POLITECNICO DI MILANO

Facoltà di Ingegneria dei Sistemi

POLO REGIONALE DI COMO

Master of Science in

Management, Economics and Industrial Engineering

AN EMPIRICAL ANALYSIS OF MOBILE PAYMENTS AND ITS CURRENT SITUATION IN THE UNITED STATES OF AMERICA AND THE UNITED KINGDOM

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Academic Year 2009-2010

Ackowledgments

I would like to thank Prof. Rangone for giving me the opportunity to work on this research. Also, I would like thank Fernando Monteiro D'Andrea, Valeria Portale and Filippo Renga for their constant support and guidance throughout the development of this thesis. Finally, I want to give special thanks to my wife for her constant support.

Benito Piuzzi

July 3, 2010

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The payment industry has certainly evolved over the years. Cash and non-cash payment instruments have been around for a while, as part of different payment systems. While cash payment systems go back thousands of years and paper-check payments go back centuries, electronic payments are relatively new and rapidly evolving (Selander, 2008). The rapid evolution of electronic payments has taken place due to the possibilities created by the Internet. Internet users have increased exponentially over the years. According to Internet World Stats (2009), in 1995 0.4% of the world population was connected to the internet, today close to 2 billion people, or almost 30% of the world population has access to the internet. Today's accessibility to the internet plus the dramatic growth of mobile phone penetration worldwide has spurred the use of mobile phones to pay for goods and services on the go. According to the International Telecommunication Union (2010), in 2009 there were 4.6 billion mobile cellular subscriptions globally. The ITU expects this to reach 5 billion in 2010. On the other hand, the mobile payment industry is expected to grow dramatically in the next few years. In 2009 the volume of mobile payments was $170 billion dollars, and it is expected to grow to $630 billion by 2014 (PRWeb, 2010). The most advanced country in this area is Japan, with its contactless NFC chip developed by Sony, called FeliCa, which allows users to pay via proximity with their mobile phones. Developed in 2004, now it reaches to more 500,000 merchants and close to 10 million customers (Times, 2010). Because of the enormous potential for business and its impact in the improvement of the lives of millions of people around the world, it is important to analyze where mobile payment is and where is going in the next few years. Furthermore, two main players of the mobile payment industry are Europe and the U.S. Because the U.S. technology enters Europe through the U.K. (Bohle & Krueger, 2001), it is important to analyze both countries to determine any possible trend or pattern on mobile payments that could be of relevance to the industry.

Because mobile payment is a very extensive topic, the thesis will explicitly focus on the analysis of current mobile payment services, or applications, being offered in the U.S. and the U.K using a specific set of parameters embedded on a excel Database. These parameters include:

- Technology (remote/proximity-NFC)
- Service Pattern (determines what type of mobile purchase was made, for example: transportation, durable goods, P2P, Digital Content, etc)
- Activation distribution (method of activation)
- Payment Source Distribution (whether is paid through the cell phone bill, credit card, checking account, etc.)
- Promoting Players (Key entities that promoted a mobile payment service or application when it started)
- Payment Size (whether it was micro or macro)
- Current Status (whether a service has just started or have been around for a while)

The services analyzed did not include banking applications, except for Wells Fargo banking system, which unlike others; it provides mobile services for payment not only via mobile app, but also texting and web. Also, considering the fact the contactless cards are becoming the most popular mean to execute proximity mobile payments, for purposes of this analysis, each credit card company was included separately. Bank providers were not individually analyzed.

Before analyzing the services provided in the U.S. and the U.K. an extensive review of literature was performed. The objective was to obtain a better understanding of the development of payment systems, mobile payment related concepts, the value chain of mobile payments, its classification, issues that govern the development of applications, critical success factors, mobile technologies, global scenario, the impact of culture in a payment system, and how the U.S. and U.K. operate from an political, economical, social and technological point of view.

Considering the literature reviewed for the development of this thesis, a general review of mobile payments and many definitions were established to provide a unique vision of the multiple concepts that are relevant to mobile payments.

To understand mobile payments it is important to first understand what a payment system is. From a general perspective, payment systems can be interpreted as a highly specialized mode of communication, even without the internet (Böhle et al., 2000). The communication is represented by the link that must exist among different entities so a transaction takes place. The

following figure shows how the communication takes place on a basic payment transaction. As you can see, the transaction between customer and merchant takes place through their correspondent financial intuitions. As the merchant gets the funds after a settlement, the customer gets billed for the purchase of a good or service. A payment system can also be a financial system that supports the exchange of debits and credits among financial institutions (BusinessDictionary, 2010).

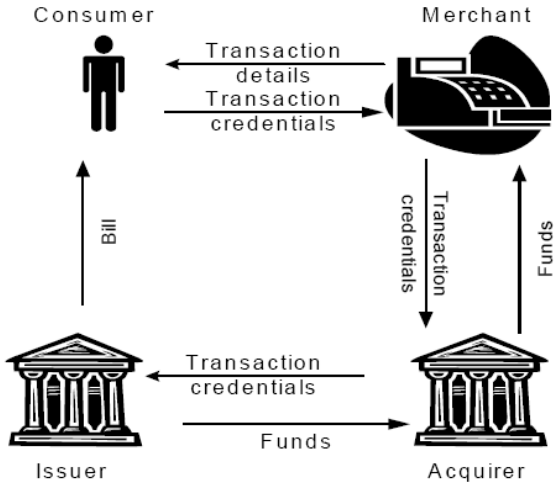

Figure 1: Payment Transaction (Pihlajamäki, 2004)

Mobile payment services represent the same interaction but in a different way, aided by technology. The most basic element to execute a mobile payment is a mobile device, which communicates through radio waves. Mobile devices are better known among other things, as a cell phone, Personal Digital Assistant (PDA), Blackberry, etc. (Grimes et al., 2009). However, Mobile Devices comprise as well any hand held portable device, including but not limited to cell phones, and/or memory devices, such as USB-drives, etc.(Department of Broadband, 2009). In fact, mobile devices also include NFC or RF technology based devices (Chen et al., 2006).

Mobile payments, also known as m-payments, entail making payments using a mobile device (Dewan & Chen, 2005) to initiate, authorize and realize a payment (Pousttchi, 2004). The initiation of these payments can be at a physical or remote POS, and can be conducted in a variety of ways including SMS/MMS, mobile Internet, downloaded application and contactless chip (e.g., NFC). Examples include ring tone downloads billed to the mobile phone bill,

purchases/payments via the mobile Internet, tap-n-go purchases using a contactless chip embedded in the mobile device and P2P transfers (Garner et al., 2006).

