MOBILE PAYMENTS REGULATIONS

A comparative study between regulatory frameworks for Mobile Payments

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ABSTRACT

The increasing growth of mobile devices penetration has provoked the rise of the mobile payments industry. With many years in the market and with a constant evolution in both its technology and transactions volume, numerous implementations have entered the market around the world. It has demonstrated potential and innovation for services offered, business models, and delivery schemas. All these positive aspects bring new challenges for the industry and in particular for regulators.

Mobile payments are emerging in the intersection of financial regulation, telecommunications regulation, and other technological rules that make the picture complicated and challenging. That is why regulators' role should be to develop fair rules to protect both customers and the market, but having the ability to create at the same time an environment able to encourage innovation, open competition, and new services.

This master thesis presents a depiction of mobile payments from its concept, functioning, technologies, and current situation. Everything conducted to introduce, explain, and analyze the existing regulations covering mobile payments and how the creation of such regulatory frameworks have helped the industry to grow and develop.

Finally, several cases from different geographical regions and diverse markets are analyzed in order to see their regulatory approach and specific frameworks. Everything intended to analyze the existing trends and differences around the world with regions and countries with different socioeconomic characteristics. As a result an analysis locates each case in a logic map which allows the reader to understand how enabling is the environment for the development of the industry in terms of their regulatory situation. Additionally, the trends and differences between the regions are identified and presented based on the finds of each study case.

ABSTRAKT (Svenska)

Den stigande tillväxten av mobila enheter har orsakat en ökning av mobila enheter betalnings industrin. Med många år på marknaden samt en ständig utveckling både i sin teknik och överföringar av volym, har många fullföljande kommit in på marknaden världen runt. Detta har bevisat potential och innovation för tjänster som erbjuds, affärsmodeller och leveransscheman. Alla dessa positiva aspekter har med sig nya utmaningar för branschen, särskild för tillsynsmyndigheterna.

Mobila betalningar växer fram i finansiell reglerings snittet, reglering av telekommunikation, och andra tekniska regler som gör bilden komplicerad och utmanande. Det är därför tillsynsmyndigheternas roll bör vara att utveckla rimliga regler för att skydda både kunder och marknaden, men samtidigt att ha förmåga att skapa en miljö som kan främja innovation, öppen konkurrens samt nya tjänster.

Detta examensarbete presenterar en skildring av mobila betalningar från sitt koncept, funktion, teknik och nuvarande situation. Allting ledde till att introducera, förklara och analysera de befintliga förändringar som omfattar mobila betalningar och hur skapandet av reglerande regelverk har hjälpt industrin att växa och utvecklas.

Slutligen analyseras flera fall från olika geografiska regioner och olika marknader för att se deras regleringsmetod och regelverk. Allt syftar till att analysera befintliga trender och skillnader runtom i världen med regioner och länder med olika socioekonomiska egenskaper. Som ett resultat finns en analys som placerar varje fall i en mapp som ger läsaren en möjlighet att förstå hur viktig miljön är för utvecklingen när det kommer till dess reglerande situation. Dessutom identifieras och presenteras de olika trenderna och skillnaderna utifrån upptäckter som hittats i varje enskilt fall.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
ACH	Automated Clearing House
ADBI	Asian Development Bank Institute
ALI	American Law Institute
AML	Anti-Money Laundering
B2B	Business to Business
BSA	Bank Secrecy Act
CARD	Card Accountability Responsibility and Disclosure
CBK	Central Bank of Kenya
CFPB	Consumer Financial Protection Bureau
COPPA	Children's Online Privacy Protection Act
EBA	European Banking Authority
EC	European Commission
EFT	Electronic Funds Transfer
EFTA	Electronic Funds Transfer Act
EPC	European Payments Council
ESMA	European Securities and Markets Authority
ESRB	European Systemic Risk Board
EU	European Union
FATF	Financial Action Task Force
FCC	Federal Communications Commission
FFIEC	Federal Financial Institutions Examination Council
FRS	Federal Reserve System
FTC	Federal Trade Commission
GLBA	Gramm-Leach-Bliley Act
GSM	Global System for Mobile Communications
GSMA	GSM Association
KYC	Know Your Client
MBB	Mobile Broadband
MMAI	Mobile Money Association of India
MMS	Mobile Money Services
MNO	Mobile Network Operator
MPIW	Mobile Payments Industry Workgroup
MPSP	Mobile Payment Service Provider
NCUA	National Credit Union Association
NFC	Near Field Communication
OCC	Office of the Comptroller of the Currency
P2PE	Point-to-Point Encryption
PA-DSS	Payment Application Data Security Standard

Abbreviation	Meaning
PCI DSS	Payment Card Industry Data Security Standard
PCI SSC	Payment Card Industry Security Standard Council
PDA	Personal Digital Assistance
PIN	Personal Identification Number
POS	Point of Sale
PSP	Payment Service Provider
PTS	PIN Transaction Security
SIM	Subscriber Identity Module
SMS	Short Message Service
TILA	Truth in Lending Act
UCC	Uniform Commercial Code
ULC	Uniform Law Commission
UMPS	Universal Mobile Payment System
USSD	Unstructured Supplementary Service Data
WAP	Wireless Application Protocol

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1. INTRODUCTION

1.1 Project Context

This master thesis project was developed as part of the last semester studies of the two-year Erasmus Mundus Master's Programme in Security and Mobile Computing (NordSecMob)[1]. During the studies' period the necessary credits and courses were taken in both the Norwegian University of Science and Technology (NTNU)[2] in Trondheim and the Royal Institute of Technology (KTH)[3] in Stockholm. After successful conclusion, two officially recognized Master of Science (MSc) degrees will be granted by both the home and host university.

The development of this project was completely in charge of the student but all the work was done in association with the international consultancy firm Ernst & Young (EY)[4] and its office in Stockholm, as well as the techno-economics group of the Communications Systems (CoS)[5] department within the School of Information and Communication Technology[6] of KTH.

1.2 Background

From the moment mobile phones were introduced into our lives, their development has been amazingly quick. For this reason and due to the high amount of services and solutions that can be offered through one of these devices, the world has seen an increasing growth in terms of penetration during the past years. Nowadays the advance has gone in such a way that the amount of mobile subscriptions is reaching the figures of the world's population (see *Figure 1*).

[1] Master's Programme in Security and Mobile Computing - NordSecMob http://nordsecmob.aalto.fi/en/
[2] Norwegian University of Science and Technology www.ntnu.edu
[3] The Royal Institute of Technology www.kth.se/en
[4] Ernst & Young Sweden www.ey.com/se
[5] Communications Systems Department www.kth.se/en/ict/forskning/cos
[6] School of Information and Communication Technology www.kth.se/en/ict

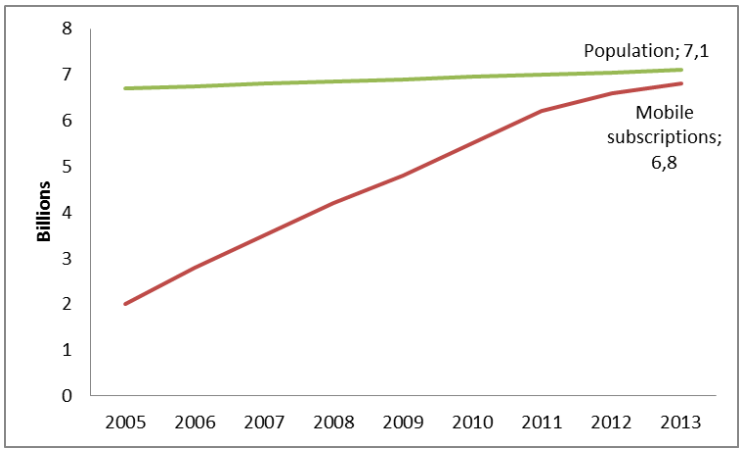

Figure 1: Number of mobile subscriptions and World's Population[7]

Today, due to their wide acceptance and adoption, mobile phones are used not just as communication devices, but also as daily life tools. The possibility to add or extend basic functionalities brought the opportunity to offer a big range of services to make every user's daily activities easier and quicker. In this way, this is how regular services that were linked to other kind of technologies or procedures now are being offered through mobile devices. As a consequence, different market players have seen the chance to develop and deploy mobile services using the phone as the linking point between users and diverse kind of providers.

This is how mobile payments became one of the functionalities based in mobile applications or technologies which enable the user to perform financial transactions by the use of a mobile device. Current solutions for mobile payments have been deployed during the past years around the globe and even though the technology has showed incredible potential, it is still far to be a global phenomenon. In addition, traditional payment methods such as debit/credit cards and electronic payments are widely used and accepted.

Mobile payments were having a volume transaction of over 105.9 billion USD by year 2011. In 2013 the growing had a rate of 122%, reaching the 235.4 billion. Therefore and taking the same behavior, the projected transaction volume for year 2017 will reach the 721 billion (Statista, 2014). However, mobile payments are developing differently according to the maturity of the market, and how developed

[7] Figure based on numbers and figures of (International Telecommunication Union, 2013).

the country or region is. Among all these factors, due to the specific characteristic of mobile payments and their wide array of applications, regulation plays an important role in order to assure effective and legal implementations. Seeing that, it is crucial for governments, agencies, industry regulators, and other involved bodies to merge the various factors of their scopes in order to generate a unique road map for the regulatory framework of mobile payments. Maintainable competition in banking and payment services should be balanced with an acknowledgment of the client's needs and an outline of clear rules for new comers (EY, 2014).

As a matter of fact, it has been suggested that the regulations have been put on hold or have not developed enough due to an immature market and the uncertainty of a well-established technology and standard globally (Zhong, 2009). The lack of UMPS (Universal Mobile Payment System) restricts the different markets to take active action on the creation, establishment or adaptation of regulations aiming exclusively mobile payments and its transactions (Zhong, 2009).

Even though specific regulations are not clearly established and for some geographical regions there have not even come to consideration, there are mature markets where the problem has started to be addressed and therefore new regulation entities have created new articles or procedures specifically for mobile payments and similar technologies. In some other scenarios, financial and technological laws aim to cover electronic money transactions, have extended their regulatory capabilities to also cover transactions involving mobile devices (McTaggart & Freese, 2010).

Evidently, there is no an existing global regulatory body defining specific rules and guidelines for all mobile payment implementations around the world. However, there are different examples of existing and under develop regulations in different geographical regions, both in developed and developing economies, where diverse needs have driven the countries to define their regulatory frameworks. Moreover, the penetration and acceptance of technology or payment method differs entirely from region to region based in their characteristics, market and culture.

1.3 Motivation

1.3.1 Problem

The deployment of mobile payment technologies has already begun and there are several examples of implementations and ideas. Nonetheless, the application of a successful and effective service of mobile payments suggests the cooperation between different players such as Mobile Network Operators (MNO), financial institutions (e.g. banks and credit card companies), service providers, merchants, equipment suppliers and industry associations (Taga & Oswald, 2009). These many actors of different specialties and backgrounds bring the relevance and need to have a clear and reliable framework of rules and regulations. This will allow new players or entrepreneurs enter the market without uncertainty of an undefined or unstable legal structure. Moreover, when the technology is being deployed and more implementations are coming as a reaction to the non-stopping growth of mobile broadband penetration around the world (International Telecommunication Union, 2014) (see *Figure 2*). This forces the regulators and authorities to take a lead role to protect both the interests of the market and the users.

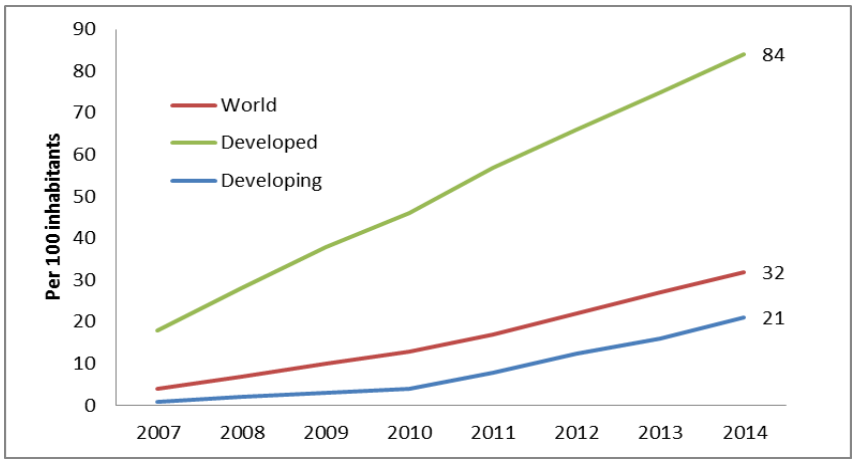

Figure 2: Active Mobile-broadband Subscriptions[8]

Due to the spread and evolution of mobile technologies, the amount of transactions supported by mobile payment solutions have been growing yearly (see

[8] Based on numbers and figures of the "ICT Facts and Figures: The World in 2014".

Figure 3) and are a long-running global trend, taking users away from traditional payment methods such as cash, checks and card-based systems. Although its growth is expected to be high, mobile payments transactions only account for about 1% of the total volume of transactions globally. This indicates that this type of payments will begin to take a bigger part of the total global transaction volumes, yet, they are far to be consider as a common habit for consumers or the market (Horne, et al., 2014).

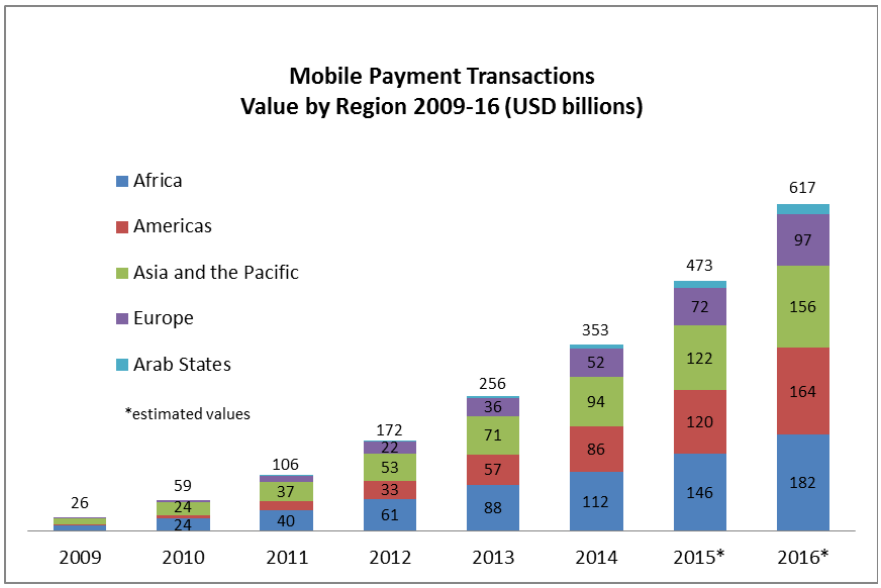

Figure 3: Mobile Payment Transactions[9]

As a result of the sort of transactions handled by mobile payment services (usually including electronic communications involving money, personal data, credentials, and sensitive information), the users need to be protected against any kind of fraud. Therefore, different regulatory bodies, such as monetary authorities, central banks, telecommunications authorities, local governments, regional bodies (e.g. European Union, National Banks), the Payment Card Industry (PCI), and others have developed or are creating regulations covering important aspects such as the technology, security, financial aspects, privacy, etc.

