Value and contribution to theory and practice

This thesis brings a strong contribution to the theory. In fact, the dissertation clearly addresses a gap in the literature proposing a first model that has been built starting from the fundamentals of customer experience, VAS best-practices and mobile wallets functioning and not from other existing models. As just said, this model stands apart from existing models present in the literature, as it tackles the VAS domain from a completely different angle. It is the first time a model is built aiming at suggesting the best-fitting VAS to companies. In fact,

other models have been developed to evaluate the level of customer experience offered by an operator on the basis of the already offered set of VAS, without proposing the set itself. The second model also represents a contribution to theory, as it aims at scientifically prove the results of prior literature. As a matter of fact, the results of the model only partially prove the existing literature. In fact, two assets out of four have been ranked differently by the model, contradicting prior literature. This shows the evolution of the assets' accomplishment levels.

The thesis brings a contribution also to the practical domain. In fact, real-world managers and practitioners willing to build a new wallet or to revise their existing one can refer to the proposed model and get as an output the best-fitting VAS from a CX viewpoint. In fact, by simply attributing the scores they deem to best represent the fit between a variable and their characteristics, they will receive as an output the average scores for every VAS and the list of the five best choices to be implemented in their wallet. The model is absolutely transparent as it clearly shows the assumptions that lay behind the output. This is another strength of the model as managers and practitioners using the model can easily evince the reasons why the model takes certain "decisions". This helps building trust in the results, as the operator running the model feels empowered since the quality of his/her inputs directly translates into the quality of the results. This is because they are the ones assigning scores to the descriptive variables.

Also the second model brings value to practice as companies can easily understand their focus areas by looking at the output of the payment assets

model. The ones having the lowest evaluations are the ones that should be boosted. As the underlying drivers are transparent, companies can easily understand what their areas for improvement are.

15.3. Descriptive, normative and/or methodological value

This dissertation has a clear methodological value. In fact, starting from the aforementioned fundamentals, the thesis aims at tackling the lack of homogeneity for VAS (in terms of number, quality and choice of VAS offered) in a rather structured manner. The big challenge for this thesis was to build a structured model tackling a 'soft' issue. In fact, the descriptive variables feeding the model are shaped to advise a set of VAS aiming at maximizing the offered CX, which is a rather unstructured topic. However, the model manages to provide structure to tackle such an issue and thanks to its flexibility and modularity, it can be deployed to investigate other issues such as the fit between new VAS and the analysed operators or even the fit between the same VAS and new typologies of operators.

There is a clear methodological value arising also from the second model. In fact, it aims at evaluating very complex and blurred elements via a structured approach. The evaluation of the level of accomplishment of the assets is in fact based on concrete and measurable variables bringing structure and objectivity to the results.

15.4. Limitations of the thesis

The thesis presents a series of limitations/shortcomings as the domain the work aims at tackling is vast and so far rather unexplored. The main limitations are the following ones:

- The census comprehends 'only' 30+ wallets, mainly represented by two typologies of operators: banks and service providers. A broader census could have led to higher quality results, especially for merchants and start-ups which were the categories with less representation in the census. Potentially, a higher number of wallets could have led to more populated groups of operators or even a higher number of typologies. This is because with a higher presence of wallets some new typologies could have been analysed or simply a category that was too populated could have been split up into two or more.
- All the descriptive variables associated to the analysed VAS are different. In fact, the model presents a different set of descriptive variables for each of the VAS studied. This increases the quality of the results as the variables are shaped to match the specific characteristics of a certain VAS. However, it increases the complexity of the model and does not allow a simple comparison between the average scores attributed to each VAS. A unique set of descriptive variables would have simplified the model and allowed for an easier comparisons of the scores, even if probably resulting in the detriment of model's quality.
- The model proposes a one-size-fits-all type of solution for each of the four typologies of operators analysed. However, this gives an

aggregated view which does not necessarily represents the needs and wants of each of the operators falling in that category. As an example, banks are not all the same. In fact, there are banks such as Intesa San Paolo, UniCredit and Montepaschi that have closer contacts with merchants, whereas other institutions such as Mediolanum which could be defined as a retail bank and are therefore dealing with end customers. Thus, even if they are all falling under the same overarching category of banks they certainly have different needs. That said, the model is anyway flexible and allows the specific player to run different scenarios feeding it with inputs that are operator-specific, shaping the results on their own unique characteristics, needs and wants.

- Another limitation comes from the fact that the models look almost only at the customer side. However, when building a new payment ecosystem, this is made of both sellers and buyers. Sellers are more hesitant to enter in this new world of digital payments. Therefore, they are equally important to customers (i.e. buyers) and actions to incentivize their entrance into the ecosystem should be taken.