How a mobile payment is executed sometimes depend on the amount of money to be spent. It is important the set a clear distinction between micro and macro payments. Because most of the literature reviewed in this research comes from Europe and/or the United States, and their currency values do not differ by a great amount, a standard value to identify the difference between micro and macro payments must be established. In 2004, Mallat et al. (2004) determined that micro payments represented transactions of US$10 or €10, or less, and macro payments represented paymentents over the before indicated amount. Furthermore, Andreoli (2008) established that in the U.K., micro payments were payments of £10 or less. For purposes of this research, 10 Dollars ($), Euros (€) or British Pounds (£) will be the official value to determine whether payment is micro or macro.

Another variant of mobile payments is the payment method. As is the case with other, older, payment schemes like cash, the current mobile payment market does not have a single, definitive, payment method, in fact there is a substantial variation between what particular scheme is adopted from region to region (Wilcox, 2010). The number of different payment methods offered by the provider to settle payments will contribute to the acceptance of the payment method itself (Kreyner et al., 2002).

The different payment methods are contained within three important ways of billing customers; these are (Bohle & Krueger, 2001):

- Billing on the Mobile Phone Bill

This type of billing incurs a post-paid payment settlement, due to the fact that the customer is billed after a good or service has been purchased (Kreyner et al., 2002).

- Billing by deducting from prepaid accounts/prepaid cards

Prepaid accounts, or cards, refer to payments in which the customer either buys a smart-card (contactless), where the money-value is stored and then pays off of this credit for goods or services desired, or he can upload a digital wallet with electronic coins on a prepaid basis.

- Billing by enabling the use of traditional payment instruments such as credit card payments and direct debits (bank account)

While direct debits represent an instant payment, credit payment represent post-paid payments (Nambiar & Lu, 2005). With the debit approach, the customer maintains a positive balance of the account and money is subtracted when a debit transaction is performed. With the credit approach, charges are posted against the customer's account and the customer is billed for this amount later or subsequently pays the balance of the account to the payment service (Abrazhevich, 2001).

In order to understand how the value chain operates, based on the literature reviewed, an adapted Porter Value Chain was built. Unlike the original, which introduced activities, this one introduces the different actors of the Value Chain.

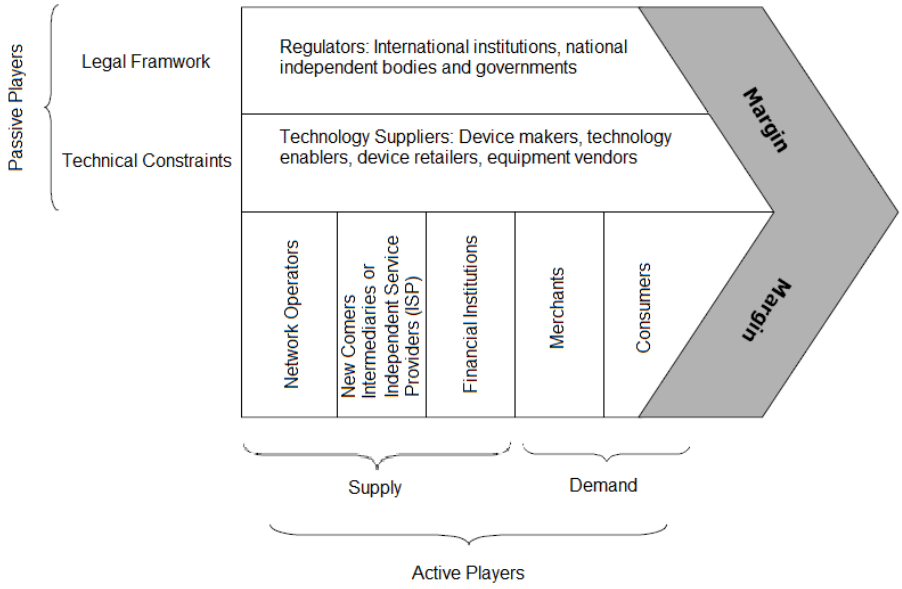

Figure 2: Mobile Payment's Value Chain, adapted from Porter's Value Chain Model

While active players execute the main activities to deliver a mobile payment service or application to the end consumer, passive players the ones that allow a mobile payment transaction to take place, in an indirect manner, by providing the necessary regulations and technology.

Mobile payments can be further classified into Remote Mobile Payments (RMP) and Proximity Mobile Payments (PMP). RMP refer to payments made when the buyer and seller do not physically meet to exchange goods or services (Saji, 2006). In other words, they are not in the same place during the transaction. RMP can take place through a Virtual POS or POS m-Payment. Unlike RMP, for a PMP to take place the customer must be physically present at the merchant's POS (Dewan & Chen, 2005). To complete a transaction, the customer must initiate the payment using a mobile handset at the POS by passing the handset across a "reader," which scans the handset and completes the transaction using the financial information (credit card, debit card, etc.) stored on the handset (Terol & Light, 2008).

The main differences between these types of mobile services are summarized in the following table:

Criteria	RMP	PMP
Enabling Technology	Cellular Technology	RFID, Bluetooth and NFC
Transaction Technology	WAP or dialing the Merchant	Present the payment device within inches of the merchant's RF or NFC enabled reader.
Spatial Distance	Anywhere where cellular signals are available	Merchant's physical location
Transaction Time	Slower (rely on Network)	Faster (tap)
Authentication Strength	PIN or Password	After waiving device, further authentication depends on Merchant
Security	Unlimited cryptographic capabilities	Limited

Mobile payments applications and services are constantly evolving. However a number of issues are worth to consider in order to successfully implementing a solution that delivers value to the end consumer. Some of the main issues to consider include:

- **General Acceptance**

This tends to be the chicken and the egg problem. On one hand, customers will not use the procedure unless a significant number of merchants accept it; on the other hand merchants will not be willing to accept the procedure unless a significant number of customers use it (Pousttchi, 2004).

- **Coordination**

Multiple industries may participate within a mobile service, including financial services firms (both banks and nonbanks), telecommunications companies, technology providers, and handset makers. Such broad participation can make this market complex.

- **Physical Form**

The fact that there are many forms to make a mobile payment can be confusing to customers. Although both methods (with mobile phone and smart cards) could be highly effective, one must prevail to provide a certain standard.

- **Size of a Payment**

The size of a payment does matter. Mobile payments are interesting only if the volume of transaction or profit margin is high. Macro payments are conducted for purchases with a higher margin and therefore more profitable, but its volume is usually low (Ondrus J., 2005).

- **Security and Privacy**

Security in mobile payments is certainly one of the most important issues to be considered. In fact, there is no guarantee of total security while sending sensitive information over an open network like the Internet (Ondrus, 2003).