Given the specific characteristics of mobile payments as a tool with a wide array of applications, the boundaries between regulatory rules tend to overlap. The

[9] Figure based on values presented at "*Trends in Telecommunications Reform - 2014*".

competence between regulatory bodies such as the monetary authority, central bank, and telecommunications authorities among others might be a problem (Martins de Almeida, 2013). Furthermore, regulatory bodies might offer an enabling and good environment for services to grow, but at the same time might also suppress innovation and therefore diminish a possible commercial success. Mobile payments as a technology and business enabler have yet many challenges to face, but there is no doubt that regulators will be a factor of an eventual success for the industry. That is why there is a need to understand and distinguish the behavior of the different regulatory bodies regarding mobile payments, and how this might or might not affect the deployment and spread of this technology.

1.3.2 Research Questions

Based on the presented background and the identified problem, the main objective of this master thesis is to address and answer the following Research Questions:

- Which trends can be found in regulatory frameworks for mobile payments in regions with diverse socio-economic and technological environments?

- What are global regulators and authorities doing to provide an enabling environment for the development and growth of the mobile payments industry?

In order to answer these research questions, it was necessary to design an adequate analysis, methodology, and strategy. This allowed the author to organize and present relevant findings from the collected information and the subsequent study. The presented results are directly linked to these questions and the whole process to reach these answers is presented in the next chapters.

Correspondingly, the research is limited to the analysis of a group of four different geographical and economic regions. All of them selected in a way that relevant information is presented and diverse techno-economic realities are studied. The findings of the analysis of this work, along with relevant interviews of

key players, aim to identify trends and differences of the development of regulatory frameworks for mobile payments around the world, which will ultimately provide the tools to perform a thoughtful analysis which will have as a result the necessary information to answer the objective research questions.

The gathered information and results will give the author the required elements to provide a personal analysis towards the future of mobile payments in terms of its regulatory trends and practices. This analysis does not intend to provide a clear roadmap of how the technology is going to develop purely based in regulatory frameworks. Instead, it is limited to understand how the known history of implementations, mistakes, and successes clarify the picture in terms of lessons learned and known cases. Most importantly, the author's intention is limited to highlight the influence of regulations as an enabler or blocker for the development of the technology.

1.4 Related Work

1.4.1 General Literature Picture on Mobile Payments

There is a substantial amount of publications devoted to mobile payments, having emphasis on different and broad number of topics from technical aspects, business opportunities, sociological analysis (human behavior), and legal and regulatory issues. These areas are given and defined in the literature overview for mobile payments done by (Dahlberg, et al., 2008). Here the authors define the four specific groups where most of the analyzed and investigated literature sources can be classified:

- ✓ Changes in Social/Cultural Environment.
- ✓ Changes in Commercial Environment.
- ✓ Changes in Technological Environment.
- ✓ Changes in Legal, Regulatory, and Standardization Environment.

According to the same paper, the most studied among these groups of topics are the ones related to technology elements (systems or protocols) and consumer

behavior (user acceptance, attitude towards the systems and adoption), with 29 and 20 publications respectively from a group of 73 conferences and journals publications analyzed. On the other hand, legal/regulatory studies have as few as 4 publications in the same group of analysis. This phenomenon might be caused by the topic's complexity and the uncertainty it represents since the industry is not mature enough and is still struggling to position itself in our society.

Practical examples of authors analyzing the social, cultural and acceptance of mobile payments are the ones presented in (Provost, 2012) and (Ho, et al., 2008). Here the revolution and social impact of a new technology are explored. Also, in the second text, different user acceptance scenarios are evaluated in order to understand the eventual reception and success of mobile payments implementations.

From the business and commerce side, cases like the one presented in (Hu, et al., 2008) illustrate how mobile banking and payments are affecting the mobile commerce. Similarly, in (Smith, et al., 2010) the authors analyzed the position of MNOs within the ecosystem of mobile payments.

Amid the publications analyzing the technological aspects, it is possible to find texts where the author(s)' study case presents or/and analyze one or several implementations such as in (Żmijewska, 2005) and (Chang, et al., 2012). Here technical aspects, capabilities of the technology, and efficiency of its implementation are explained. These and other studies have shown a big number of implementations and try outs around the world, proving that the technological constrains to make this a successful technology have in a great part been surpass, leaving the reaming challenges to the business area, society acceptance and regulatory framework development. As a consequence, these areas should be in the focus of future investigations, without leaving behind the technological base that supports it all.

1.4.2 Specific Literature on Mobile Payments Regulations

Although all the information and research done in other fields within mobile payments are undoubtedly providing the necessary support and background for

this master thesis, the main focus of this sub-section is on the regulatory aspects around the mobile payments. Therefore, specific literature discussing related topics on regulation was analyzed in order to find out relevant work developed by others and to identify the existing research gap on the field.

Among the literature related to regulations, some papers are correlated in the sense that they show some approximation towards the topic, like it is done in (Karnouskos & Vilmos, 2004) and (Leavitt, 2012). In these papers, regulations are not the main topic but it is mentioned and highlight as an important matter. In addition, some authors within law specialization like (Martins de Almeida, 2013) analyze the specific case of a country as Brazil to understand how a nation's background may influence in the design and deployment of a regulatory framework. For instance, authors like (McTaggart & Freese, 2010) provide an overview from the technological and legal aspects and analyze the applicable legal landscape in the United States. In the same way, the summary report presented in (Crowe, et al., 2012) offers an analysis done in several meetings by the Mobile Payments Industry Workgroup (MPIW) and a number of financial and federal regulators on the landscape of regulations for mobile payments in the United States. They have addressed the current state, different laws and acts, as well as the opportunities, challenges and the next steps towards a clear and stable regulatory scheme in their country.

Following the same line, some publications deepen less in specific regulations of a country but instead analyze the current situation in short and less complex works like those on (Fonté, 2013) and (Martin, 2012); both addressing regulatory issues of the United States.

In order to take a broader perspective, literature analyzing legal frameworks for mobile payments in other countries is offered by (Lachaal & Zhang, 2012), where Africa's issues on the subject are addressed. Also some other authors went into specific cases such as South Africa's regulatory framework in (Lawack-Davids, 2012). Following the same pattern, (Kemp, 2013) analyzes contracting issues on mobile payments regulations in the United Kingdom.

Out of the academic sphere, private consultancy firms and international organizations have done very interesting works by analyzing the whole spectrum of mobile payments and giving an explicit study of regulations issues and challenges both globally and in specific contexts, such as KPMG in (Choi, et al., 2007) for Asia Pacific, both the Mobile Money Association of India (MMAI) and GSM Association (GSMA) in (MMAI/GSMA, 2013) for India and (Mbiti & Weil, 2011) for the case of Kenya.

As mentioned before, corporate companies have done bigger studies where they analyze the whole spectrum of mobile payments and discuss regulatory issues among such topics as adoption, challenges, technologies and economics aspects. One of these studies have a more brief and general view in (EY, 2014) and a deeper and more long investigation in (Horne, et al., 2014).

Another approach is focusing on topics of analysis of the necessary assistance between all the involved players, like the one in (Bourreau & Verdier, 2010). Here the authors present the cooperation models between all the involved actors and discuss, not in deep, regulatory issues of the mobile operators posed by their presence in the payment market.

Finally and without going into details or mention every one of the existing ones, a logical source of information on regulations are the official regulatory bodies of different regions such as the US, Europe, the UK, Asia, etc. All their official documents and publications are the reliable source to understand and interpret the current laws and restrictions for the deployment of mobile payments solutions. Institutions such as the Asian Development Bank Institute (ADBI), Consumer Financial Protection Bureau (CFPB), European Bank Authority (EBA), European Commission (EC), European Payments Council (EPC), European Securities and Markets Authority (ESMA), European Systemic Risk Board (ESRB), Federal Communications Commission (FCC), Federal Financial Institutions Examinations Council (FFIEC), Federal Reserve System (FRS), among many others were consult and cited throughout this document.

As a conclusion, there is extensive and very large literature and developed work related to mobile payments, nonetheless the regulatory part seems to lack a combined and focus analysis. Isolated works seems to overpass and simply provide a quick overview of this aspect when it comes to broader analysis, moreover when the discussion has been mainly centralized in both the technology and the user acceptance towards new payment methods. The research gap this master thesis aims to cover is related with the noticeable lack of a regulatory-centralized work, focusing mainly on the regulatory aspects of the technology. Furthermore, by not just presenting unrelated cases, but instead, finding trends and similarities between them to find measurable facts which will allow this text to provide a research job that has not been done before and it is clearly missing in the literature on the topic.

1.5 Contribution

The main contribution of this project is to offer a comparative study of different regulatory frameworks from diverse regions and markets around the world, combining them into one analysis to identify patterns, trends, and differences among every system and their unique characteristics.

Additionally, each of the analyzed markets will be categorized and classified in terms of its openness and certainty, by analyzing the current situation of their regulatory systems for mobile payments. This will provide a more meaningful analysis where cases are not studied in an isolated way, but instead are combined and compare to highlight the influence and importance regulations have had in the development of the industry. Moreover when regulators are being challenged by a constant growing and complex mobile payments market.

As a final step, the personal analysis from the author is presented in relation with the challenges towards the future of mobile payments based on the presented study cases and their analysis. All of this by taking the main conclusions of the comparative study, interviews, and analyzed literature.

1.6 Structure

This thesis is structured to present six chapters where each of them aims to provide support information for the development and further analysis of regulations on mobile payments. Also, it was designed in a way that the reader does not need to have a deep or previous knowledge on the matter, since concepts and definitions are offered in order to deliver an easy-to-read research and provide awareness of the topic's relevance.

Continuing the current introductory chapter, the content of the remaining sections is divided and summarized as follows:

Chapter 2 – *Methodology*: the objective of this section is to explain which methods and steps were used in order to gather the necessary information, process it and presented as a pertinent result.

Chapter 3 – *Key Definitions*: this section contains the important and relevant definitions needed in order to understand the whole context of mobile payments. That is why concepts, technologies and examples are offered in a way that the further reading is done in a much easier way.

Chapter 4 – *Why Regulations?:* here a brief introduction to regulations and their importance for the evolution and expansion of mobile payments is given. Also a general context is presented in order to explain the topic and its importance.

Chapter 5 – *Study Cases and Regulatory Frameworks*: the main idea of this part is to present the initial findings of the work as well as to summarize the different frameworks and their unique characteristics and shapes.

Chapter 6 – *Mobile Payments Regulations Analysis and Future*: as a final chapter, an analysis combining the findings of the previous chapter and the context giving throughout the whole document is presented. Additionally, a comparison analysis between schemes, regions, and trends is presented.

To finalize and as closure section of this work, relevant conclusions are presented as well as the future research on the area.

2. METHODOLOGY

2.1 Overview

The work scheme of this master thesis consists of a number of steps or phases that were designed to provide the necessary order and structure to this work. Each of these parts gives the necessary input to the next one, following a logical and intelligent flow, which gives the reader the indispensable tools to understand and follow the topic and its development during the whole reading.

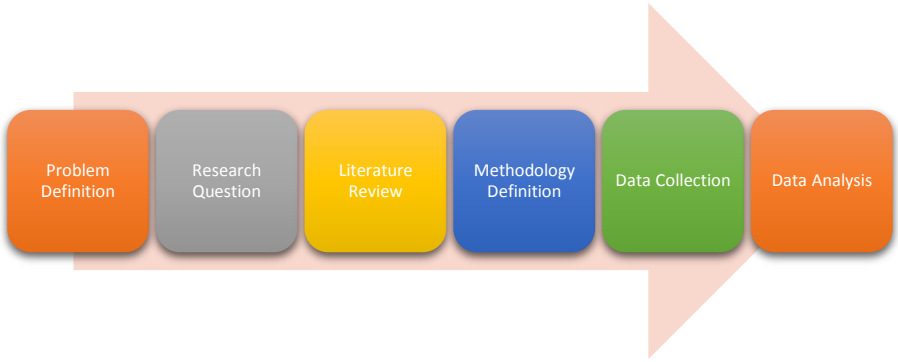

Figure 4: Master Thesis' Phases

As it can be appreciated (see *Figure 4*), this work has six different phases which give a logic structure from the problem definition to the results presentation. Both phases one and two were defined and explained in Chapter 1, which means that the next step is to define a proper methodology to solve the problem and reach the expected results. This chapter explains the remaining steps and provides the specifics of how the needed information was collected, analyzed and used in order to answer the previously proposed research questions.

2.1.1 Research Method

The characteristics of this research lead to the use of one of the most classic research methods, the qualitative, which is characteristically used in social sciences. Nonetheless, and due to the features analyzed in this work, it is the most convenient method to understand and investigate different sources with similar purposes but completely diverse structures, such as regulatory frameworks.

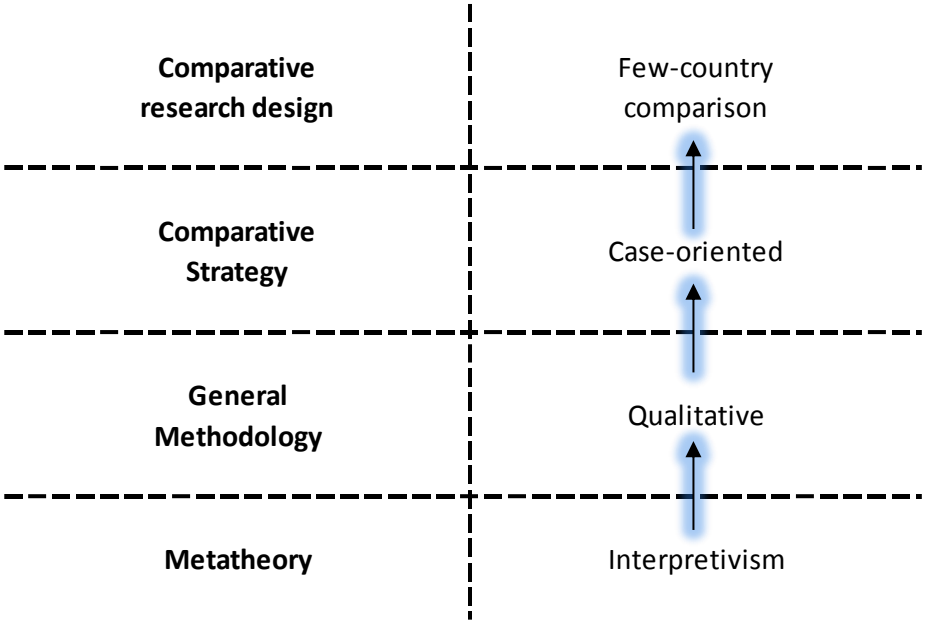

Figure 5: Methodology Structure[10]

The application of this methodology technique implicates the use of interpretivism (Lor, 2011), which adds the necessary insight of the author's thoughts, analysis and understanding of the collected and presented data. Then, the qualitative research method is applied to collect the essential information to subsequently continue to the study cases. This strategy presents a comparative study of different countries/regions with different features, completing a comparative research design (see *Figure 5*).

The multiple case study approach used in this work, lead to the selection of a sample or significant study cases with particular characteristics. This is how, and in order to keep this work in scope (relevant and no excessively extensive), countries located in different geographical regions and varied markets and cultures were selected. The motivation and reason to select each one of them, is explained in more detail in the next section:

[10] Figure design based in the presented theory of (Lor, 2011).

2.1.2 Study Cases

2.1.2.1 Geographical-based Cases

In pursuance of having a complete and valuable research, the study cases selected for this work were based in the need of having enough information to work with and cover a significant sample of frameworks and countries. Therefore the following basic geographical division was used to start the identification of relevant samples from each one of them:

- ✓ **Americas:** this continental region offers a lot of examples for mobile payments implementations as well as frameworks with different kind of characteristics and development. In the case of this work, a developed and growing market[11] of the United States was selected as one of the most representative in the region.