15.5. Opportunity for future research

Starting from the limitations of this thesis, there are a few clear inputs for future research. Firstly, it would be interesting and valuable to expand the census up to 50-80 wallets, in order to have more populated categories or even a higher number of categories (i.e. typologies of operators). Furthermore, it would be interesting to create more detailed categories, splitting the ones that are too

general (i.e. involving too many sub-categories of operators like the banks category deployed for this dissertation).

Another idea for future research is the creation of a model that presents the same exact set of descriptive variables across all the VAS and typologies of operators analysed. To make such a model valuable, the variables should represent a measure of the following four key aspects:

1. How big is the gap (i.e. from a technological, infrastructural, … viewpoint) that operator or typology of operators should close to be able to implement a specific VAS?
2. How big would be the impact (i.e. financial, economic, reputational, …) for the organization for implementing a certain VAS?
3. How important is the added value and the improvement in CX to clients for implementing a certain VAS?
4. How important are the volumes a certainly typology of operators deals with, on average? Based on customer volumes, considerations on which VAS is best to have might change.

The model created for this thesis only considers 12 VAS. A very interesting exercise for the future would be to expand this list including also other VAS such as:

- Comparison shopping
- Insurances (currently included within financial services)
- Donations

- Car ownership tax payment
- Lottery tickets
- Money pools
- Cashback programmes
- …

Talking about the pure payments side of a wallet, this thesis aims at assessing the level of accomplishment of the 4 assets representing a sound payment system. An interesting opportunity for future research would be to start from the results of this thesis and build a model that, similarly to the one built on the VAS side, assesses the suit of options and features that should be present on the payment side for each typology of operators to maximize CX by increasing the accomplishment of those assets.

Finally, future research should definitely investigate the sellers side of the digital payment ecosystem, evaluating constraints, opportunities, complexities and possible incentives to increase the attractiveness of mobile payments also on the sellers' side, enhancing and improving the payments infrastructure.

16. Sitography

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CHAPTER 4 – ANNEXES

Annex 1

In Annex 1, it is possible to find the detailed explanation of why every descriptive variable has been chosen to represent the VAS.

VAS	Descriptive Variables	Explanation
Mobile Ticketing	Ticket based	A business that naturally sells tickets could heavily benefit from a mobile ticketing system. Examples of ticket-based businesses are the airlines, stadiums, theatres, rail operators and many others. Typically, ticket-based companies are those offering services and not products to their clients.
	Cross Selling	Big players selling a great array of different services to their customers have the possibility to exploit mobile ticketing as a means to effectively sell other products to their customers.

	Loyalty Program	The presence of a loyalty program increases the advantages coming from a mobile ticketing system. This is because, thanks to mobile ticket sales, it is way easier to track the sales to a certain customer. This allows operators to offer loyalty bonuses or rewards in a more effective manner. As an example, it is sufficient to think about how difficult it is for a rail company to keep track of all the papery tickets sold to a certain customer. Thanks to mobile ticketing, rail companies have a clear idea of the ticket volumes sold to a specific customer and hence they can easily assign loyalty rewards (i.e. free ride after 9 tickets sold)
Mobile Parking	Access to Infrastructure	To enter the business, creation or ownership of parking lots is a pre-requisite. Operators that own data on cars on the national roads and have

		access to the infrastructure have an edge over other operators.
	Ownership of Brick and Mortar Stores & Customer Volume	The ownership of physical stores is a key variable determining whether it could be convenient for an operator to offer a mobile parking system to their customers. In fact, giving the possibility to a customer coming to visit your facility to check and reserve the parking in the immediate proximity of the shop itself is an extremely effective customer experience enhancer. If the customer can also proceed to the payment via app and enter the store with no stress, the overall result is even better. Such a consideration is only valid if the operator deals with big volumes of customers. The reason is that such an investment involving fixed and variable costs is only justified by big

		volumes of clients exploiting the service. Another reason why big customer volume is required to offer such a service, is to create agreements with city halls or the government. In fact, parking spaces present in public roads are typically owned by the state and therefore require the establishment of an agreement or a partnership to be managed. What one can expect is that these agreements can only be made with big entities guaranteeing big flows of customers.
e-Couponing	Switching Costs	If switching costs are structurally low in a specific company's industry, there may be the need of increasing those by offering an e-Couponing service to customers. This will make them feel part of a more long-term relationship with the company and

		will be more likely to shop again from the same enterprise.
	Product/Service Repurchase Frequency	e-Couponing programs are more likely to be implemented by companies that sell a product or a service which should be repurchased quite frequently over time.
	Product Perishability	Businesses selling perishable products can take enormous advantage of e-Couponing, as they can fairly easily drive up sales by sending coupons to customers and ensuring a higher-than-usual sales rate to get rid of the soon-to-perish products.
Loyalty Programs	Switching Costs	If switching costs are structurally low in a specific company's industry, there may be the need of increasing those by offering a loyalty program to customers. This will make them feel part of a more long-term relationship