- **Standardization**

Mobile payments lack of a set of cohesive technology standards that can provide a universal mode of payment. One of the main factors that contribute to mobile payments low success is the lack of standards, which give rise to fragmented versions of different mobile payments offered by different entities.

- **Consumer Habits**

It is a well established fact that the force of habit dictates the continuation of the same type of behavior. It is noted that once behavior has become a habit it becomes automatic and is carried out without conscious decision

These issues lead us to implicitly consider the critical success factors (CSF) which are needed to reach a critical mass. These are: The ease of use, cost, reliability, user/market acceptance, security, universality, value proposition, maturity, speed, and scalability.

In order to understand the functionality of some mobile payments, it is important to understand the underlying technology that operates behind the communication network and payment processing. The network communication considers Mobile network technologies, which have evolved from analog based systems to digital based systems. This evolution can be described by different generations of mobile technologies, i.e. first generation (1G), second-generation (2G), 2.5G, third-generation (3G) technologies and fourth-generation (4G). Some of the main standards for each generation technology are (McKetterick & Dowling, 2003). On the other hand, payment processing technologies vary depending if the technology is remote or proximity. Remote technology include SMS, WAP, USSD, Mobile Applications (Mobile Wallet), SIM related technologies, I-Mode, Web Clipping. On the other hand proximity technology includes Bluetooth, Infrared, NFC and RFID.

Based on the current global situation it is important to highlight the following events to understand the impact of a research on a topic such as mobile payments:

- Among all technologies, cellular phones are leading the way with 4 billion units worldwide.

- USA is among the top mobile subscribers, and globally the number is increasing dramatically.
- When looking at the mobile internet penetration as a percentage of the total amount of mobile subscribers, the U.S. leads the way, followed by the U.K.
- 3G subscription is on the rise, taking almost 50% of all subscription revenues worldwide and expected to reach 68% by 2013.
- In 2009 mobile Web shopping exceeded US$10 billion. On the other hand, in the U.S., mobile Web shopping reached only US$1.2 billion (Gallen, 2009).

Along with the above presented facts, it is equally important to consider the how the U.S. and the U.K. differ, or not. What is really interesting about cross-border payment culture is when certain similarities or cultural approaches become visible between neighboring countries or otherwise culturally related countries: e.g. Germany and Austria, Belgium and Netherlands, Scandinavian countries, or the U.K. and the U.S. The U.K./U.S. case is particularly important because U.S. payment methods often enter to Europe through the U.K. (Bohle & Krueger, 2001). Certain signs show proof of a certain co-relation among these cultures, but a thorough analysis of mobile payments is necessary to corroborate this. For example, the following table shows the % of mobile subscribers in the several EU countries and the U.S. by mobile content usage. Amazingly, the U.S. and the U.K seem to be very similar in certain mobile usage tendencies.

Table 1: Mobile Content Usage Pattern between the U.S. and EU5. Adapted from (comScore, 2010).

Reach (%) of Mobile Subscribers by February 2010 - Mobile Content Usage							
	UK	DE	FR	ES	IT	US	Absolute Difference US-UK
Sent an SMS/Text	90.30%	81.60%	81.70%	84.50%	79.50%	64.00%	26.30%
Mobile Browsing	30.80%	17.40%	21.70%	19.90%	20.70%	29.40%	1.40%
Accessed Social Networking Site or Blog	18.20%	6.50%	10.20%	9.50%	11.70%	18.00%	0.20%
			Similar Numbers				
Accessed News	13.70%	7.50%	9.00%	6.70%	10.40%	15.10%	1.40%

Because of this the main objectives of this thesis are:

1. To find and describe U.S. and U.K. mobile payment services.
2. To determine the features associated with Mobile Remote Payments (MRP) and Mobile Proximity Payments (MPP) in the U.S. and the U.K., to check any possible trend.
3. To identify and analyze key differences between the mobile payment scenario in the U.S. and the U.K.

In order to reach the objective 51 services were analyzed 35 are from the U.S., 11 are from the U.K. and 6 are mobile payment services that are running in both, the U.S. and the U.K. The criteria applied for the analysis is stated at the beginning of this section (refer to Database).

Based on the analysis, the following table summarizes the findings.

Table 2: Summary of Results

	MAJORITY OF THE SERVICES		
	U.S.	U.K.	U.S. & U.K. (only RMP)
Mobile Payment Distribution	Contactless and Remote (PMP and RMP)	Contactless = PMP	Remote=RMP
Service	-*RMP:* P2P -*PMP:* Durable goods, FMCG, and entertainment	-*RMP:* Other -*PMP:* FMCG, bars and/or restaurants and public transportation	Durable goods, digital content, e-Commerce, and parking
Activation	-*RMP:* Web -*PMP:* Banks	-*RMP:* Web -*PMP:* Banks	Web
Source of Payment	-*RMP:* Bank Account and Credit card -*PMP:* Bank Account	-*RMP:* Bank account and Credit Card -*PMP:* Bank account and Credit Card	Bank Account and Credit Card (very close follows Pre-Paid card and Phone Bill)
Promoting Players	-*RMP:* Technology and service providers -*PMP:* Banks and card networks	-*RMP:* Technology and service providers -*PMP:* Banks and card networks	Technology and service providers
Service vs. Payment Source	-*RMP:* P2P with credit card or bank account -*PMP:* Banks	-*RMP:* Other with credit card or bank account -*PMP:* Banks	-Digital content paid with phone bill. -Parking paid with credit card or bank account
Micro vs. Macro Payments	-*RMP:* Micro & Macro -*PMP:* Micro & Macro	-*RMP:* Micro -*PMP:* Micro	Micro payments
Current Status (Pilot, Started or Running)	Started	Running	Running

Based on the results it is possible to conclude that the number of services in the U.S. is greater but in the U.K. the few that are present are running effecitvely in terms of being fully operational. Also, the U.K. offers conservative mobile payments by mostly offering mobile micro payment solutions. On the other hand, in the U.S. both are offered popularliy. Other than that, overall they seem to present the same type of technolgies, used for similarly types of consumption, with a strong presence, on both countries, of financial institutions. This can be due to the fact that people trust more their money to “experts” in handling money.

Future recommendations include:

- A more detailed analysis to the different technologies used on each service
- A greater number of mobile payment services (if available) that operate in the U.K.
- Use more updated information. Because the growth of this technology is exponential, the amount of services and technologies available grow every month, if not, everyday. The collection of information for this thesis lasted 4 months. A collection of information on services for a longer period could help providing a better insight to more complex differences in mobile payment services in the U.S. and the U.K.
- Compare these technologies to technologies of other countries in Europe to check whether or not there is a difference between technologies in the U.S.-U.K vs. other Countries in Europe.