- ✓ **Europe:** the case of Europe is was selected due to the existence of the European Union (EU), which is the political and economic union of 28 member states[12]. The EU operates through a system of supranational independent institutions. One of them is the EC, executive body responsible for proposing legislation and decisions for all the member states. That is why this region can be analyzed through the EU and its regulatory bodies.

[11] The transaction value for mobile payments in the US is expected to growth from 1.04 billion USD in 2013 to 58.42 in 2017 according to (Statista, 2014).

[12] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

- ✓ **Africa:** as it is presented in *Figure 3*, the African continent is leading the way in terms of value of transaction volume for mobile money. This singularity has been driven by a social factor such as the financial inclusion. It is estimated that 2.5 billion people in lower and middle income countries are unbanked (Pénicaud & Katakam, 2013). Mobile money services focus on provisioning of convenient, safe and affordable financial services. That is how Kenya led the way, and it is a great example of this model with the implementation of the *M-Pesa*[13] solution, making it the perfect sample to this study.

- ✓ **Asia:** in Asia the Philippine's market showed a growth from 3% mobile money penetration to 68% from year 2000 (Leishman, 2009), showing its potential and development in the field. Furthermore, the market has already active and important implementations of mobile payments, accounting for up to 10% of the national Gross Domestic Product (GDP) (Choi, et al., 2007). This selection was done to balance the study sample to two developed countries/regions and two developing ones

2.1.2.2 Global Regulator Case

After studying the different geographical regions and proposed countries, the author provides the view of a global payment regulator, which currently plays a big role in the industry and will, for sure, be important in the future development of

[13] Payment and transfer service operated by *Safaricom* (MNO in Kenya) and used by nearly 18 million Kenyans (7 million have a bank account) (di Castri, 2013).

mobile payments. This player is the PCI Security Standards Council (PCI SSC), which has defined the well-known PCI Data Security Standard (PCI DSS).

The standard was created in order to increase control around cardholder data and avoid any kind of fraud related to credit or debit card transactions. Many mobile payment solutions are using credit/debit card information for their operations; therefore, they might have to accomplish PCI DSS compliance.

In this study, the current approach to mobile payments from the PCI DSS perspective is analyzed, in order to understand how its controls are addressing, or not, specific payments systems such as those based on mobile devices.

2.2 Approach

2.2.1 Literature Review

All the information and sources cited or consulted for the development of this master thesis, went through a review process that evaluated their relevance to the subject, how updated they were (no material older than 10 years was taking into account) and how relevant and reliable the source was. By having the three elements, the data collection process was started and categorized as it will be explained in the next section.

2.2.2 Data Collection

The process of data collection took an important amount of time at the beginning of this work by cause of the several and diverse sources that had to be consulted. During this process important information might be ignored and not relevant sources and data can also affect the ultimate quality of the final work. Therefore and in order to have a clear representation of the different available sources, all the collected secondary data[14] was classified in the following three categories:

[14] Secondary data represents all the available material on the subject.

- ✓ **Academic**
  This kind of documents includes research papers, articles, and books. All of them were mainly developed in an educational environment and published in international journals or periodicals due to the relevance of their content.

- ✓ **Private Sector**
  All the documents classified under this label, are the ones created and produced in the private sector, where the aim is to create awareness of a market trend or to predict its behavior or growth in the near future. This includes market analysis reports, market surveys, and white papers, among others. The relevance of these documents is the noticeable tendency to highlight market phenomena, reliable figures and numbers as well as a good analysis towards the future.

- ✓ **Official Bodies**
  The specific characteristics and topic of this master thesis required the collection of official documents containing regulations for the different geographical areas analyzed. The sources of such documents are therefore official institutions like governmental institutions, local and international regulatory bodies, central banks, and in the case of PCI, the PCI SSC.

In addition to the collected documents, primary data[15] was collected using interviews. This was done in order to get a deeper insight of the topic and from different point of views hence interviews with different kind of players and industries were conducted. These interviews were not following the same kind of questionnaire, but instead were handled by the author according to the type of information that was given by the interviewees and their specific background and characteristics[16].

[15] Primary data is normally collected in the field.
[16] Details about each interview will be provided in the Appendix of this work.

With the objective of get the best picture and opinions from different sectors and experts, the interviews were conducted with three professionals from different industries, such as the private consultancy business, the payment service providers (PSP) and the PCI. The following people were interviewed:

- ✓ **Pierre Pilorge – Financial Services Customer Leader at EY**

  As one of the leaders of the Advisory Financial Services and specialized in the customer needs and services. Pierre has more than 20 years of experience in both the financial market as well as the consultancy business. He is also part of the *Mobile Money*[17] initiative within EY and a Partner in EY France.

- ✓ **Egil Bergenlind – Compliance Officer at iZettle**

  He is the person in charge of the compliance for the Swedish mobile payment solution iZettle, a company that offers a single application, hardware, and service which allow merchants to accept card payments on their mobile devices. Their services are offered in up to 9 countries in Europe and South America, giving him the experience, background, and knowledge of regulatory frameworks and their development towards this kind of solutions.

- ✓ **Santiago Pinilla – Qualified Security Assessor (QSA)[18] at McAfee**

  As a QSA he has professional experience working with different kind of financial and banking institutions with high level of credit/debit card transactions and knows the whole regulatory framework of the PCI standards.

2.2.3 Data Analysis

Once all the information is collected and disclosed, the next step is to make a

[17] *The mobile money revolution is here* - http://www.ey.com/GL/en/Industries/Financial-Services/Banking---Capital-Markets/Financial-services-meet-the-electronic-wallet

[18] Certification granted by the PCI SSC for professionals completing specific information security training related to the PCI DSS. The professionals have to be employees of an approved PCI security auditing firm.

deep and thoughtful analysis to present the meeting and divergent points of the different study cases. To accomplish this kind of breakdown, it is necessary to have common indicators or categories which allow the realization of the comparative phase of this methodology.

To perform the comparison between different systems, it is necessary to identify common categories among all of them and then to perform a cross-reference check to identify trends and divergences. Thus, a comparative study is developed taking the main and important features, which will finally lead to the analysis of the current situation and challenges for the future.

The first model to be used in the comparison of the different analyzed regions and countries will be the one proposed by (Porteous, 2006). This model allows to locate different study cases (for this case, countries) into a logic map which shows how open and which level of certainty a regulatory framework offer for the development of the mobile payment industry (see *Figure 6*).

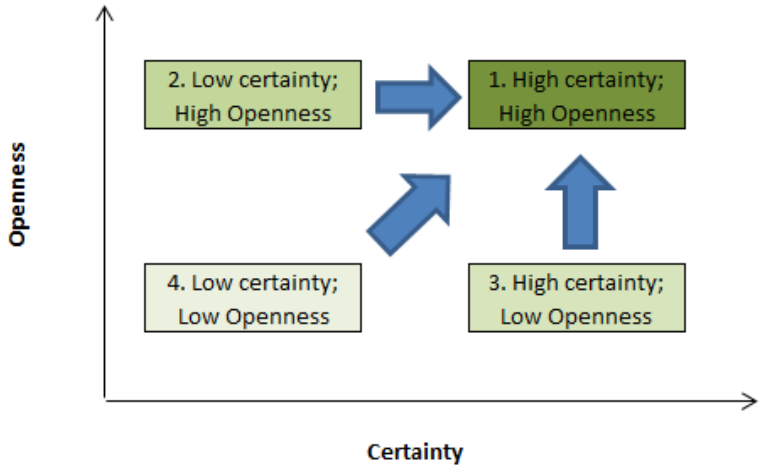

Figure 6: How enabling is an environment?

Another comparative model used to associate the different study cases, is a table summarizing key factors of each market within a broader context of an enabling environment characteristics. The table model (see *Table 1*) was designed and based upon some of the concepts presented in (International Finance Corporation, 2011).

Category	Parameters
Socioeconomic context	Population, GDP, geographical area, remittance flow
Regulation	KYC, license requirements, clear regulatory framework, agent regulation
Existing access to financial services	Unbanked population, non-bank provision of financial services, banking industry, informal financial access
Existing mobile market situation	Population penetration, level of competition, industry's fragmentation
Potential demand	P2P/B2B/G2P transfers, public transport, remittances
User perceptions	Entities trust, willingness to use the service, cultural factors

Table 1: Parameters Affecting Success of Mobile Payments

As final part of the analysis, a social and cultural analysis together with economic and technological factors is used to analyze the current situation of each study case presented. In order to do this, the model proposed by (Taga & Oswald, 2009) was adapted in order to be used in this work and to provide relevant insights to the developed study (see *Table 2*).

	Developed Markets	Emerging Markets
Economic and technological factors	- Developed banking infrastructure - Regulatory restrictions - High internet penetration - High mobile penetration	- Low penetration of banking infrastructure - Low income per capita - Low internet penetration - High mobile penetration
Social and cultural factors	- Credit-card usage legacy - High computer literacy - Technology savvy	- High percentage of emigration - Low computer literacy - Cash based societies
	Stimulating M-Payments	Inhibiting M-Payments

Table 2: Factors behind M-Payments According Market Type

Additionally, the *Mobile Money Demand Curves* model presented in (International Finance Corporation, 2011) will be used to position the study cases of this work and to analyze how close or far are they from each other and in which direction they are heading.

3. KEY DEFINITIONS

3.1 E-Commerce & M-Commerce

Before going into the details of mobile payments and how to define them, it is important to start from the bottom and understand that their origin is based in concepts and evolution of pre-existing and more developed ideas. By having these definitions, the reader will have a more clear line of thinking throughout this text.

Electronic Commerce: it is defined as the action of maintaining business relationships or trading products, services or commodities via computer networks such as the Internet (Zwass, 2012). This way of making businesses was an evolution of a classic way to do something, to the progression and simultaneous integration with new technologies and communications. Another way to call this type of procedures is "digitally enabled transactions" that include all transactions mediated by digital technology. This, of course, means that they occur over the Internet (Laudon & Guercio Traver, 2011).

This type of commerce has some features that should always be presented in order to guarantee its status as e-commerce. Nonetheless, there is one characteristic that is the most important, ***ubiquity***. This indicates that it is possible to access the business products, services or commodities, everywhere and anytime (when the necessary means are presented, e.g. Internet connection). This is a classic differentiation from classic models and it is highly related to the following concept.

Mobile Commerce: the rapid dissemination of mobile phones and other sort of mobile devices such as tablets, Personal Digital Assistants (PDA), laptops, and others, across the world during recent years, has created the foundation for a new type of technology-supported commerce. Going beyond the classic e-commerce, where the transactions are done via any kind of enable-connected terminal, the term m-commerce fits perfectly for transactions carried out exclusively via mobile or wireless terminals. Both wired and wireless transactions are considered electronic commerce, but the prefix "m" helps to make the contrast more clear (Dholakia & Dholakia, 2004).

The added value of this type of commerce is the potential to make the clients spend more, as they can buy a big variety of products and services on the go. This gives a mayor edge for both merchants and users, since ones are receiving the benefit of growing amount of sales (increase revenues), while the others have the convenience of buying at any place where there is an available wireless connection.

3.2 Mobile Payments

There is no specific or official definition for mobile payments services due to the constant evolution in technology and changes around it. Also, the concept may change and vary from place to place depending on geographic location or cultural approaches. Regardless this, the most approximate and common definition to mobile payments is the one given by (Karnouskos & Fokus, 2004):

"Any payment where a mobile device is used in order to initiate, activate, and/or confirm this payment can be considered a mobile payment"

Contrary to the common idea, mobile payments are not restricted to mobile phones; they might also be executed via other mobile devices such as tablets, PDAs or so. Yet, the concept and its progress have always been more related to transactions and operations made via mobile phones, PDAs (smart phone) or tablets. All of them devices are capable to connect to a mobile telecommunication network (Carr, 2008).

Figure 7: Mobile Money or Mobile Wallet illustration[19]

[19] This figure represents the concept of both mobile money and mobile wallet, the integration of the mobile device with the money. The representation source is http://blog.gopayment.com/.

3.2.1 Types of Mobile Payments

There are two categories to classify this kind of services, and this is done depending on the client's closeness to the recipient and the type of payment is attempting to execute. Below the two classifications are presented and explain[20]:

- ✓ ***Remote Payments:*** this operation involves sending a payment to a distant receiver. They can be made anytime and anywhere with no need of a point-of-sale (POS) terminal. There is no need for the parties involved to be in the same place.

- ✓ ***Proximity Payments:*** in the case of this schema, the payment operation is doing on an in-person base. The payee obtains remote or digital information from the payer to execute the payment. In this scenario, both sides of the transaction have to be in the same place. This type of payment is being currently developed and standardized with different kind of technologies and is used mainly in a person-to-business (P2B)[21] scheme.

With the intention to provide a better explanation of the type of services that can be offered by each of these types of payments, the following table summarizes it:

	Remote Payments	Proximity Payments
Mobile Payments	P2P Remittances Bill payments Salary payments Payment of digital goods and services	In-store payments - point-of-sale (POS) Transportation or others Vending machines Mobile POS (mPOS)
Mobile Banking	Airtime top-up General banking services - Balance, transaction history - Fund transfer between accounts - ATM Locator	Cash-out/ATM Payments

Mobile Payments User

Table 3: Types and Services for Mobile Payments[22]

[20] Definitions based on information given in (Horne, et al., 2014).
[21] There are already some person-to-person (P2P) implementations for proximity payments but they are still limited and not widely spread (Taga & Oswald, 2009).
[22] Table and data based in illustration presented in (Horne, et al., 2014).

3.2.2 Technologies

As mentioned, there are different kinds of implementations of mobile payment services. Depending of their target market and the type of payment, different technologies can be used to provide the necessary platform. Several of them have proved to fulfill the requirements and be reliable enough to support payment transactions. Even though there are many technologies being implemented and some others under experimentation, in this document the most relevant and well-established will be presented[23].

Technologies for Remote M-Payments

SMS: this technology is one of the most simple and used due to its simplicity, easy access in any mobile phone (no need of smart phones), and general good knowledge of the consumers to use it. Relying on short message services (SMS), also known as text messages, it is available in any carrier and the price rates are very low. Nonetheless its speed and not strong encryption might represent some problems.

In order to use this technology the purchaser sends an SMS to the provider, then the mobile payment service provider (MPSP) processes the transaction and once it is done, a confirmation message is sent back to the seller. This kind of technology is quite common in developing countries were the mobile penetration is high but not the smart phone penetration, therefore, the users need a simple and easily available platform to use.

USSD: method based on Unstructured Supplementary Service Data (USSD), which is very similar to the SMS but provides a more reliable connection and real-time session to achieve more responsiveness. The operation mode is also the same, but provides makes the transaction quicker.

[23] All definitions and explanations were based and rewritten by the author by combining information from (Becker, 2007) and (Horne, et al., 2014).

WAP: users initiate remote mobile payments with Wireless Application Protocol (WAP)[24], which uses wireless communication to access information, mainly from the Internet through the mobile device. Payments are done directly from a browser or application and the purchase is made directly from the provider website by downloading different kind of commodities.

These purchases are comparable to the traditional ones done via a web browser, which makes the user very familiar with its functioning. Even so, it requires a smart phone and a reliable data connection.

Technologies for Proximity M-Payments

NFC: similar to the concept of contactless plastic cards, by using the Near Field Communication technology the user needs to interact with a POS terminal in order to exchange payment information stored on the mobile device which should be wave or tap in front of the terminal.