		with the company and will be more likely to shop again from the same enterprise.
	Product/Service Repurchase Frequency	Loyalty programs are more likely to be implemented by companies that sell a product or a service which should be repurchased quite frequently over time.
	Mobile Ticketing	The presence of a mobile ticketing service increases the advantages coming from a loyalty program. This is because, thanks to mobile ticket sales, it is way easier to track the sales to a certain customer. This allows operators to offer loyalty bonuses or rewards in a more effective manner. As an example, it is sufficient to think about how difficult it is for a rail company to keep track of all the papery tickets sold to a certain customer. Thanks to mobile ticketing, rail companies have a clear

		idea of the ticket volumes sold to a specific customer and hence they can easily assign loyalty rewards (i.e. free ride after 9 tickets sold)
Mobile Top-ups	Customers Volume & Agreements Creation Likelihood	If mobile top-ups does not represent the core business and the company is not a start-up, featuring a high customers volume is a must. This is because typically, in order to offer such a service, an agreement with a telco operator is required. As mobile top-ups can be offered quite simply by almost all typology of operator, it is logical to think that telco will be more likely to establish agreements with big operators dealing with huge volumes of customers.
	Service Based	To put it simply, considering that mobile top-ups is a service, a user will expect to find such a service within an app of a company offering services. As previously affirmed,

		companies will have to stick as much as possible to their core business in order to offer the highest possible customer experience.
Invoice settling	Invoices	Offering invoices as a standard practice of the business is a key reason for implementing an invoice settling system. Companies needing to create invoices can be both service- and product-based.
	Service Based	To put it simply, considering that invoice settling is a service, a user will expect to find such a service within an app of a company offering services. As previously affirmed, companies will have to stick as much as possible to their core business in order to offer the highest possible customer experience.
Mobile Ordering	Physical Presence	Physical presence is a key pre-requisite to offer a mobile ordering

		service. This is simply because it is more logical to offer mobile ordering to your own customers that will soon come to your brick-and-mortar store rather than offering it as a service to other stores. This will help managing the flows of customers and balancing the overall workload.
	Different Cashiers	When offering mobile ordering, having the possibility to differentiate the flows of customers within the store is very important if the aim is to always maximize the customer experience. This is because a customer that already made an online order is not willing to make the same (potentially long) queue of the other fully-offline customers. Hence, this variable tends to favour big players able to offer several cashier lines still ensuring none of them will sit idle for long time.

	Quick-Service Industry	Being in a quick-service industry increases the need of a mobile ordering system. This is because mobile ordering allows for a quicker service, having at the same time the time to prepare the order without letting the customer waiting for it within the building. This is because the clients will find a ready-to-consume service as soon as they enter the company's building giving the feeling of quick service while the company had more time to get it ready before the customer arrives. In fact, mobile ordering lets clients carry out more value-added activities while the order is prepared.
Geolocation	Physical Presence	Physical presence is a key pre-requisite to offer a geolocation service. This is simply because it is more logical to offer geolocation-based communications and

		promotions to customers passing by (or close by) your brick-and-mortar store rather than offering it in random locations if you are only present online. This will help ensuring higher flows within the store, as customers or prospects are already passing relatively close.
	Promotions	Offering promotions under the form of e-Couponing or loyalty programs is an enabling driver for the adoption of geolocation. The reason is that those services perfectly fit together. Offering a promotion via an e-coupon already drives up sales. Offering an e-coupon when a customer is already walking or driving by the store greatly increases the effectiveness of the promotion.
Digital Identity	Market Saturation	Only few, big and entrusted players will have the possibility to offer such a service. Hence, the market for

		digital identity will easily saturate. Once the market is saturated, the VAS cannot be added to any further wallet.
	Government Agreements Creation Likelihood	Players that typically have connections to governments or that are big enough to create those connections are more likely to offer a digital identity service to their customers.
	Technological Expertise	Digital identity requires a series or technologies to run in a trustworthy manner. In particular, digital identity in mainly based on blockchain technology that is able to guarantee and legally track and provide the digital identity of a certain person (and even a certain good). This process needs to pass through many safety steps and it is certainly presenting a high level of

		technological complexity and savviness.
e-Commerce	Online Sales	Businesses already having online sales are those that could potentially benefit the most out of an e-Commerce app within their wallets. This is because users are more and more multichannel when approaching any kind of purchase and every e-Commerce player needs to be present in all of them.
	Product Based Business	It sounds reasonable to think that businesses that are product-based are more likely to offer an e-Commerce functionality within their wallets. This is because the concept of e-Commerce fits more products offerings rather than services offerings.