1. LITERATURE ANALYSIS

To be able to fully understand this research, its methodology and its results, it is imperative to review and analyze past and current information regarding mobile payments. The objective of this section is to help providing a better insight and understanding of the scope of this research. The literature reviewed comes mostly from the United States and Europe and it spans from 1997, which represents the year in which the first mobile payment was launched (Owens, 2010), until 2010. Because of the extent of this research, this section will be divided as follows:

The first part of this section will consist in a review of general mobile payment related definitions used in different academic researches or publications. Since the first mobile payment was launched, many articles, reports and academic papers have been published with the purpose of providing a better understanding of this subject. However, each work provides a set of definitions, usually related to mobile payments, which can differ from case to case. Some of these definitions include Mobile Payments, Micro Payments, Remote Payment, Proximity Payment, etc.

Because of the extent of this research and the recurring use of mobile payment related definitions, and to avoid any type of confusion, it is important to set standard definitions based upon previous work. These definitions will facilitate the consistency and understanding of the different topics covered within this research.

The second section on “Value Chain” includes an analysis of the different entities involved in the delivery of a mobile payment application or service. The literature reviewed will consider a description of these entities, their motivations and how they play a role in the value chain of mobile payment applications or services.

A number of authors have developed ways to classify mobile payments. Whether it is by the technology used, application, size of payment, or all of them. A review at the different classifications will provide the necessary information to create a unique and standard mobile payment classification table, which will be used later for the empirical analysis.

The fourth section provides a literature analysis at the different issues that prevent mobile payments from becoming successful, in terms of mass consumption. For example, Ondrus et al. (2009) indicated that one of the reasons of why the usage rates of Mobile Payments in general were so low was because it meant that the user had to change their payment habits. Moreover, the authors pointed at the credit card adoption and the time it took, and how it can take a lot of time before a mass adoption is reached.

Indicating these issues, based on previous work, can help us elaborate more on how they can affect the successful adoption of mobile payments. For the purposes of this research, specific detail and attention will be given to the effects in the U.S. and the U.K. and/or Europe.

After analyzing the issues that govern Mobile Payments Applications it is important to indicate what the CSF are. The literature reviewed for this section aims at reviewing the CSF needed for mobile payments applications to reach the needed mass consumption.

After reviewing the value chain it is important to highlight the advantages and disadvantages for each of them during the process. This section aims at reviewing literature related to the advantages and disadvantages, if any, for each of the entities when playing a role within the value chain.

Afterwards, a section about the “Evolution of Payment Trends and Payment Technologies” will offer a better understanding of the importance and effect that technology has on customer payment behavior. Moreover, differences can be made towards determining the success or failure of certain technologies. The literature for this section provide information regarding the born and evolution of successful payments, such as credit or debit cards, and others not so successful, in terms of reaching a critical mass, such as NFC and contactless cards. Also it will provide information on payment trends around the world and how these have change with the insertion of technology.

The literature reviewed in this section will provide a more specific knowledge on the development of mobile technologies worldwide, such as NFC, Contactless, and WAP, and their impact on customer payment behavior.

The section about "Global Scenario of Mobile Market" will provide a general picture of the current mobile market scenario worldwide, through graphs and statistics. The literature reviewed focused on current developments in developed and developing nations, paying extra attention to the near future progress.

Afterwards, the section about "Payment Culture" has for objective to review some literature to understand how different regions can differ or not, regarding their payment methods and behaviors. Depending on the region certain technologies may or not be marketed in a different way. Moreover, understanding this section will help us comprehend how the U.S. and the U.K. can relate to each other.

Finally, this last section will consist of a thorough analysis of the two countries that are the main focus of the empirical analysis of this research, the U.S. and the U.K.

The literature reviewed for this section will consists of information regarding their political, economic, social conditions. Afterwards the analysis will focus on the technologies available, payment trends, mobile payments, and active players. This section will serve as the cornerstone of the empirical analysis, because it will deliver information regarding the main similarities and/or differences, in the areas mentioned above, between the U.S. and the U.K., if any.

1.1 Definitions

The following section will consist of an analysis and description of the concepts used along previous work, whether they were used in academic papers, journals, online articles or websites, they all have a common denominator, they all are related to mobile payment applications or services, and will be used frequently throughout the development of this research. The aim of this section is to obtain the most complete definition that fits the research presented. Because of that, a standard definition will be set in order to be consistent along the research, and to provide a clear and unique understanding of each concept.

1.1.1 Payment Systems

The goal of any business is to find a way to attract customers to the business, and get them to pay for products and/or services (Scavone, 2008). From this premise has spawned a wide number of

technologies to make the payment processes as faster, thoughtless and simple as possible. The importance of payment systems rests on its impact on the economy of any country, since it determines how quickly and how securely a seller of goods and services will receive a payment (Crede, 1998).

According to the Bank of International Settlements (2005) there are certain factors that can influence the development of a payment system. These are (Padoa-Schioppa, 2005):

- Development Factors: These include environmental factors (demographic, geography, distribution of resources and social values), economic factors (economic growth, wealth distribution, education and training availability, development of industry and Innovation), financial factors (costs, risk and benefits of development payment initiatives), and public policy factors (legal framework, financial regulatory system, policies affecting the different payment systems)

- Characteristics Demanded of Payment Systems: Some of the characteristics demanded are: high availability of choice of instruments, information on relative benefits, user associated costs, low user costs, interoperability, low risk and high security.

- Characteristics of Supply of Payment Services: To achieve revenue generation and lower costs and risks it is important to: introduce new technologies to process information, have interoperability of payment systems, have financial and non-financial institutions to expand to provide new payment services and markets.

From a general perspective, payment systems can be interpreted as a highly specialized mode of communication, even without the internet (Böhle et al., 2000). The communication is represented by the link that must exist among different entities so a transaction takes place. The following figure shows how the communication takes place on a basic payment transaction. As you can see, the transaction between customer and merchant takes place through their correspondent financial intuitions. As the merchant gets the funds after a settlement, the customer gets billed for the purchase of a good or service.