Even though this is a practical and innovative solution, it involves a significant number of players in the payment process which makes the value chain more complex. On one side the merchants need to install NFC-capable readers at their POS terminals. Handset manufactures should offer NFC capability and subsequently, such smart phones should be in the catalog of wireless carriers. This makes it a very high promising technology; however, its penetration is not high yet.

QR Codes: they represent the evolution of 1D barcodes, containing more meaningful information right into the code. Its fully name is Quick-Response Code (QR Code), which basically transfers information via the barcode into the smart phone, once this is read by the camera and/or some POS implementations.

Following this model, the user can retrieve the purchase information from the merchant and proceed to execute the payment via the mobile device. Also, it can be done all the way around, when the merchant reads the payment information from the user's phone through special QR-enabled POS.

[24] This concept is better known nowadays, or related with, Mobile Internet.

3.2.3 Players Involved

As it was previously mentioned, there are several players involved in the mobile business networks. The particular characteristics of this payment method gives the chance to different actors to interact with the final user, create new solutions or work with other industries in order to increase revenues and to provide integrated products, to get new clients and to develop business models. All these players act as a market facilitator, but their role might change depending on the market's unique features and/or regulatory laws that might be oriented to endorse the participation of specific players or combinations.

The following actors (Mobile Network Operators, Financial Institutions, Merchants, Independent Payment Service Providers, Suppliers, and Regulation Authorities) are considered the six main players within the mobile payments context (Taga & Oswald, 2009). They will be the leading business actors for the technology's development and future.

Mobile Network Operators

Their role may change according to the specific market conditions and culture. In relation to this, they might offer different kinds of m-payment solutions or technologies related to the market's demand and necessities. Furthermore, they have a key position being in the direct contact to the client in terms of mobile devices, and authorization and access to the broadband network, which will eventually allow the consumer to execute m-payments.

Besides facilitators, in some cases they act as full service providers[25]. In some particular cases like Japan and Austria (Taga & Oswald, 2009), they have a bigger role by acquiring existing or creating their own financial institutions.

[25] Examples like M-Pesa, operated by Safaricom in Kenya and other African countries are an example of this model.

Financial Institutions

Regardless of frequently not being seen as the driving force of the current development of m-payments (Yurcan, 2013), they are very often involved in the operation of such systems due to their already existing relation with the clients and their financial solutions. The most common bond they have with the consumer is a bank account and/or credit/debit cards linked to it. This is how they connect traditional payment methods to m-payment solutions.

While not being current leaders in the deployment, creation or support of m-payments, the banks and financial institutions are expected to take a leader role in this domain. A role that they have due to their experience in the financial market and payment mechanisms, as well as having extensive experience in risk management, fraud mitigation, and compliance (Badi, et al., 2012).

Merchants

This player has a major role in the m-payments domain due to its direct contact with the consumers. Thus they try to improve the customer's experience and loyalty by offering new and more convenient payment methods, also sometimes driven by the demand of a certain technology or a need to reduce transaction fees (like those ligated to credit/debit card payments) (EY, 2014).

On another segment of the market, other kind of merchants such as public transportation or ticketing systems are also offering m-payments solutions, which are mostly based on contactless technology (NFC). This kind of implementation helps with the ease of use and facilitates the flow of passengers across the systems.

Independent Payment Service Providers

These providers are known as third-party solutions and are usually start-ups offering a service or a platform between the clients and their bank accounts or credit/debit cards. In some cases, they develop mobile applications to interact with

the client (either customer or merchant), as mention before, are known for leading the innovation and development of this market (Taga & Oswald, 2009).

In some markets, and depending on local regulations, these service providers are making alliances with MNOs or banks in order to reach more clients faster. Each member of the partnership is focus in the technology or service they have expertise, making it easier to focus on a single aspect of the business.

Suppliers

Being m-payments highly dependent on technology, several suppliers are involved in the equation, from global handset manufactures, to smaller but still necessary POSs terminals vendors. Whereas at the beginning they seem to be purely facilitators in mobile-based transactions, the involvement of these actors in the standardization of the industry is important for its growth and development (Horne, et al., 2014).

Many times they create partnerships among them to facilitate the acceptation process among customers or to create new demand scenarios. This can be seen in current technological trends, such as cameras, and other functionalities existing on virtually every mobile phone.

Regulation Authorities

As any payment solution, mobile payments involve financial transactions, customer privacy, risk of money laundering, transmission and/or storage of private data, and other sensitive elements. This makes regulations play a big role, existing at different levels from the international, local, or even market-focused. While demographics and socioeconomics play a key part on the take-up of m-payments, regulators often have a determinant role too (EY, 2014).

A current challenge for authorities is to define the frontiers between the competence of legislation and the competent regulatory norms, since these normally tend to overlap and confuse the service providers which are trying to have

full compliance (Martins de Almeida, 2013). The same occurs with different agencies like central banks, monetary and telecommunications authorities.

Regulations challenges are to be strong enough to protect both the customer and the market balance, but also, should function as enablers for the technology or initiative to progress. If they act other than that, MPSP mind find themselves in a tangle of policies and regulations (Horne, et al., 2014).

3.2.4 Delivery Models

With the number of players involved and the variety of solutions and models available for the deployment of m-payments, it is important to understand and recognize the multiplicity of existing delivery models. They vary according to the type of service, the way to execute the payment, and, of course, the type of players involved in the transaction.

Some of the most common delivery models (not limited to them), which have been implemented in different ways and locations are explained below (Horne, et al., 2014).

Bank-led models: it is based on an extension of already existing payment services model. It includes an issuer and an acquirer to set up the process and complete the value chain (see *Figure 8*).

Figure 8: Value Chain for Bank-led Service[26]

Operator-led models: In these kinds of models, the MNO acts, in some way, as an independent entity that offers mobile payments (see *Figure 9*). It develops, maintains, markets, and runs the necessary technology for the customers to use it. As an independent unit, MNO carries out transactions and bills the customer.

[26] Value chain design based on the model and explanation presented in (Horne, et al., 2014).

Figure 9: Value Chain for Operator-led Service[27]

Operator/financial institution collaboration: For this model, MNOs partner with financial institutions or banks, as well as credit card companies to offer payment services. As discussed before, the beneficial part of such union, is that both parts know their roles and can focus in their field of expertice.

[27] Value chain design based on the model presented in (Horne, et al., 2014).

4. WHY REGULATIONS?

4.1 Regulatory Environment

The old premise of a mobile payment as a growing industry has started to become real, and the evidence of this is the number of implementations and research around the topic during the last decade or so. The number of solution's launches is accelerating and new and more sophisticated technologies are supporting the growing number of transactions. However, many m-payments services have struggled to meet expectations, creating questions about business models and the necessary tools that may be required for a larger scale implementation.

This creates the need to define and understand the most critical parameters that have an impact on mobile payments. Here, the four most relevant among them are presented (International Finance Corporation, 2011):

- ✓ *Regulation*.
- ✓ *Existing Financial Access*.
- ✓ *Current M-market Situation*[28].
- ✓ *User Perceptions*.

Regulations as one of the critical parameters to impact m-payments, give to the authorities the task to understand the challenges facing by the industry, and what are the key points where regulators might help. Also, they should be aware that many complicated rules may create barriers and confuse the industry. On the other side, a lack of clear or imprecise regulations may create a bigger harm to its development and future.

4.2 General Aims

Both policy makers and regulators should balance two related but broad aims regarding mobile payment services (Horne, et al., 2014). Each one of them is important and therefore the attention and devotion put into their every aspect

[28] It is defined by the dominance and investment climate.

should be tremendous in order to have an integrated result. These are the two aims:

- ✓ To ensure that all financial services are well regulated to protect consumers and prevent abuses.

- ✓ To encourage the expansion and growth of services that bring significant economic progress and social benefits.

4.3 Considerations

It is a challenge *per se* to regulate an industry that is not mature enough and which is not fully covered or addressed by the current legislations. Despite this complicated picture, authorities and regulators should take the lead and confront the situation before it gets out of their control.

The first thing to have into consideration for regulators, is the market they are controlling, in this way their roles will be clear and the framework will develop towards a secure but yet enabling environment. Hence, there is a group of considerations that should be recognized and addressed (*see Table 4*).

REGULATORS	
Mobile Payments	**Considerations**
	- Markets at early stage of development
	- Differences among markets
	- Non-financial institutions taking lead on m-payment services
	- Wide variety of operation models
	- Service as a financial inclusion tool
	- Consumer expect level of protection equal to traditional services
	- Regulatory oversight might intercept
	- Roles of different regulators involved
	- Cost of compliance might be high
MARKET	

Table 4: Considerations for Mobile Payments Regulator and its Market[29]

[29] Concepts were taken and adapted from (Horne, et al., 2014).

4.4 Defining Roles & Collaboration

The nature of the mobile payments and banking solutions involves the intersection of different existing areas of regulation; such as financial services, telecommunications, information technology, and consumer protection (Horne, et al., 2014). The scope of each one of these types of areas of regulation is defined below.

- ✓ **Financial services regulation:** it covers the issuing process for accounts and/or credit/debit cards. It is normally composed by different agencies that might include a central bank, a dedicated regulatory body or separate service-focus organizations.

- ✓ **Telecommunications regulation:** covers the operation of mobile network operators, which might have different roles, from provisioning simple connectivity or even offering their own payment solution based on mobile technologies.

- ✓ **Technology regulation:** different financial transactions and services are currently supported by technology solutions, which are normally standardized and defined by industry organizations. One certification of this kind is the one defined by the Payment Card Industry in its PCI-DSS. Additionally, many financial regulators require proper industry certifications in order to use a certain technology.

- ✓ **Consumer protection:** is in charge of guarantee and provide close surveillance to the consumer's interests as well as confronting privacy and data protection issues.

Mobile payments and related services represent a challenge for all these regulatory types, since new players are involved and known players are taking new roles (non-financial institutions and MNOs). Agencies will have to work together to confront

this scenario, moreover, when new technologies are not standardized, making the regulatory job more difficult.

4.5 Regulatory Issues

The motivation behind the success or not of a new technology or service is based on the added value offered to the different players involved, and while the mobile payments industry keeps growing, new needs and issues emerge. Merchants need greater incentives, the consumers seek ease of use, and service providers pursue new ways to generate revenues and know their clients.

Taking into account all these requirements and demands from different sides of the spectrum, the long-term success of mobile payments technologies and solutions require regulatory certainty. Still, this roadmap is not easy to follow or design, moreover when the financial crisis drove the banking regulatory bodies to mainly seek stability and they might seem reluctant to the openness of a regulatory framework for new services (EY, 2011).

In this context, regulatory issues are expected to become complex. From different perspectives and angles issues arise, involving the status of non-banking institutions, interoperability, and consumer protection security (see *Figure 10*).

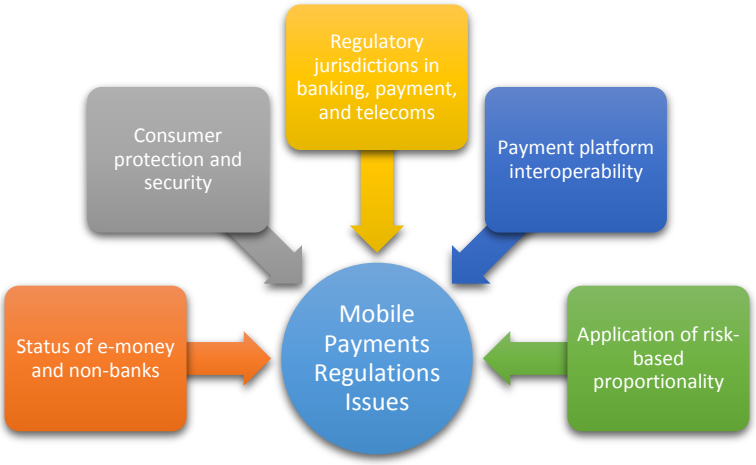

Figure 10: Regulatory Issues in Mobile Payments[30]

[30] Information and figure based on information from (EY, 2011).

4.6 Regulations Influence in M-Payments Development

It has been clearly defined how regulations play a major role in the whole development of the mobile payments industry. That is why it is vital that policy makers and involved agencies create an enabling environment (see *Figure 11*), able to offer the necessary controls and, at the same time, promote good conditions for the market to be established and subsequently evolved into a mature industry.

Figure 11: Key Enablers for the Delivery of Mobile Payments[31]

Seeing the importance to reach these conditions, it is very important to define the needed circumstances to have an enabling environment. Such settings are those that promote a sustainable route of market development, while at the same time endorse socially desirable outcomes (Porteous, 2006). This is achieved due to macro-political and economic forces, as well as specific policy and laws.

While having an enabler environment is the ultimate goal for regulators, also they have to understand the dynamic nature of a market development and how the need or risk of having appropriate regulations changes as a market develops. Unnecessary policies at an early stage may go against the current situation of the

[31] Concept and figure based on the information of (EY, 2009).

market, on the other hand lack of essential regulations at the right time, might harm the future of the industry. This can be depicted in the classical s-shaped market development trajectory (see *Figure 12*).

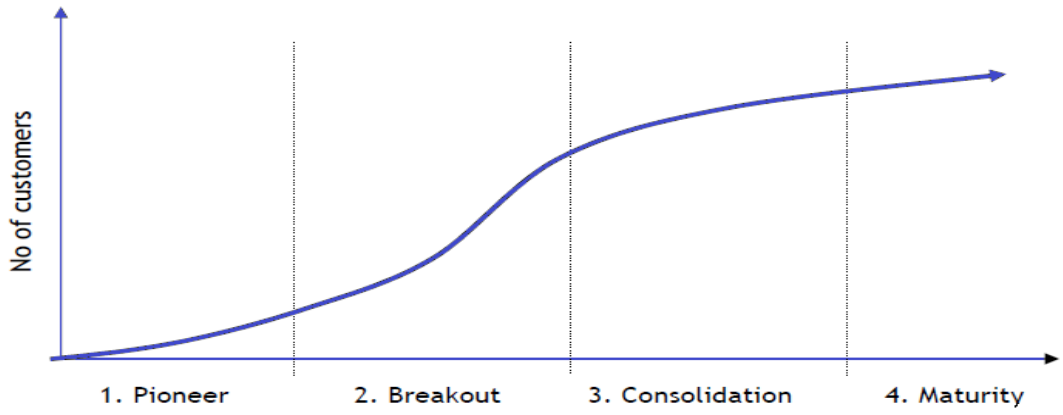

Figure 12: Stages of Market Development[32]

Each of the these stages represent a different posture for the regulation authorities, finding different type of challenges and problems alongside while the industry keeps growing and getting more mature.

Pioneer phase: early entrants are launching and testing out their products to find initial success. Here regulators will have to offer a balance where rules are not very strict to close doors to new players, but at the same time offer enough security for users to be protected.

Breakout phase: some success has been reached by entrants, new firms admission expands the market. In this case regulators should keep a close look to the development of the market.

Consolidation phase: due to the increase in competition and external factors, the company reaches more maturity and the customer base keeps growing but at a slower pace. With consolidation, regulations refine according to the market will be needed.

[32] Concept and graphic based on the information presented in (Porteous, 2006).

Maturity phase: the number of firms in the industry and their rules have been settled, the market grows at a steady pace. Regulators will have to maintain security on the market.

4.6.1 Regulations as Enablers

There are several examples around the world from different markets and cultures where mobile payments deployments have seen a reasonable success, as a result, of an enabling environment for their development. A good example of such markets and scenarios is Japan.