Financial Services	Access to Customer Data	Access to customer data is a key prerequisite to offer financial services. This is simply because each financial service is built on the needs of the single, specific customer and to shape the service on the customer's needs it is required to know that very customer. Hence, access to the customer's financial history is key and this is typically something only financial institutions have.
	Online Financial Services	Businesses already having online financial services are those that could potentially benefit the most out of a financial service feature within their wallets. This is because users are more and more multichannel when approaching financial institutions and every player needs to be present in all of them to maximize competitiveness and customer experience at the same time.

	Capital Availability	Access to capital is key to be able to offer financial services. This is simply because to lend out money to customers you need to have those money beforehand. Typically, this is a service that only big and well-established institutions can offer. Banks are the perfect example, but nowadays other big players are entering the business.
	Customer Volumes	Access to big volumes of customers is another prerequisite to successfully launch a mobile financial service feature. This is because due to the high capital needs, access to huge amounts of customers helps reducing the structural risk of the business and, if offering financial services is not the core business of the company, this is an activity that can only be offered by big players.

Receipts Storing	Product Based Business	Product-based organizations use of receipts as a proof of payment.

Annex 2

Here follow the detailed view on the scoring process, with the scores attributed to each descriptive variables that are then translated into average scores for the 12 VAS.

	Mobile ticketing		
	Ticket based	Cross Selling	Loyalty Program
Banks	1	7	2
Banks average	3.3		
Merchants	1	3	7
Merchants average	3.7		
Service Providers	7	7	2
Service Providers average	5.3		
Start-ups	7	4	2
Start-ups average	4.3		

	Mobile Parking		
	Access to Infrastructure	Physical stores	Customers volume
Banks	3	4	2
Banks average	3.0		
Merchants	2	8	4
Merchants average	4.7		
Service Providers	7	2	2
Service Providers average	3.7		
Start-ups	2	2	3
Start-ups average	2.3		

	e-Couponing		
	Switching Costs	Repurchase Frequency	Product Perishability
Banks	8	3	/
Banks average	5.5		
Merchants	7	8	6
Merchants average	7.0		
Service Providers	5	3	/
Service Providers average	4.0		
Start-ups	8	4	/
Start-ups average	6.0		

	Loyalty Program		
	Switching Costs	Repurchase Frequency	Mobile Ticketing
Banks	8	3	3.3
Banks average	4.8		
Merchants	7	8	3.7
Merchants average	6.2		
Service Providers	5	3	5.3
Service Providers average	4.4		
Start-ups	8	4	4.3
Start-ups average	5.4		

	Mobile Top-ups		
	Customers Volume	Agreements Likelihood	Service Based
Banks	8	7	9.0
Banks average	8.0		
Merchants	6	3	1.0
Merchants average	3.3		
Service Providers	9	7	9.0
Service Providers average	8.3		
Start-ups	3	4	9.0
Start-ups average	5.3		

	Invoice Settling	
	Invoices Presence	Service Based

Banks	8	9.0
Banks average	8.5	
Merchants	3	1.0
Merchants average	2.0	
Service Providers	6	9.0
Service Providers average	7.5	
Start-ups	4	9.0
Start-ups average	6.5	

	Mobile Ordering		
	Physical Presence	Different Cashiers	Quick Service
Banks	4	5.0	2.0
Banks average	3.7		
Merchants	8	6.0	8.0
Merchants average	7.3		
Service Providers	2	2.0	7.0
Service Providers average	3.7		
Start-ups	2	2.0	7.0
Start-ups average	3.7		

	Geolocation	
	Physical Presence	Promotions
Banks	4	4.0
Banks average	4.0	
Merchants	7	8.0
Merchants average	7.5	
Service Providers	2	4.0
Service Providers average	3.0	
Start-ups	2	6.0
Start-ups average	4.0	

	Digital Identity		
	Market Saturation	Governments Agreements	Technological Ability
Banks	2	7.0	3.0
Banks average	4.0		
Merchants	2	3.0	4.0
Merchants average	3.0		

Service Providers	2	7.0	4.0
Service Providers average	4.3		
Start-ups	2	2.0	7.0
Start-ups average	3.7		

	eCommerce	
	Online Sales	Product Based
Banks	7	1.0
Banks average	4.0	
Merchants	7	9.0
Merchants average	8.0	
Service Providers	7	1.0
Service Providers average	4.0	
Start-ups	8	1.0
Start-ups average	4.5	

	Financial Services			
	Customer Data Access	Online Financial Services	Capital Availability	Customer Volumes
Banks	8	7.0	8	7.0
Banks average	7.5			
Merchants	3	3.0	4	7.0
Merchants average	4.3			
Service Providers	8	9.0	7	8.0
Service Providers average	8.0			
Start-ups	8	8.0	3	4.0
Start-ups average	5.8			

	Receipts Storing
	Product Based
Banks	2
Banks average	2.0
Merchants	9
Merchants average	9.0
Service Providers	2
Service Providers average	2.0
Start-ups	2
Start-ups average	2.0