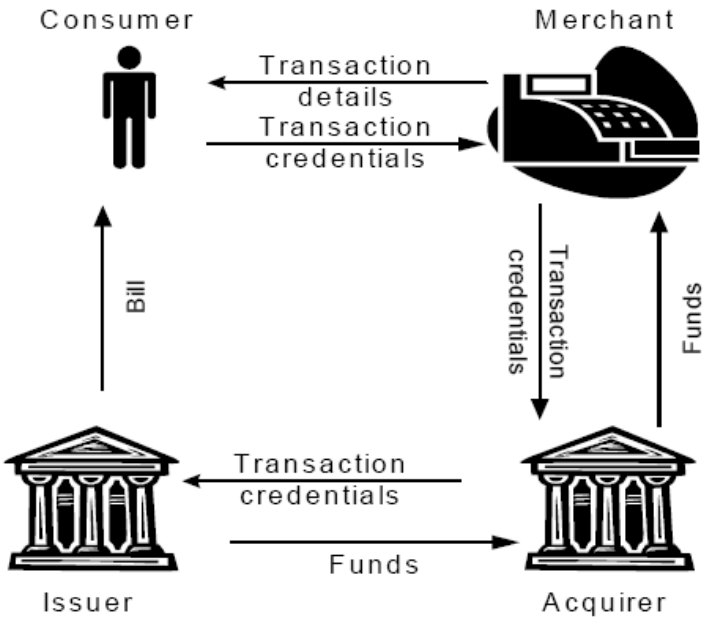

Figure 3: Payment Transaction (Pihlajamäki, 2004)

A payment system can also be a financial system that supports the exchange of debits and credits among financial institutions (BusinessDictionary, 2010). This exchange occurs through cash and non-cash payment instruments. While cash payment instruments correspond to the use of bills and coins, non-cash payment instruments correspond to the use checks, credit cards, debit cards, and electronic payments (Gerdes & Walton II, 2002).

Unlike cash payments, non-cash payments require three elements (Crede, 1998).

1. The buyer (debtor) must have an agreed way to authorize a specific payment and instruct its bank to proceed with the transfer of funds.
2. The seller's bank (creditor's bank) and the buyer's bank need an agreed method of exchanging payment instructions. This is referred to as payment clearing.
3. Finally the buyer's bank and the seller's bank must have an authorized method of payment settlement. Payment settlement can be done in a number of ways. It can involve adjusting accounts which the two banks have with each other, or it can be achieved through accounts each bank holds with a third-party, often a Central Bank.

The following diagram provides a better picture of how these three elements play a role in non-cash payments.

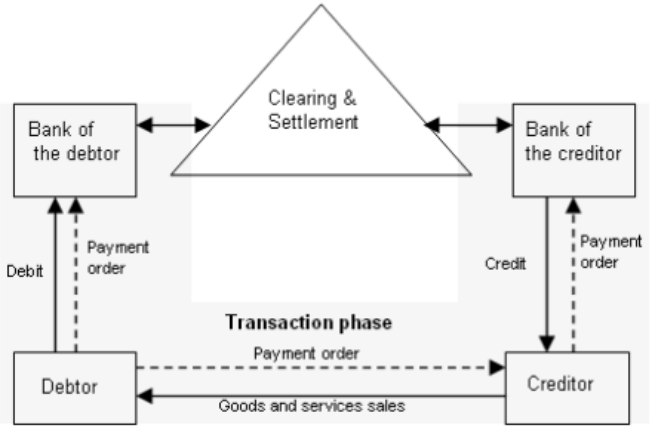

Figure 4: Stages of Non-Cash Payments (Banque de France, 2004)

Cash and Non-Cash payment instruments have been around for a while, as part of different payment systems. While cash payment systems go back thousands of years and paper-check payments go back centuries, electronic payments are relatively new and rapidly evolving (Selander, 2008). The rapid evolution of electronic payments has taken place due to the possibilities created by the Internet. In fact, electronic payments are part of a new generation of payments that also include digital payments and virtual payments (Ondrus, 2003).

Electronic payments are also known as digital money, and they represent payments done electronically. This type of payment involves the use of computer networks, internet and digital stored value systems (VbTraders, 2009). Furthermore, electronic payments comprise the use of mobile payment technology, which will be discussed in later sections of this research.

1.1.2 Mobile Device

Within the electronic payment array of alternatives, mobile payments stand out the most for its uniqueness. Before defining what mobile payments are, it is important to have clear understanding of what a mobile device is. The importance of understanding what mobile devices are lies in their potential to benefit the service and product industry due to its capacity to handle a great number of different commerce-related tasks (Anckar & D'Incau, 2002).

Mobile devices are used for radio wave communications, and maybe known among other things, as a cell phone, Personal Digital Assistant (PDA), Blackberry, etc. (Grimes et al., 2009).

However, Mobile Devices comprise as well any hand held portable device, including but not limited to cell phones, and/or memory devices, such as USB-drives, etc.(Department of Broadband, 2009). In fact, mobile devices also include NFC or RF technology based devices (Chen et al., 2006).

With the advances of technology, nowadays, mobile devices can be used, depending on the country and/or city, in a variety of payment scenarios such as payment for digital content (e.g. ring tones, logos, news, music, or games), concert or flight tickets, parking fees, and bus, tram, train and taxi fares, or to access and use electronic payment services to pay bills and invoices. Payments for physical goods are also possible, both at vending and ticketing machines (unmanned POS), and at manned POS terminals (Antovski & Gusev, 2003).

1.1.3 Mobile Payments

Mobile Payments were first introduced in 1997 by Finnish phone operator Sonera, when a trial in Finland allowed people to buy Coca-Cola using a GSM cell phone by sending SMS payment instructions (Owens, 2010). Since then, Mobile Payments have gone through ups and downs, with several trials and services running around the world. The market developments of Mobile Payments have been quite uneven throughout the world. Some countries are much more advanced in terms of technology deployed and business cases implementation, like Japan, South Korea, and other Asian countries. However, in Europe and North America, the development of mobile payments has not been as successful, with the exception of a few countries (Ondrus & Pigneur, 2007). The main reason for this is the lack of unified standards, security and privacy concerns, and slow diffusion regarding mobile commerce in general (Dewan & Chen, 2005).

Mobile payments, also known as m-payments, entail making payments using a mobile device (Dewan & Chen, 2005). This type of payments occurs electronically and involves mobile communication techniques, such as network and wireless, in conjunction with a mobile device to initiate, authorize and realize the payment (Pousttchi, 2004). The initiation of these payments can be at a physical or remote POS, and can be conducted in a variety of ways including SMS/MMS, mobile Internet, downloaded application and contactless chip (e.g., NFC). Examples include ring tone downloads billed to the mobile phone bill, purchases/payments via the mobile Internet, tap-n-go purchases using a contactless chip embedded in the mobile device and P2P

transfers (Garner et al., 2006). A more detailed explanation of the different technologies and will be delivered on section 1.6.

In the “strict sense” Mobile Payments consider all the services that allow "activation of payments or money transfer via phone" regardless of the wireless technology used to enable the provision of payment and transport (cellular networks, Near Field Communication, Bluetooth, ...) and the underlying payment instrument (credit card or debit or charge ...)

Just like any payment system, a mobile payment is a process that comprises the following steps (Microsoft & M-Com, 2010):

1. *Service Registration*. The customer commences a payment service relationship with the financial institution or payment provider. This includes the enrolment and activation of the payment instrument.