The Japanese case: This country is considered the most successful developed country using mobile money (International Finance Corporation, 2011). Here dominant players from different industries such as a MNO, a NFC technology company, a credit card company, and public transport company, are working all together. Furthermore, the regulatory situation did not hinder the industry, since the government fully supports m-payments and owns 63% of the biggest MNO (NTT DoCoMo) (International Finance Corporation, 2011).

The leading position of all these companies and the role played by the government to bring different private sector actors together, has undoubtedly helped to the establishment and development of a better and more mature mobile payment industry.

4.6.2 Regulations as Blockers

In the same way, that is possible to find successful stories where the regulatory environment has created an enabling atmosphere, there are cases where the complete opposite situation is presented. In this condition, regulators and authorities have acted as blockers and have become an obstacle for the industry and its players. An example of this is the current situation in India.

The Indian case: For the case of this country, authorities have emphasized their commitment with financial inclusion, but have pursued this goal with relatively a conservative policy (di Castri, 2013). Here regulations play a major role since the

Reserve Bank of India (RBI) has imposed a set of operating guidelines where mobile payment/banking services are limited to rupee-based services (EY, 2009). Currently, only licensed and supervised banks are eligible to provide mobile payment services, making difficult to reach the nearly 41% of unbanked population (Bank of India, 2011).

5. STUDY CASES AND REGULATORY FRAMEWORKS

5.1 United States of America

While the country has not been a leader in the development of mobile payments, the industry is taking off powered by new technologies, mobile-oriented habits of younger consumers, and entrepreneurial companies leading the market (Taga & Oswald, 2009). Yet, with a big and developed technological industry and the high penetration of smart mobile devices, the market is expected to grow significantly alongside with the transactions volume.

5.1.1 Market Overview

Although mobile payments have been functioning in other countries since early last decade, the market in the US has developed more slowly, mainly because of its lack of specific infrastructure and absence of cooperation amongst banks, MNO and merchants (Angelovska-Wilson & Feltault, 2007). This is combined with a market defined by its widespread, well-established existing financial infrastructure for classical payment methods such as debit/credit card. Moreover, the high percentage of banked population creates a market that at the moment is lacking a high demand for new payment methods (see *Table 5*).

Indicator	USA
Bank account penetration (%)	93
POS devices per million inhabitants	17 277
ATMs per million inhabitants	1 317
Payment cards per million inhabitants	6 842 448

Table 5: Financial Sector Development Indicators[33]

Despite these factors, the high technological penetration in terms of smart phones (see *Figure 13*) facilitates the access and reachability to customers interested in the use of mobile payments. Combined with the projected mobile POS payments volume (see *Figure 14*), foresee the relevance, richness, and opportunities lying on the mobile payments industry for the country. Even if the projected percentage of transactions based on m-payments does not show big

[33] Table created with data taken from appendix B of (International Finance Corporation, 2011).

growth, the volume in terms of millions of dollars is already relevant for entrepreneurs and traditional industry players. By the end of the year 2012, there were at least 40 and as many as 120 mobile wallets implementations in the United States (Stewart & Daly, 2013).

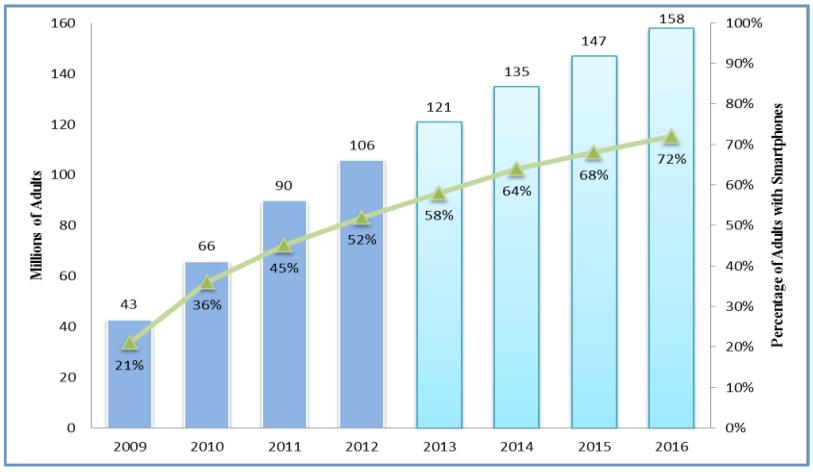

Figure 13: Adult Smartphone Adoption 2009-2016[34]

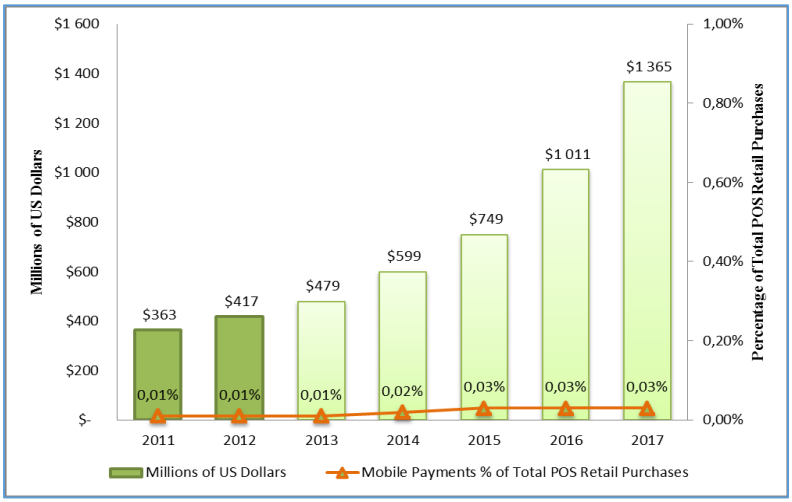

Figure 14: Mobile POS Purchase Dollar Volume 2011-2017[35]

Despite having a good technological environment and high penetration of top technologies among the society, the users seem to be reluctant to the adoption of this type of payment. Recent studies showed that the three main reasons for users

[34] Figure based in data presented in (Crowe, 2012).
[35] Figure based in data presented in (Crowe, 2012).

in the US to have decided not to use mobile payments are the following (Board of Governors of the Federal Reserve System, 2014):

- ✓ It is easier to pay with traditional payment methods[36] - **76%**,
- ✓ Concerned about security - **63%**,
- ✓ Don't see extra benefit from using mobile payments - **61%**

In addition, the actual use of mobile payments in the last year by group age shows a defined disproportionately used by younger consumers with 37% of m-payment users among them. While individuals of ages above 60 account barely a 10% of m-payment users (39 over 372) (see *Table 6*).

Age Ranges Groups	Not Using MP	Using MP	Total
18-29	19%	36%	22%
30-44	25%	33%	27%
45-59	29%	21%	27%
60+	27%	10%	24%
Responders	100%	100%	100%
	1 956	372	2 328
Combined Actual Use	Not Using MP	Using MP	Total
	84%	16%	100%

Table 6: *Use of Mobile Payments in the Last Year by Age*[37]

Although m-payments have not been a major contributor to the payments industry in the US, banks clearly anticipate their future importance. Payment services based on mobile phones instead of credit/debit cards are being tested by the Citibank (Taga & Oswald, 2009). Also independent service providers are contributing by launching different implementations and options for the consumers.

5.1.2 Regulatory Landscape

Currently, there is no governing authority or law supervising mobile payments specifically. Multiple regulatory agencies with different scopes and emphasis would

[36] Traditional payment methods are cash or credit/debit card.
[37] The table construction was based on data from (Board of Governors of the Federal Reserve System, 2014).

be involved with wireless payment transactions. A summary and overview of the most relevant agencies involved can be seen in *Figure 15*.

Due to the complexity and high number of involved entities, the picture goes beyond of those nine agencies and associations. Among other names, m-payments transactions might have to follow laws and regulatory directives of agencies such as the National Credit Union Association (NCUA), Federal Reserve Board (FRB), Financial Crimes Enforcement Network (FinCEN), Consumer Financial Protection Bureau (CFPB), Federal Financial Institutions Examination Council (FFIEC), among the most relevant.

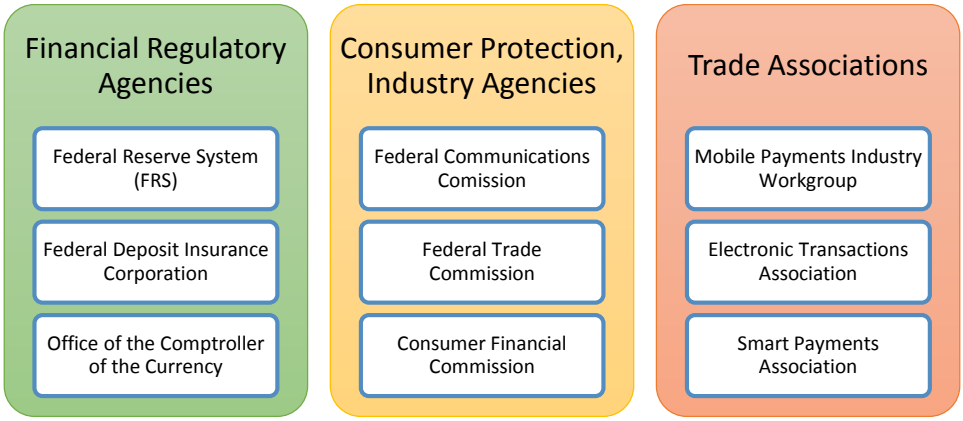

Figure 15: US Industry Entities Affecting M-Payments[38]

Each of these agencies, associations or groups, were created with the objective of deliver protection over different aspects involving the payment process or their technologies. That is why companies have to understand with which directives they must have compliance and how all of the different regulations are related and might overlapped in different ways. Likewise, it is important to recognize that the more data is collected and the more elements are involved in the money movement, the more legal rules will apply.

The unique characteristics of mobile payments services include multiple stakeholders who may not completely understand the application of existing laws and regulations. The creation of new business models among financial institutions, MNOs, and technology service providers, implies the creation of a strategy to share

[38] Figure base in data presented in (EY, 2014).

responsibilities for regulatory compliance, consumer protection, and dispute resolution.

The Federal US banking regulators (including the FRB and FinCEN) and the consumer protection regulators (including the CFP and FTC) have stated the following:

"*Regulations do not apply simply by virtue of who you are (whether a bank or non-bank), but rather apply to what you do.*"[39]

Regulators have remained silent to the applicability of regulations and laws to mobile payments, possibly because the market is still immature and yet growing. This has provoked the loss of pace from regulators in relation with current innovations, making the existing rules cover any underlying payment method. M-payments are executed similarly to traditional payments, but they are making use of a new interface, a mobile device, therefore current laws might extend to this kind of services, even if the regulators have not expressed their position on this yet (McTaggart & Freese, 2010).

Beyond having specific regulations for m-payments, a wide current framework of policies and regulations are covering this type of payments. In that direction, the consumer mobile protection will depend on the funding payment method. That is how some regulations and laws can be classified into different categories like the following[40]:

Pay now (debit)

- **Electronic Funds Transfer Act (EFTA)** and **Regulation E**; govern electronic funds transfers (EFTs) to and from a consumer's account held by a financial institution. These are transfers initiated by electronic means.
    - The Fed (Federal Reserve System) has not announced whether MPSP and MNOs are subject to these regulations.

[39] The statement was taken from (Fonté, 2013).
[40] Structure and definitions based on information from (Crowe, 2012).

Pay later (credit)

- **Truth in Lending Act (TILA)** and **Regulation Z;** govern credit card transactions. It imposes to the credit card issuer, initial disclosure requirements regarding charges and billing rights.
    - Regulation Z will likely apply when the card is linked to a mobile phone.
    - Both the Fed and the PSP have shown to be excluded from Regulation Z; however neither has made an official statement.

Pay in advance (prepaid)

- **Credit Card Accountability Responsibility and Disclosure Act (Credit CARD Act);** reform legislation to establish fair and transparent practices related to credit under an open plan and other purposes**.**
    - It is not clearly stated if m-payments are subject to this act, however services involving holding funds for future purchases may have to comply with the law.

Other regulations that may impact m-payments[41]

- **Uniform Commercial Code (UCC) Article 4A;** governs B2B wire transfers and Automated Clearing House (ACH)[42] payments**.**
    - Neither the Uniform Law Commission (ULC) nor the American Law Institute (ALI) stated if the regulation applies to wire transactions executed from a mobile device.

- **Gramm-Leach-Bliley Act (GLBA);** protects the customer's private information from being disclose without authorization by the financial institution.

[41] Definitions and concepts were taken from both (McTaggart & Freese, 2010) and (Fonté, 2013).
[42] It is an electronic network for financial transactions in the US.

- The Fed and the congress have not discussed the connection of GLB with mobile payments. In any case, banks are always subject to this law due to their role within the payment chain.

- **The United and Strengthening America by Providing Appropriate Tools Required to Intercept and Obstruct Terrorism (USA PATRIOT Act);** imposes various requirements to financial institutions to prevent terrorist from accessing financing. This includes the process known as Know Your Customer (KYC), which is used to verify the customer's identity. This Act made the KYC mandatory for all US banks, along with the Customer Identification Program (CIP) that should be developed within the financial institution.

- **Dodd-Frank Wall Street Reform and Consumer Protection Act;** brought significant changes to financial regulation after the global economic crisis of 2009. It aims to provide systemic risk reduction and control.

- **Bank Secrecy Act/Anti-Money Laundering (BSA/AML);** requires financial institutions to assist government agencies to prevent money laundering by keeping records and file reports.
  - Financial institutions should consider updated their AML policies to cover m-payments.

- **Children's Online Privacy Protection Act (COPPA);** protects minors under 13 from unauthorized information collection. Also, the operator must include privacy policy indicating how and when seek parent's consent.

General Conclusion

The Federal and State Regulators and the MPIW have agreed that the existing regulatory framework provides sufficient governance for the existing m-payment services. Nonetheless, regulatory representatives acknowledged that future guidance should be more specific about the mobile concept. Lastly, and as a

conclusion, neither agencies nor industry stakeholders see any action needed for additional legal regulation (Crowe, et al., 2012).

5.2 European Union (EU)

The European Union is a very particular region, its unique characteristic uniting 28 member states into one economic and political area brings a lot of challenges in terms of regulations. As it is understandable, the market and economic situation of each of the member states is different, and cultural reasons, as well as local regulations, offer a very complex market to analyze.

The creation of independent institutions within the union, such as the European Commission (EC) and the European Central Bank (ECB), has brought together experts and opinions from all the member states. The situation has undoubtedly helped to create robust, secure, and thoroughly discussed regulatory framework for payments around all the European market.

5.2.1 Market Overview

The union of 28 different states brings to analysis a non-homogenous geographical area, with diverse population sizes, technology and Internet penetration, and markets with players and economies of diverse characteristics. This situation makes opportunities for the mobile payments industry vary significantly from country to country. Nevertheless, there are key indicators to understand the current situation of m-payments in the region, and which kind of future is ahead.

Being one of the most successful mobile industries around the world, Europe has shown its strength for innovation and the development of new services. With four out of five individuals having a mobile subscription (The Boston Consulting Group, 2013), Europe keeps showing leadership in terms of subscription penetration. Nonetheless, there are still significant variations among some countries, although those differences have narrowed down over recent years, the gap is still there and

keeps representing a constant challenge for the European Union organizations and agencies.

A clear example of this situation can be appreciated by comparing the penetration rate for each member state and the region's total (see *Figure 16*). Here big differences among countries as Slovenia, with 102% penetration rate and Finland with 180%, mark the tendency of a very diverse market. Additionally, sub-regions show a more homogeneous behavior, as it can be seen Nordic countries like Sweden, Denmark, and Finland, are leading the way.