2. *Payment Request*. The customer initiates a payment to a third party (person, biller or merchant) and typically includes transaction value and timing as parameters. In some payment models the payment request is initiated by that third party.

3. *Payment Authorization.* The customer authorizes the payment (including authentication) before it is processed.

4. *Payment Confirmation*. Confirmation of the payment outcome is provided to the customer.

5. *Payment Report.* The customer can review the payment that took place, at some point in the future.

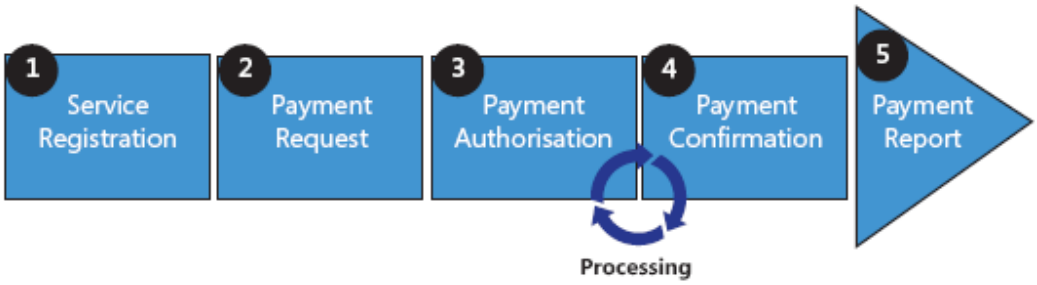

Figure 5: Mobile Payment Steps

To successfully process and complete a transaction, mobile payments require three basic elements: (Ondrus, 2003):

- *Network*: Gathers the technologies used in a wireless network infrastructure. These can be operator driven (GSM, UMTS, etc.), computer based (Wi-Fi, etc.), or self-organized (Bluetooth, P2P, etc.)
- *Device*: Represents the user wireless infrastructure. These can be basic (SIM, RFID, Smartcard, etc.), dedicated (cellular, PDA, iPad, etc.) or used for general purposes (laptop, etc)
- *Mobile Application*: Describe the technologies used mostly by mobile application developers, mobile application service providers and content providers. These can be divided in presentation, communication, environment, and operating system.

Once the elements are present, the completion of a transaction requires the presence of a group of entities, each with a specific role. The following diagram shows a basic structure of a mobile payment and how the transaction takes place. The different entities that are part of a mobile payment transaction will be further discussed in section 1.2.

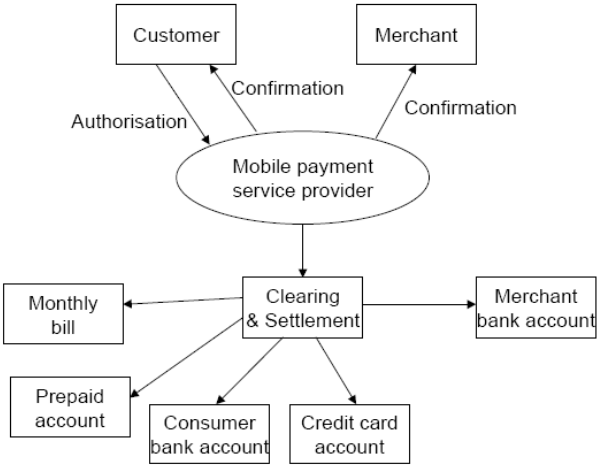

Figure 6: Structure of a Mobile Payment (Kruger, 2001)

This diagram shows how the mobile payment service provider deals with both, the customer and merchant, to clear and settle a transaction based on the source of the money. The money to complete a transaction usually comes from a monthly bill, a prepaid account, a bank account or a credit card (Dahlberg & Oorni, 2007). Further information on billing systems is introduced in section 1.1.6.

1.1.4 Micro vs. Macro Payments

Mobile payments can also be classified in micro and macro payments (Varshney, 2003). Since its very beginnings, in the mid 90's, mobile payments attracted a great number of international researchers. Because these researchers came from different backgrounds and settings, different values and currencies were used to describe micro and macro payments. For example, in 2008 Madlmayr et al.(2008) determined that micro payments were payments of €5 or less and macro payments any payment for more than €5. In 2008 a discussion paper on mobile banking and mobile payments, done by the Federal Reserve Bank of Philadelphia in the U.S., established that micro payments were small dollar transactions of US$5 or less (Cheney, 2008). In 2002, Kreyner et al. (2002) performed a study to determine the acceptance of mobile payments in Germany. As part of the study, Kreyner established that micro payments were payments of €2.50 or less, and macro payments could be further categorized in payments of €2.50 up to €50, payments up to €250 and payments of more than €250. American e-commerce company, PayPal, defines micro payments as payments of US$12 or less (PayPal, 2008).

Because most of the literature reviewed in this research comes from Europe and/or the United States, and their currency values do not differ by a great amount, a standard value to identify the difference between micro and macro payments must be established. In 2004, Mallat et al. (2004) determined that micro payments represented transactions of US$10 or €10, or less, and macro payments represented paymentents over the before indicated amount. Furthermore, Andreoli (2008) established that in the U.K., micro payments were payments of £10 or less. For purposes of this research, 10 Dollars ($), Euros (€) or British Pounds (£) will be the official value to determine whether payment is micro or macro.

1.1.4.1 Micro Payments

Micro payments represent a large amount of revenue. According to Communications International, Visa International estimates worldwide payments for items less than US$10.00 to be US$1.8 trillion annually. With the overall growth in e-commerce, it's unlikely the concept of micro-payments will disappear (Ecommerce, 2010). In the U.S. market alone for POS micro payments could equal as much as US$160 billion (McGrath, 2006). However, due to its low profit margin, the success of this type of payment relies on the transaction volume (Ondrus J., 2005).

Micro payments enable the remote payment of mobile content and services such as news, digital content, ringtones, parking, tickets, and location-based services (Varshney, 2002). Mobile micro payments also provide a potential payment method for e-commerce. In Finland, Helsinki City Transport offers a mobile subway and tram ticket, an example of a successful mobile payment service. A user sends a SMS before entering the train, bus or tram and gets a SMS message with a specific code as a receipt. The ticket is valid for an hour. The service is charged on a phone bill and needs no registration from the user (Kalliola, 2004). Approximately 55 percent of the tram tickets and nearly 10 percent of all individual tickets for Helsinki public transportation are currently purchased via a mobile phone. According to Helsinki City Transport, mobile ticket users have been satisfied with the new service, which has also reduced the problem of traveling without a ticket (Lahdenrata & Vepsäläinen, 2004).