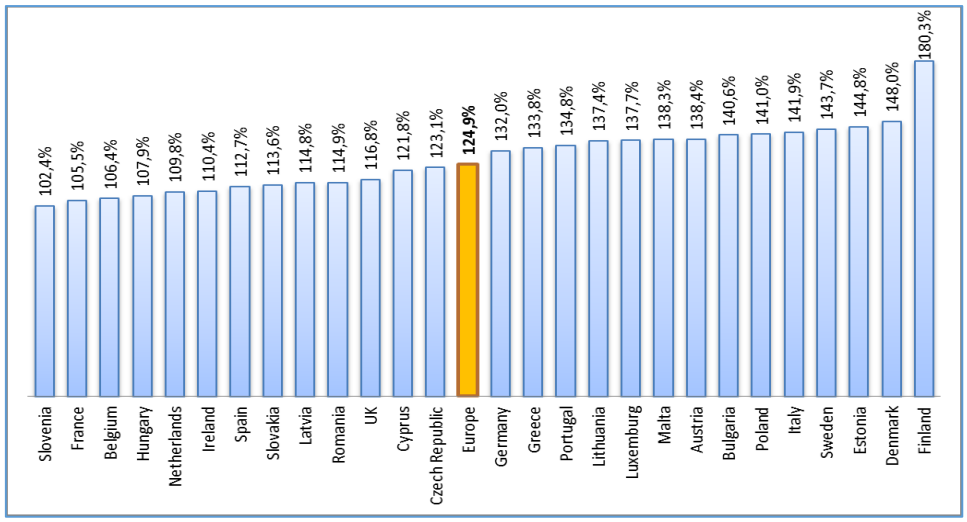

Figure 16: Active SIM Penetration by Country[43]

Another factor, besides the mobile penetration for the successful deployment of mobile payments in a develop area like the European Union, is the good and reliable access to a Mobile Broadband (MBB) subscription. This indicator shows a projected growth of over a 100% in a time span of 5 years (see *Figure 17*).

[43] Numbers and figure based on information presented in (The Boston Consulting Group, 2013).

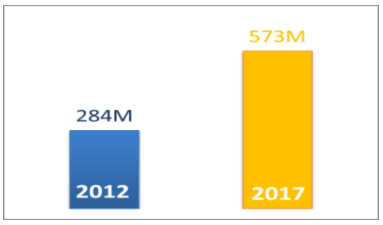

Figure 17: Number of MBB Connections in Europe[44]

As a remaining challenge, the scattered heterogeneousness of the region continues to be a factor also with this indicator. Leader countries like Sweden have more than twice penetration than the whole region average (see *Figure 18*).

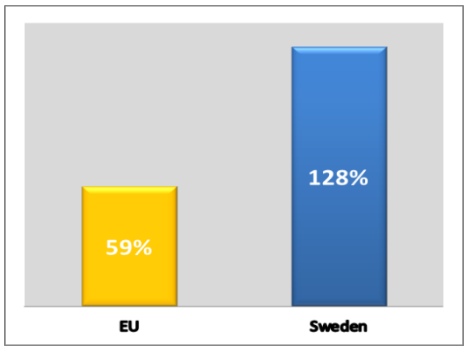

Figure 18: MBB Penetration[45]

Having all these factors combined and a global growing industry, mobile payments in Europe show a significant growing in terms of transactions and the amount of money they process (see *Figure 19*). Moreover, when projected mobile payment transactions in Europe show an average evolution of over 115% per year (Horne, et al., 2014).

[44] Figure and data based on information presented in (The Boston Consulting Group, 2013).
[45] Numbers and figure based on information presented in (The Boston Consulting Group, 2013).

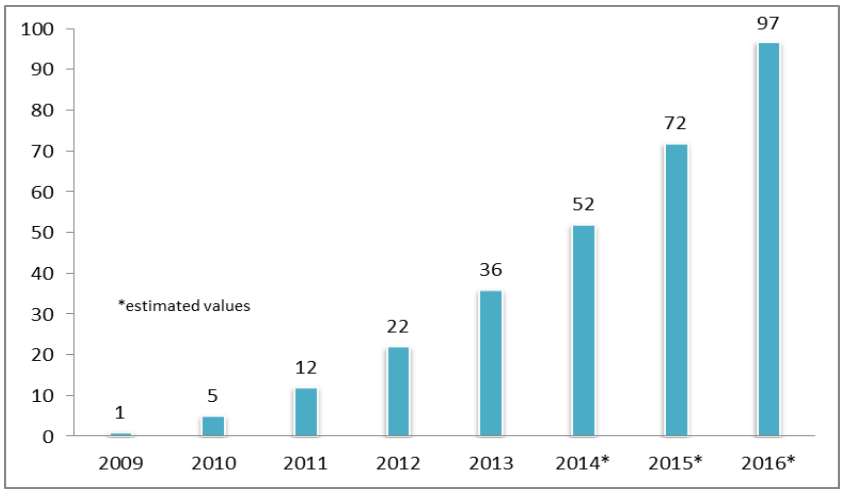

Figure 19: Mobile Payment Transactions 2009-2016 (USD Billions)[46]

5.2.2 Regulatory Landscape

The European Union has a particular concept of mobility that goes beyond the technological aspect, involving individuals and services. Hence the EU is a borderless region where its citizens can move freely among the member's territories, and seamlessly use services from different industries and domains.

An important feature for this region is the effort to harmonize the market. The introduction of the common regional currency, the Euro (€), in 2002, dissolved one of the biggest problems to confront in terms of unity. Yet, not all the members of the union have enter the Eurozone, so special schemas are still needed with those countries.

In the same direction, the European Commission has created the Payment Service Directive (PSD), which was established to deliver a single context for payment standards and obligations, leading to the creation of the Single European Payments Area (SEPA) (EY, 2011). Together with the E-Money Directive of 2009 they have created a set of regulations and guidelines for payment services inside the European Union territory.

[46] Figure created based on data presented in (Horne, et al., 2014).

In terms of regulations for mobile payments, there are not specific sets of rules or policies for them. However, the existing framework is pervasive and deeply layered (Kemp, 2013). Besides, each country has its own legal and regulatory environment, that it should follow the directives from the EC, but can add additional set of rules or interpret in a different way the mandatory guidelines from the EU.

General Directives Covering M-Payments in the EU

- **Single Euro Payment Area (SEPA);** regulation adopted in 2012 (EC 260/2012), aims to create a single market for the European retail payments market. Starting the 1st February 2014, all credit transfers and direct debits using Euro as currency will be made under the same format[47]. Once the SEPA is completely established, cross-border euro payments will have no distinction in any member state.
    - **eSEPA;** within the regulation the EC has defined an innovation chapter covering the most relevant types of retail payment that should be integrated with the general SEPA but are still considered under development. Some of them are e-mandates, online e-payments, e-invoicing, and mobile payments[48].

- **Directive on Payment Services (PSD);** it provides the legal foundation of an EU single market for payments, including a set of rules applicable to all kind of payment services in the European Union. Its main objective is to make cross-border payments easy, efficient, and secure. To conclude it aims to promote competition and the creation of new players offering better services and ultimately cost-reduction.
    - It acts like the legal support for the SEPA.

[47] Information summarized and retrieved from the official European Commission portal for the SEPA - http://ec.europa.eu/internal_market/payments/sepa/index_en.htm.
[48] Information summarized and retrieved from the official European Central Bank (ECB) portal for the eSEPA - http://www.ecb.europa.eu/paym/sepa/innovation/html/index.en.html.

- In July 2013, the EC released a proposal for the PSD II (see *Table7*) which offers a revised version and includes the separate regulation on **Multilateral Interchange Fees (MIFs)**[49]**.**

- **E-Money Directive (EMD);** released on 2009 under (2009/110/EC), it aims to benefit consumers and businesses within the European market. Its objectives are to enable new, secure, and innovative electronic money services, open the market to new companies, and promote effective competition[50].
  - The directive focuses on modernizing rules on electronic money, as well as help payment institutions with the requirements of the PSD.

[49] The MIFs are charges paid by the retailer to the issuer of a credit/debit card when an electronic transaction is executed. It is designed to share the costs of processing the transaction (EurActiv, 2013).

[50] Information summarized and retrieved from the official European Commission portal for the SEPA - http://ec.europa.eu/internal_market/payments/emoney/index_en.htm.

Date	Milestone
dec-05	EC proposal on a PSD
nov-07	Adoption and publication of the PSD in the EU Official Journal
nov-09	First deadline for the introduction of the SEPA instruments for direct debits
nov-09	First deadline for the introduction of the SEPA in EU Member States
nov-09	European Payments Council and the Mobey Forum sign an ageement to support the take-up of mobile payments
nov-09	Retailers and consumer groups give SEPA a cautious welcome
jun-10	Second deadline for implementation of the PSD in EU Member States
dec-10	Deadline for the replacement of current credit cards with SEPA-compliant cards
jul-13	Proposal for the updated PSD II

Table 7: Timeline for the PSD[51]

Additional Mobile Payments Support

- **European Commission**
  - **Card, internet and mobile payments (Green Paper);** the European Commission released this document in 2012 seeking for the views of different stakeholders with the objective to hinder obstacles towards a further market integration.
- **European Payments Council (EPC)**[52]
  - **White Paper Mobile Payments;** the document provides analysis of how different actors can evolve and subsequently interact to support the SEPA payments (European Payments Council, 2012).
    - **White Paper Mobile Wallet Payments;** it is a non-technical document to inform PSP, customers, and stakeholders involved in the payments chain value. Provides views of mobile wallets

[51] Base information and concepts were based on data from (EY, 2011), and the European Commission portal on PSD - http://ec.europa.eu/internal_market/payments/framework/index_en.htm.
[52] It was founded in 2002 as the coordination and decision making body of the European banking industry in relation with payments. - http://www.europeanpaymentscouncil.eu/index.cfm/about-epc/the-european-payments-council/

as enablers for m-payment into the SEPA (European Payments Council, 2014).

5.3 Kenya

The Kenyan market is completely different to the ones presented above, by being a developing country, Kenya's social, cultural, and economic characteristics are unique. The role of mobile payments has not taken a technological or innovative approach; instead it has been used to reach those who did not have an efficient, secure, and cheap way to transfer money without being enrolled with a banking institution.

The success of mobile money services and in particular of M-Pesa in the country was brought by a combination of factors and players that used the service as a tool. By creating a profitable business that provides a major social benefit to the population, which is in its majority unbanked.

5.3.1 Market Overview

The history of mobile payments in Kenya is unquestionably related to the appearance and posterior success of M-Pesa. However, it is essential to understand the market's characteristics that made this initiative grow to reach millions of users and billions of transactions across the country.

By the year 2006 barely 19% of Kenya's population was using formal financial services; another 8% semi-formal, 35% informal, and 38% were completely unbanked (see *Figure 20*). These are the definitions of formality for this market[53]:

- **Formal:** regulated banks.
- **Semi-formal:** Savings and Credit Co-operatives (SACCO) and Microfinance Institution (MFI).

[53] Definitions were taken from the data presented in (FSD Kenya, 2009).

- **Informal:** Accumulating Savings and Credit Association (ASCA) and Rotating Savings and Credit Association (ROSCA).
- **Unbanked:** nonuse of any formal or informal financial products.

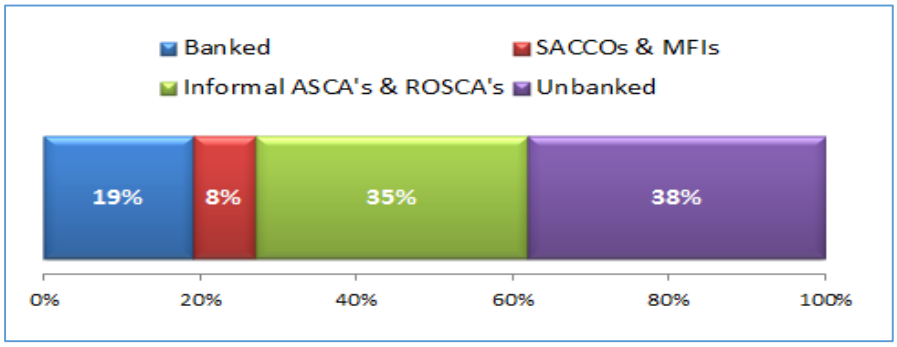

Figure 20: Financial Access in 2006[54]

M-Pesa

It is Mobile payment service that started its operations in 2007 through a joint venture between MNOs, *Safaricom* (Kenya) and Vodafone (UK). It is using a schema where the user should open an account with the MNO and consequently use it to transfer funds. Connections, money withdrawals and deposits, are done through a network of agents (usually stores) (Sveriges Riksbank, 2013). By the year 2010, after three years of formal operation, M-Pesa alone had nearly 40% of the money transfer market in the country (see *Figure 21*).

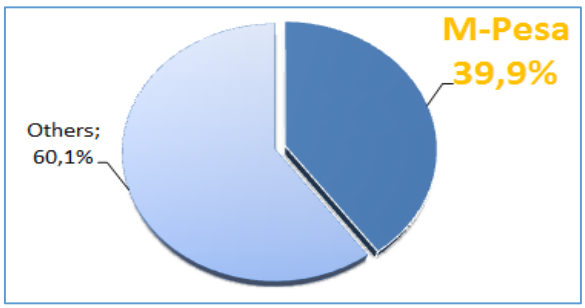

Figure 21: Means of Money Transfer 2010[55]

[54] Figure created with data presented in (di Castri & Gidvani, 2013).
[55] Figure created with data presented in (di Castri & Gidvani, 2013).

Since the starting of M-Pesa and later success, the mobile payments industry has taken a major role in the economy and society of the country. Reaching high volumes of transactions and penetration throughout the country (see *Table 8*).

Kenyan Market Quick Facts	
Metric	**Kenya**
Mobile Money Users	23 018 500
74% of Adult Population	
Average value of transaction	29,3USD
Kenyan GDP transacted via mobile money services	31%
Monthly mobile money transactions value	1,622bn USD
Total Transactions	56 000 000
Agents	96 319

Table 8: Key Metrics for Mobile Money in Kenya[56]

5.3.2 Regulatory Landscape

Having a tight regulation on banks, no financial institution had attempted to enter the mobile money business, but *Safaricom* as a non-bank, created *M-Pesa* and with a complete lack of regulations on the subject took control over an unattended market.

By the end of year 2008, the Kenyan Ministry of Finance requested an immediate risk assessment audit of the service by the Central Bank of Kenya (CBK). With the study, the CBK determined if there was risk on the operation and how *M-Pesa* fitted in the existing regulatory framework. Here the most important conclusions and findings of the whole process are presented in order to understand how the regulatory framework worked and how evolved alongside the service[57].

M-Pesa, the CBK and Regulations

With the increasing growth of *M-Pesa*, the political establishments in Kenya started to make questions about the risks and implications of an unregulated

[56] The table was created based in data and labels from (di Castri & Gidvani, 2013) and (International Finance Corporation, 2011).
[57] The dates, information, and facts were summarized and taken from the Study Case made by (Alliance for Financial Inclusion, 2010).

money transfer service getting popular in the country. With banks leading the objections, parts of the society were arguing that *Safaricom* was offering banking services without a proper license. Additionally, the second largest MNO of the country, *Zain*, claimed that the CBK was giving special treatment to *Safaricom* due to its dominant position.

2006
- Safaricom approaches the CBK regarding M-Pesa. - CBK requests further supporting information. - CBK receives risk mitigation plan.
2007
-After evaluation, CBK determines that M-Pesa is not in the banking business. - CBK issues the legal permission to Safariom and M-Pesa. - Safaricom briefs CBK regarding international transfers.
2008
- Minister of Finance calls M-Pesa for audit.
2009
- CBK adopts guidelines on Agent Banking, following amendments to Banking Act which permitted third parties to provide services on behalf of banks.
2011
- Landmark National Payment System Bill grants CBK power to oversight payment systems.
2013
- Government introduces 10% tax on money transfer services, M-Pesa charges raises proportionally. - CBK holds public consultation on a) Electronic Money Regulations; b) Regulation for provision of electronic retail transfers; c) Anti-Money Laundering guidelines for mobile payment services.

Table 9: Regulations Timeline for Mobile Payment Services in Kenya

Before allowing the business to grow and to establish, the CBK performed a number of actions before taking a position towards *M-Pesa*. The first action was to ask legal opinion from the CBK's legal counsel. Secondly, they hired an external operational risk audit, and, lastly, they conducted a major survey of more than 3.000 *M-Pesa* customers[58]. Additionally to the CBK steps, *Safaricom* put significant effort to self-regulate its service. Regardless of this, the regulation of non-bank payment systems remained unclear.

The CBK team isolated a number of areas of potential concern and came to the following conclusions:

Legal status: the main concern on this matter was to define if *M-Pesa* was in fact a banking business or not. For this the CBK used its legal counsel to interpret the Banking Act and determine if *M-Pesa* was conducting banking businesses. As a

[58] None of these results were publicly released (Alliance for Financial Inclusion, 2010).

conclusion there were three reasons to define their business as a non-banking one. A) There is no credit risk for either the client or the PSP; B) The customer funds are not used to pursuit business or interest income; C) The is no interest paid on customer deposit.

Money Laundering: as one of the biggest risks associated with this mobile money service, the CBK hired the private IT consultancy company *Consult Hyperion* to perform an audit and confirm that M-Pesa complied with AML standards of the Kenyan legislation and the Financial Action Task Force (FATF)[59]. As a result the risk mitigation offered by *Safaricom* gave proof to the CBK that the customers are protected.

Operational Risk: the authorities were concerned about the robustness of their operations capacity and the pertinent controls to support it. For that reason the technology consultancy firm *Consult Hyperion* was hired again to perform a second audit on *M-Pesa*. They tested such elements as encryption, SIM card's functionality, management of confidential customer data, hardware security, and backups. Making it sure that it was possible to have records and monitor every transaction for eventual requests from the CBK. In conclusion, *M-Pesa* pasted all the controls and proved that it has capacity to handle the demand and the controls imposed by the authorities.

Regulation Summary

The particular case of Kenya shows how a market with such a specific necessity like reaching the big unbanked population, had a flexible and enabling position in terms of its regulatory framework. This allowed the entrance to the market to new players, giving them the legal permission to offer an unknown service, representing a huge challenge to the authorities due to their own lack of legislation. Combining the innovation of the private sector (*Safaricom* and *Vodafone*) together with the public interest, the CBK took reactive position by waiting the unregulated service to

[59] It is an intergovernmental organization developing policies to combat money laundering and terrorism financing.

hit the market, and consequently, to create the controls and to offer security to the customers.

5.4 Philippines

This country has another successful story of mobile payment implementation in a developing economy. Factors like a high number of unbanked population combined with high penetration of mobile phones, marked the favorable conditions to allow the entrance of two big players offering mobile money services.

Interesting facts like business models combining non-banks players like MNOs, and partnerships involving well-established and known banks, provides a market with new characteristics and challenges for regulators. That is how authorities have enabled a good environment helping success the mobile money with progressive regulations.

5.4.1 Market Overview

Before performing the analysis of the two mobile money services running in the Philippines, important market aspects are presented and explained in relation with the successful entrance of a new service to the market. In that direction, the first relevant aspect to comprehend is the significant growth in the mobile penetration. Since year 2000, the Philippines have showed a growth from 3% to 68% in year 2009 (Leishman, 2009).

On another hand, the access to financial services is limited and only 31% (see *Figure 22*) of the population (42.1 million in 2009) is banked, leaving an important fragment of the country unbanked and with the clear evidence of need and demand to cover.

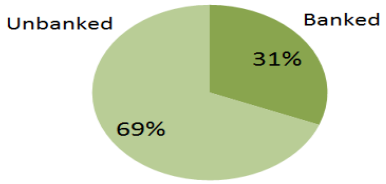

Figure 22: Banking in the Philippines[60]

If both statistics on mobile penetration and unbanked population are combined, it is possible to locate the unattended market (see *Figure 23*) that the MPSPs identified. This is how, together with regulations and an enabling environment, mobile payment services were successfully deployed and have put the Philippines as world leader in mobile money.

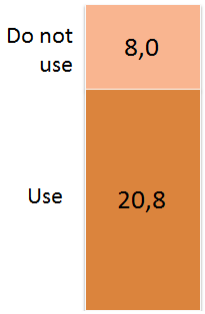

Figure 23: Mobile Phone use among Unbanked (millions)[61]

Mobile Payments Services Recap

The first player to enter the market was MNO *Smart*[62], which together with the bank *Banco de Oro* (BDO)[63], the largest bank in the country, created *Smart Money* in 2001 (Leishman, 2009). The service offers transactional financial services through SMS, allowing the users to send and receive money both locally and internationally via mobile phones. Its model is more bank-oriented than MNO-oriented since the bank is responsible for the accounts security, audit and fraud management (Taga & Oswald, 2009).

By year 2004 a similar service was launched by the MNO *Globe*[64]. Its mobile payment service called *GCash* offers alike services based on mobile phones transactions, with the big difference that the model is MNO-oriented. As a

[60] Figure based on data presented in (Beshouri & Gravråk, 2010).
[61] Figure based on data presented in (Beshouri & Gravråk, 2010).

consequence and by not having a bank involved, *Globe* has to be in charge of fraud management and every legal aspect of its service (Taga & Oswald, 2009).

5.4.2 Regulatory Landscape

The market conditions in the Philippines offered without a doubt a great opportunity for mobile payments services. But its success would not have been possible without the cooperation and key decisions made by all players involved, including banks, MNOs, and authorities, which in this case is the *Bangko Sentral ng Pilipinas* (BSP)[65].

A number of crucial elements had the biggest impact in the design and subsequent success of a mobile payment operation involving many actors. From the inter-organization cooperation of many industries, to the government interest of provide the society with a highly needed service, these are those factors (Leishman, 2009):

- Creation of regulations conducive to mobile money
- Effective service design
- Alignment of interests within an ecosystem

The initial regulatory openness allowed the two major MNOs to start their particular m-payment models and services. With no specific regulation to prohibit any of the players to start their services, the central bank recognized a significant opportunity to create a regulatory framework allowing MNO-based services compete with banks (di Castri, 2013). The growing competition and variety of services brought a substantial reduction in remittances fees, something vital for the country's economy where the remittances are equivalent to 10% (over 14 billion USD) of the Philippines' GDP (Choi, et al., 2007).

The BSP has used the "test and learn" approach to design regulations on mobile payment services, by giving a letter of no objection to operators for their proposed model and a pilot operation. Risks and benefits are discussed and after a test

[62] Smart Communications - www.smart.com.ph
[63] Banco de Oro - www.bdo.com.ph
[64] Globe - www.globe.com.ph
[65] Central Bank of the Philippines - www.bsp.gov.ph

period, regulations are passed after it, once they know how the market is developing (Leishman, 2009). Among different risks associated with financial services, the regulators in the Philippines have also address KYC issues as well as AML precautions.

5.5 Payment Card Industry (PCI)

5.5.1 PCI-SSC and PCI-DSS Overview

The *Payment Card Industry Security Standards Council* was launched in the year 2006 as an open global forum initiative of the five founding payment brands. American Express, Discover Financial Services, JCB International, MasterCard, and Visa, along with strategic partners, share equality in the council's governance and inputs into the security standard[66].

Figure 24: The 5 Founding Global Payment Cards

The council is in charge of the development, management, education, and awareness of the Security Standards. All these standards include the *PCI Data Security Standard (PCI DSS), Payment Application Data Security Standard (PA-DSS)*, and the *PIN Transaction Security (PTS)* requirements. Each of the standards addresses different aspects of transaction involving credit or debit cards, a brief explanation of the scope and purpose of each standard is given below:

[66] Information taken from the "About Us" page of the PCI SSC - https://www.pcisecuritystandards.org/organization_info/index.php

PCI-DSS: it is the council's main standard, developed to encourage and to enhance the cardholder data security and to facilitate the broad adoption of consistent data security measures globally (PCI Security Standards Council, 2013). It applies to all entities involved in all card processing (merchants, acquirers, issuers, and service providers). It consists in 12 requirements/controls that should be passed to achieve compliance.

PA-DSS: defines security requirements and assessment procedures for software vendors of payment applications. The compliance with PA-DSS does not make and entity PCI-DSS compliant, since PA-DSS would be into the scope of PCI-DSS if the procedures indicate its necessity (PCI Security Standards Council, 2013). All applications storing, processing, or transmitting cardholder data are in scope of the standard.

PTS: defines a set of requirements for the secure management, processing and transmission of Personal Identification Number (PIN) data during online and offline payment card transactions (PCI Security Standards Council, 2011). It includes 32 requirements presented in 7 groups or controls.

5.5.2 PCI Stand on Mobile Payments

Mobile payments are services known for having a different variety of payment mechanisms and solutions to reach different markets, customers, and service providers. One of these mechanisms is credit/debit card-linked accounts, where an existing credit or debit card is link to a mobile device and all the purchases are added to the card's statement or deducted from the debit account (Horne, et al., 2014). A mobile wallet service based in this model is *Google Wallet*[67], with the customer adding cards to its mobile phone account.

By having credit/debit card data saved and processed in the phone or in the MPSP servers, the mobile payment service would be under the scope of the PCI-DSS standard. The number of mentions and reachability of each standard regarding mobile payments is significantly low (see *Table 10*).

[67] Google Wallet service - www.google.com/wallet

Standard	Mobile Payments/Money mentions	Pages
PCI-DSS	No mentions related with mobile solutions	112
PA-DSS	No mentions related with mobile solutions	92
PTS	No mentions related with mobile solutions	86
P2PE	No mentions related with mobile solutions	211

Table 10: Mobile Payments/Money Mentions in PCI-SSC Standards

As observed in the table above, the PCI standards (including the P2PE[68] requirements), does not mention or have any specific directive for mobile payments solutions involving credit/debit cards. Fact that had made experts suggests, that a guideline like the P2PE does not cover software solutions nor mobile payments (Messner, 2011).

The banking sector have been wondering if mobile payments will pass the PCI compliance test, indicating that the current efforts to address these kinds of payments have not been enough (Adams, 2012). Furthermore when the only direct mention made by the PCI SSC to mobile payments is done in a 2-pages support document addressed to merchants[69].

Current situation and future

As it was presented, there are not clear references to mobile payments in the PCI standards documents. Additionally, and as stated the interview held with QSA consultant. The PCI Council knows about the importance and growing of mobile payments, but at the moment and while the technology is not significantly deployed, the current standards should be able to cover current implementations. This makes PCI a player not affecting significantly the current development of mobile payment as a global regulator.

[68] It is a set of requirements for solutions offering Point-to-Point Encryption; its objective is to reduce scope of the PCI DSS assessment for merchants using this kind of solutions (PCI Security Standards Council, 2013).
[69] This document is defined as "*Accepting Mobile Payments with a Smartphone or Tablet*" (PCI Security Standars Council, 2012).

6. MOBILE PAYMENTS REGULATIONS ANALYSIS AND CHALLENGES

6.1 Openness & Certainty for an Enabling Environment

When a new market is in its early stages, there are a number of factors and characteristics that will define the development trajectory it will follow. Such factors are defined by conditions giving by both the market and its regulatory authorities, which will be big influences to drive the market to grow or to hold back.

On this direction, two specific features or dimensions affecting the development course of a young market are defined below[70]:

Openness: it is related to how local policies and legal environment allow or encourage the entry of new players and models to the market. In case this condition does not exist, there will be limited room for innovation.

Certainty: it is connected to the level of certainty offer by the policy makers and regulators. How the entrance of new players will be affected by the possibility of arbitrary and sudden changes. If this condition is not meet, new entrants will be discouraged to pay the cost and risk to entry such market.

In the perfect scenario an enabling environment will be sufficiently open and at the same time offer a good level of certainly. However, in reality is difficult to find such markets, therefore a trade-off between different levels of these dimensions would give as a result a more realistic shape of a market. For example, markets with few or nonexistent regulatory laws, may be wide open for the entrance of new players, but the risk of having arbitrary changes in the law does not offer a good balance to invest in the market.

Study Cases Openness and Certainty Analysis

After the presentation of the study cases of the different geographical regions of United States of America, the European Union, Kenya, and the Philippines. The presented model will be used to locate each of these countries/regions in the logic

[70] Both definitions and model based on the information presented in (Porteous, 2006).

map and understand how the presented factors will affect the future and development of mobile payments in their environments.

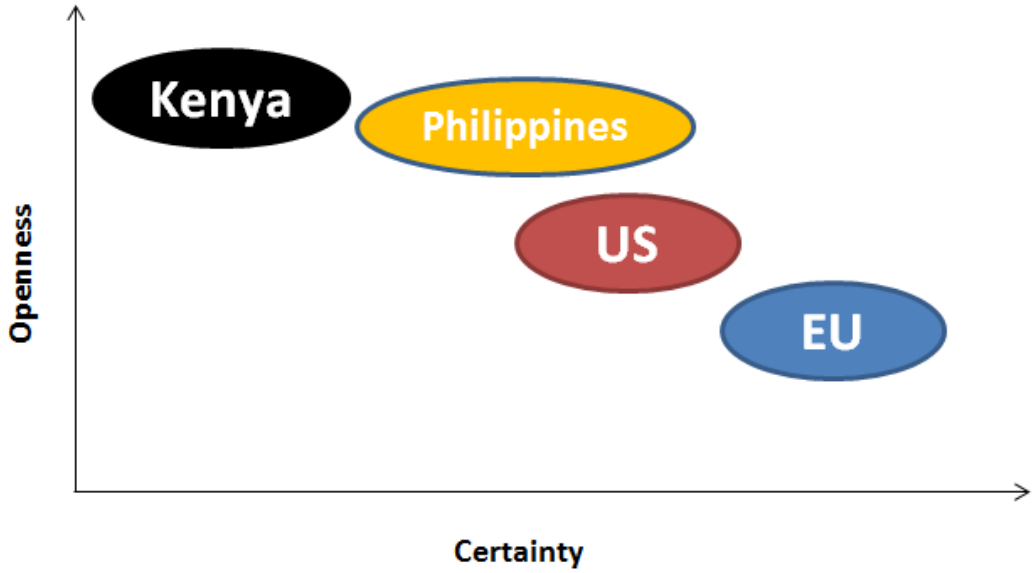

Figure 25: Enabling Environment in the US, EU, Kenya and the Philippines

United States: the regulatory framework in the US and the current development of m-payments in the country show an approach towards openness and innovation, by having a well-defined set of regulations but at the same time some freedom on e-money aspects. The good level of certainty is reached due to the quality, size, and structure of its regulatory agencies. However, the complexity of their legislation and the overlapping of federal and state laws, do not position the US at the highest level of certainty.