Mobile micro payment can occur at an unmanned or manned POS. Payments at an unmanned POS include applications such as purchase of soft drinks or items from vending machines, and payments on self-service stations, for example paying for gas without cash at hand. Mobile micro payments at a manned POS include small purchases at shops, kiosks, and fast food restaurants. While there are several pilot projects utilizing manned POS mobile payments, the use of these solutions has been marginal as the traditional payment methods are often more convenient in these purchase situations (Mallat et al., 2004).

Table 3: Mobile Micro payment Transaction Types

MICRO PAYMENT ≤ 10$, 10€, OR 10£		
Remote Mobile Content: ▪ Logos ▪ Information ▪ Games Parking	*POS Manned* ▪ Small Purchases in shops, kiosks and fast food restaurants	*POS Unmanned* Vending Self-Service: ▪ Soda ▪ Tickets ▪ Cigarettes ▪ Instant Photos ▪ Gas ▪ Toll
Ticketing Person to Person Payments		

Source: Adapted from (Mallat et al., 2004).

1.1.4.2 Macro Payments

On the other hand, mobile macro payments allow customers to securely pay for larger purchases (greater than US$10, €10 or £10). These purchases can take place electronically (e-commerce, mobile ticketing, gaming, etc.) and at a manned or unmanned POS (restaurants, retail shopping, etc.) (Mallat et al., 2004).

Mobile macro payments face competition from well-established traditional payment instruments, such as credit or debit cards, and cheques. Unlike micro payments, because of its high margin profit, this type of payments has the potential to be more profitable (Ondrus J., 2005).

Because remote macro payments allow customers to pay larger amounts of money, companies must ensure the customer that the transaction is secure. To provide a secure and trustworthy transaction, risk management and cooperation between key players is necessary (Varshney, 2002).

Table 4: Mobile Macro Payments Transaction Types

MACRO PAYMENT ≥ 10$, 10€, OR 10£		
Remote Internet Purchases: ▪ Physical goods ▪ Digital content or services ▪ Prepaid cards reload	*POS Manned* ▪ Restaurants ▪ Retail shopping ▪ Taxi payments	*POS Unmanned* ▪ Car Wash
Ticketing Person to Person Payments		

Source: Adapted from (Mallat et al., 2004).

1.1.5 Billing Mobile Payments and Methods

Before a customer gets billed for a product, or service, acquired via mobile device, it is important to highlight the different types of transaction that are available. Currently there are three transaction types, which are predominantly used for mobile contents (McKetterick & Dowling, 2003):

- *Pay Per View: T*he mobile user pays for each view, or increment, of the desired content. For example downloadable MP3 files or video clips.
- *Pay Per Unit:* The mobile user pays for each unit of content provided by the content provider. Units can be based on volume or duration of content, such as per byte or per

minute. The amount of units used for each session will be billed to the customer. Such examples of this type could be used in downloadable games or streaming video content.

- *Flat Rate:* The mobile user pays a recurring periodic amount to access the mobile content on an unlimited basis during the period. An example would be unlimited access to online newspaper articles.

In this case we assume for any other "non-mobile content" transaction, a "pay per-unit" model is used.

After the transaction takes place the customer is billed. While the billing process is determined by how the customer chooses to make a payment (Kalliola, 2004), mobile payment methods represent how the bill settled. As is the case with other, older, payment schemes like cash, the current mobile payment market does not have a single, definitive, payment method, in fact there is a substantial variation between what particular scheme is adopted from region to region (Wilcox, 2010). The number of different payment methods offered by the provider to settle payments will contribute to the acceptance of the payment method itself (Kreyner et al., 2002).

The different payment methods are contained within three important ways of billing customers; these are (Bohle & Krueger, 2001):

- Billing on the Mobile Phone Bill
- Billing by deducting from prepaid accounts/prepaid cards
- Billing by enabling the use of traditional payment instruments such as credit card payments and direct debits (bank account)

1.1.5.1 Billing on the Mobile Phone Bill

This type of billing incurs a post-paid payment settlement, due to the fact that the customer is billed after a good or service has been purchased (Kreyner et al., 2002).

Currently, one of the simplest and most common methods of paying for goods and services using a mobile phone is payment via a mobile phone bill. Operated by mobile phone operators, this is

billing system is usually targeted to low value micro payments, usually digital content. Payment to mobile phone bill is generally initiated by an SMS (Short Message Service), usually a PRSMS (Premium Rate SMS) text (Wilcox, 2010).

PRSMS is a mobile payment method where merchants and retailers can offer digital products and services via SMS text message, which customers pay to receive (Juniper, 2010). Each party (the merchant and the operator) takes a share of the revenue from the messages, which is charged to the customer on the mobile phone bill. With PRSMS, the payment can be made in one of two modes, either using MT (Mobile Terminated) or MO (Mobile Originated) (Ince, 2007). While MT represents the capability of the end-customers' mobile phone to receive the payments via SMS, MO allows end-customers to execute a payment by replying to a payment SMS (Moore, 2008).

Because of the high penetration of mobile communications all over the world, PRSMS billing boasts of a high level of accessibility. Another advantage for customers is that there is no need to formally register (ecommerce, 2009). In Great Britain, Vodafone m-pay is a special example of operator billing-based mobile payment, which can be used to pay for purchases on the Internet or at WAP sites. When a customer visits a merchant's Internet site and wants to make a purchase using m-pay, he or she logs in to the payment service by user name and password. In the service, the customer checks the details and accepts payment. The payment is then authorized and charged to the mobile phone bill (Mallat et al., 2004).

The main steps to make mobile purchase and get billed through the mobile phone bill are (Wilcox, 2010):

- The user discovers mobile content or services and chooses to buy
- The user is then redirected to the MNO site with the purchase transaction information, the transaction is authenticated and given advice of the charge
- The MNO checks the account whilst the user is then redirected back to the merchant with the authentication
- The content is delivered to the user

- The merchant confirms the purchase
- The user's phone account is debited.

1.1.5.2 Billing from Prepaid Accounts

Prepaid accounts, or cards, refer to payments in which the customer either buys a smart-card (contactless), where the money-value is stored and then pays off of this credit for goods or services desired, or he can upload a digital wallet with electronic coins on a prepaid basis. Subscription of special services is another prepaid method. One pays for something first and receives the service later on a special point of time. All of these prepaid services usually allow anonymity on the customer's side and are already used for electronic and mobile payments (Kreyner et al., 2002).

Consumers can also store prepaid money into SIM card (SIM application toolkit) or use a virtual bank account, which can be used remotely with SMS. In this case, SMS payments, excluding PRSMS, are when the mobile payment is initiated using SMS and the settlement process starts, as the funds are transferred from a registered account or a mobile wallet (Ince, 2007). The common denominator across the applications and services before mentioned is that they use SMS as the messaging technology to deliver the payment transaction, to receive the payment acknowledgment and for the exchange of service information (Wilcox, 2010). On the other hand, the only security requirement to complete a transaction with a prepaid type of payment is a PIN number (Nambiar & Lu, 2005).