European Union: the European market is unique for the amount of different markets that are brought together into one legislation structure. The good legislative bodies, their organization, and directives have allowed the region to reach a high level of certainty. Nonetheless, directives like the EMD lacks openness and the amount of taken time to define a law makes many times the regulation design not go at the same pace of innovation, and, as a result, affecting the EU openness.

Kenya: there is no doubt that the main characteristic of the Kenyan market is its openness. The free entrance of a player like *M-Pesa* to an unregulated environment

brought a lot of space for innovation, creation of new services, and social welfare by the unbanked population. Even so, the immature monitoring system and a regulatory body as the CBK with lack of experience and in a reactive position towards the market behavior. It introduces a high level of uncertainty with no clear direction of how the legal spectrum might change for new players to enter.

Philippines: this country has a good trade-off between both openness and certainty. Having the main player (Smart Money) entered the market in a MNO-bank partnership, allowed the authorities to have regulatory control over the service. Furthermore, their "test-and-learn" strategy gives them the maneuverability to adapt the corresponding laws without taking away openness from the market.

The PCI Case and Influence: the Payment Card Industry was included in this work as a global player and possible influencer that might play a big role in the eventual growth and development of mobile payments. As a matter of fact the openness and certainty of a market could be driven by strong players like the PCI, however and after the findings of section 5.5, it is likely to say that currently the security standards defined by the PCI are far to be specifically intended for mobile payments. In fact, the PCI-SSC is confident that their current certification standard is able to cover the different types of payment methods, making this global player independent in terms of openness of certainty in a global context.

6.2 Trends & Differences on Study Cases

In order to find general trends and differences among the study cases presented, a number of parameters were defined and organized for each of the countries/regions studied. All of these criteria is closely related and affects directly the success of mobile payment services.

The following table (see *Table 11*) presents 6 different categories and a number of socioeconomic statistics to give a general context of each country/region. Figures like the population, Gross Domestic Product (GDP), area, and percentage of

population living in poverty conditions, draw the first differences among every market and how their mobile payment services can develop in different directions.

Guided by the numbers and the described characteristics of each of the study cases, it is possible to see how the economic development (USA and EU) influences in the maturity of regulatory agencies as well as the access to financial services. For these kinds of economies, users are more concerned about security and privacy, rather than obtain access to unreachable financial services. Additionally, mobile penetration is not a concern anymore and the increasing use of smartphones brings to the market the opportunity to offer services based on such devices.

Category	Region	Parameters				Status
		Population	GDP per Capita USD	Area (km^2)	Poverty	
Socioeconomic context	USA	318 892 103	52 800	9 161 966	15,1%	-
	EU	509 365 627	34 500	4 324 782	16,4%	-
	Kenya	45 010 056	1 800	569 140	43,4%	-
	Philippines	107 668 231	4 700	298 170	26,5%	-
Regulation	USA	Mature and big regulatory framework. Many agencies involved.				
	EU	Experienced regulatory bodies with developed policies.				
	Kenya	Unexperienced and immature regulatory bodies.				
	Philippines	Unexperienced but rather active agencies.				
Existing access to financial services	USA	Good coverage of banking and financial services throughout the country.				
	EU	Mature and advanced financial system with good access.				
	Kenya	High levels of unbanked population with no access to financial services.				
	Philippines	High levels of unbanked population with no access to financial services.				
Existing mobile market penetration	USA	Over 100% of mobile phones penetration, increasing for smartphones.				
	EU	Over 100% of mobile phones penetration, increasing for smartphones.				
	Kenya	Important growing on mobile phone penetration, low for smartphones.				
	Philippines	Important growing on mobile phone penetration, low for smartphones.				
Potential demand	USA	Good environment for new technologies but good existing financial system.				
	EU	Good environment for new technologies but good existing financial system.				
	Kenya	Opportunity to provide financial services through m-payments.				
	Philippines	Opportunity to provide financial services through m-payments.				
User perceptions	USA	Users still concerned in security and privacy issues.				
	EU	Users still concerned in security and privacy issues.				
	Kenya	Population trust their MNO and MPSP.				
	Philippines	Population trust their MNO and MPSP.				

Level	
	High
	Medium
	Low

Table 11: Parameters Affecting M-Payments - Trends and Differences[71]

From the point of view of the developing economies (Kenya and the Philippines), regulatory maturity is still an issue, and even with their agencies efforts, there is

[71] All the information of the Socioeconomic section like Population, GDP per Capita, Area, and Poverty, were taken from the *CIA World Factbook* - www.cia.gov/library/publications/the-world-factbook

still a long road ahead. Also, the high number of unbanked population combined with the fairly good, and growing, mobile phone penetration, gives the potential to new services like mobile payments to take over an unattended market. Moreover when it is in the common interest of the governments bring financial services and social welfare to the poor population.

It is fair to say that the economy and social situation of a country draws the path of development and opportunities to m-payments. The similarities between the USA and the EU on one side, and between Kenya and the Philippines on the other, confirms this theory.

Even with such noticeable differences and conclusions, it is key to draw some bridges between these, relatively, unalike worlds. A deep understanding of the diverse socio-economic and technological realities of our societies will provide us with the necessary tools to bring those two sides closer into a more developed and equal environment for the development of new technologies such as mobile payments. The experience of advance economies like the United States and the European Union can undoubtedly act like a role model to less advanced economies in terms of technology penetration, innovation, and mainly regulation approach. On the other side, the young and developing economies like the cases of Kenya and Philippines can provide practical examples of business models, human behavior, technology adoption, and demand management of a technology yet to become a big player among the payment industry.

This group of trends and differences between the analyzed markets of the presented study cases pretends to act like an enabler to help entrepreneurs, academics, and industry leaders. All these actors are already playing a vital role in the understanding and development of new technological paradigms for our societies, and in order for them to do a better work and to reach significant results. Cross-reference analysis like this one will provide them essential insights to continue their researches and recognize strategic points where this kind of trends might accelerate success in implementations and reduce common problems.

6.3 Factors behind M-Payments According to Market Type

Continuing with the study of factors related to the market type and how they influence mobile payments, this section uses the elements and information gather in Chapter 5 to analyze the demand, context, and regulations in a graphical form. By taking the *Table 2* parameters as guides, both the United States and European Union would be categorized as developed markets with a majority of factors inhibiting m-payments. While on the other side both Kenya and the Philippines as developing economies, have a good number of parameters stimulating m-payments.

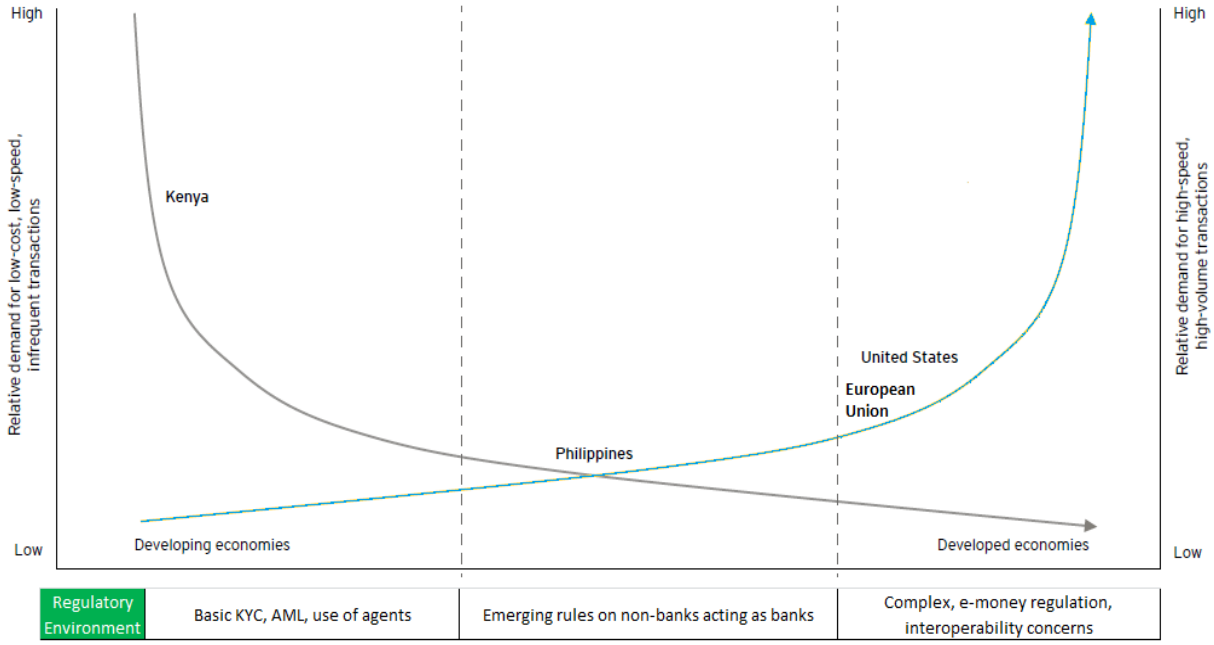

Figure 26: Mobile Money Demand Curves

All this putting into a bigger context, allow locating the analyzed regions/countries (see *Figure 26*) into the *Mobile Money Demand Curves*[72].

As it can be seen in the curves, Kenya as a developing country has a high demand of mobile payment services for low-cost, low-speed and infrequent transactions,

[72] The model is based in a combination of information between the original curves presented in (International Finance Corporation, 2011) and the version presented in (EY, 2014).

such as P2P transfer. This is very much related to its regulatory framework, were basic controls for KYC and AML are established.

The Philippines being also a developing country, has gone a bit further, and even if infrequent transactions like P2P are a considerable part of their volume, another type of connections like P2B are also in place. The regulatory framework has started to provide some guidelines for the operation of both banks and non-banks actors into the market, showing a mature evolution on the matter.

The case of United States and the European Union is similar in the regulatory part, where organized and well-established agencies with complex and demanding legal frameworks are already in place and controlling the market. The difference lies in the transaction demand and the current penetration of mobile payments in the market. This can be caused due to the quite different economies and cultures that are grouped within the European Union, a very heterogeneous area.

6.4 Challenges towards the Future

As every new technology penetrating the market, mobile payments still have many challenges and questions to overpass. Along with the regulatory point of view presented and analyzed in this document, there are a number of factors that remain unclear and represent by themselves some of the biggest question marks this technology will have to overcome. Furthermore when there has been so much expectation for a long period of time, in terms of popularity, penetration, and rate of use.

Besides the analysis work performed in this master thesis, a number of interviews were conducted with different experts in the industry, which more than specific answers or information about regulations, provided an overview of the current situation of mobile payments and their challenges towards the future. The insights of those interviews, along with the collected knowledge and draw conclusions from this document are now presented to provide a closure exploration

of how the regulatory influence on mobile payments and different factors are being driven factors of the whole technology towards the future.

Competition, industry involvement, and added-values, the keys! (Pierre Pilorge, Customer Consumer Services EMEIA, EY France)

With more than 30 years of experience in the industry, Pierre has been part of many consultancy projects within the financial sector, with a special expertise in customer related services. Currently, he is one of the global leaders of the Mobile Money initiative of EY[73], and therefore a specialist on the topic.

Out of the conversation with Pierre, there was one comment completely aligned to what has been discussed throughout this chapter. This was the regulators situation depending on the region's characteristics. Developed economies have regulators with clear objectives such as security, data privacy, and competition promotion. While in developing economies the regulators change according to the market's demand and position. These comments found a meeting point in this master thesis' findings.

In addition to the regulators position, Pierre pointed out how big players such as Visa and MasterCard are trying to make efforts towards the technology, but in a very cautioned and expectative way. This has led to have many players (MNO's, financial institutions, technology specialists, and merchants) with the same approach and therefore reducing the competition rate which is vital for the industry to grow.

As a conclusion, Pierre indicated that the last key for this technology to succeed is to provide an added-value to the end user. If the users do not perceive any motivation to move away from what they already know and trust, they will remain reluctant to change their habits.

[73] Mobile Money - http://www.ey.com/GL/en/Industries/Telecommunications/EY-mobile-money-the-next-wave-of-growth-in-telecoms

Good regulatory framework creating opportunities (Egil Bergenlind, Compliance Officer, iZettle Sweden)

As the compliance officer of the successful mobile payment solution iZettle, Egil has deeply experienced the regulatory frameworks for this kind of technology in Europe and some others geographies. His experience provided key information of how there is a structured regulatory framework in Sweden and the European Union for this industry, but the road has not been easy to follow and the uncertainty and constant change of the market made it hard to reach the point where they currently are.

Adding the experience of iZettle in Latin America, Egil stated that those emerging markets are looking into developed frameworks like the European Union or North America to design and implement their own set of rules. Consequently this statement supports what it has been seen in terms of developing economies and immature markets, trying to learn and take lessons learned from countries that have already gone further into the mobile payments road.

Current standards are enough, more to come if needed (Santiago Pinilla, QSA PCI-DSS, McAfee Colombia)

Santiago as a certified and approved QSA PCI-DSS professional has been involved in several PCI certifications for industry players in the whole Americas region as well as remote support for Europe. His deep knowledge of the PCI-DSS set of rules, gave to this work the required understanding of how the PCI is treating mobile payments.

While the standard has a big set of rules in its PCI DSS documentation, there are just 2 short documents addressing mobile payments in a very shallow way. As a matter of fact, none of the main certification guidelines and rules mentions any specific set of rules for payments done via mobile devices. For this reason, Santiago explained that the position that the PCI-SSC has taken so far and has transmit to all its QSA, it is that the current set of rules should be enough to cover any kind of payments and for the time being, there is no need to directly address, mobile

CONCLUSIONS

All the background, introductions, concepts, study cases, and analysis developed in this work had the purpose to create a clear foundation and arguments to answer the proposed research questions:

RQ1: Which trends can be found in regulatory frameworks for mobile payments in regions with diverse socio-economic and technological environments?

After analyzing four different regions, it was possible to see how each regulatory framework for mobile payments has developed accordingly to the socio-economic situation of the country/region and the maturity of the industry.

Developed economies like the United States and European Union have strong, organized, and experienced regulatory bodies. With no specific regulations for mobile payments, their complex and big legislative frameworks, give them the confidence to have sufficient coverage. While developing economies like Kenya and the Philippines with undeveloped regulatory authorities, had to had a "reactive" approach to the entrance of a new service provided by entities no regulated for such activities.

As a summary, regulatory frameworks and their development are decidedly connected to the socioeconomic situation of the country/region and similarities can be found in markets alike.

RQ2: What are global regulators and authorities doing to provide an enabling environment for the development and growth of the mobile payments industry?

Regulators in any geography should calibrate their objectives between having a secure environment and at the same time encourage the development and entry of new services relevant for the economy and the society.

Their actions are oriented in two dimensions, to offer openness and certainty. With the first one, the door to innovation to new players is open, and the second one gives the confidence to new investors. Normally, it is a trade-off between both.

FUTURE WORK

The area of mobile payments and specially the one related to regulations has many research opportunities. This work has offered an overall view of the technology, its capacities, and how different markets handle the industry from the regulatory perspective. Yet, specifics on how a new player evaluates the legal environment before entering a market could be interesting from the business point of view to analyze

Another prospect research that can be done is related to how regulators are preparing for the upcoming of new payment technologies that are not covered by their current legislations. Additionally, a collaborative work analyzing partnership schemas between different regulators and regions might help developing economies and countries to be legally prepared for a high scale deployment. While at the same time the mobile payments industry might boost their economies and provide services that are not currently covered.

As an industry on its early stages and with the existing uncertainly at diverse levels in terms of regulation, there is a significant space for research and for the continuing, improvement, and enrichment of this work.

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