Prepaid method's great advantage is that there is no possibility for any party to lose their money. There is no credit risk. But there are also drawbacks. One that is not usually mentioned is the lost interest for users. Having money in bank account is an investment, which increases the amount of money due interest rate. With this type of billing the operator or third party are getting the interest (Kalliola, 2004).

1.1.5.3 Billing from a Debit or Credit Account

While direct debits represent an instant payment, credit payment represent post-paid payments (Nambiar & Lu, 2005). With the debit approach, the customer maintains a positive balance of

the account and money is subtracted when a debit transaction is performed. With the credit approach, charges are posted against the customer's account and the customer is billed for this amount later or subsequently pays the balance of the account to the payment service (Abrazhevich, 2001).

Direct debit solution is convenient for users because it utilizes the current bank account and requires no additional administration from the customer (Mallat et al., 2004). The Malaysian company Ecapay offers an example of a mobile payment solution based on direct debit to a bank account. When making a purchase via Ecapay mobile payment service, the customer gives the merchant his or her mobile phone number. Ecapay IVR then calls the customer and asks for a PIN, which the customer enters via the mobile telephone keys to confirm the purchase and the payment is debited to the customer's mobile wallet. (Podolsky, 2009).

Billing through a credit-debit system occurs in different instances in which a mobile purchase takes place. Consumers can, for example, use a Mobile Web enabled mobile device to compare and purchase items over the internet (Tian et al., 2004). This type of online payments enables retailers to bill goods or services from a mobile web or a web site directly from a debit or credit card. Richer content such as gaming, music, and video is better paid for over the mobile web simply because of the ability to have previews before purchase, and because of the assurance of delivery (Ince, 2007)

U.S. based m-Commerce vendor mPoria provides services to mobile web-enabled retailers to sell their items. This is an example of a service in which customers can make mobile purchase via mobile web.

Figure 7: Mobile Web Purchase using mPoria (Ince, 2007)

Consumers can also download mobile applications (Apps) to their Smartphone of choice. These apps enable the customers to pay for goods or services via credit or debit card. For example, early in 2010, U.S. based company StoneRaven Media's launched an iPhone application called CardRaven that lets customers buy and send a physical greeting cards from their Smartphone (Harnick, 2010). In Europe, SBB Swiss Railways, offers travel information, real-time information following an incident, "Take me Home" function with GPS, plus the ability to buy (via credit card) and display tickets for public transport services (SBB, 2010):

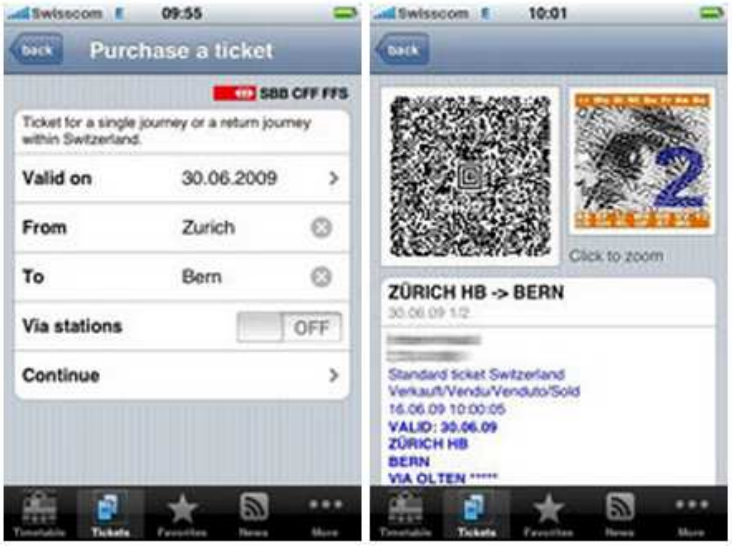

Figure 8: SBB Swiss Railway iPhone App

Another type of mobile payment billed through debit-credit system is the contactless, or "wave & pay" payment. This payment scheme uses NFC technology that can be presented in the form of a regular card (smartcard), or within a mobile phone through an embedded NFC contactless chip (Ince, 2007).

A solid example of a contactless mobile phone payment application is the one developed by NTT DoCoMo in Japan. An embedded NFC contactless chip developed by Sony, called FeliCa, allows users to pay via proximity with their mobile phones. Developed in 2004, now it reaches to more 500,000 merchants and close to 10 million customers (Times, 2010). On the other hand, some of the current contactless card issuers include American Express, who offers ExpressPay contactless technology through its debit and credit cards and key fobs, which can be linked to the

customer's credit or debit account. MasterCard also issues this type of payment technology through PayPass, marketed as Tap-and-Go (Atkinson, 2006). A more detailed list of contactless services will be provided later within the empirical analysis.

Payment solutions based on a debit-credit system require an agreement between customer and payment provider that authorizes the payment provider to divulge the customer information to merchant and charge the customer. Depending on the technology used, the transaction may require a PIN or a password. To proceed with a payment, customers select a product or service and the payment mode and authorize the transaction. The payment provider forwards the card/bank information to the merchant. The payment amount is deducted from bank account or credited to customers' account and paid to the merchant (Nambiar et al., 2004).

It is important to mention that this classification is not exclusive. For example, Mobile Wallets are pre-paid payment systems but can be loaded with a credit or debit card. Also, there are Smartphone Apps that allow the top up of pre-paid cards, as it is with Starbucks app. Other applications and web services require the creation of an account, where the customer is required to enter credit or debit card information before buying anything. Regarding contactless smart cards, they can also be used in the pre-paid format. The classification is a general estimate, based on previous research, on the different methods in which the payment is executed and settled.

1.2 Value Chain

As today's economy has gone digital, customer demand the combination of different entities to create and deliver value. No single industry alone has what it takes to establish the online digital economy; success requires inputs from diverse industries that have only been peripherally related in the past (Schleuter & Shaw, 1997). As a result, co-operation, collaboration and consolidation have been the key watchwords, as arrangements are struck between companies in complementary industries. Noticeably, companies in telecommunications, computer hardware and software, entertainment, creative content, news distribution and financial services have seized opportunities by aligning competencies and assets via mergers and acquisitions, resulting in a major consolidation of information-based industries (Barnes, 2002). Nowadays this consolidation can be witnessed by looking at how mobile payments create and deliver value.

Due to the fact that mobile payments encompass companies from different sectors, such as retail, financial services, and telecommunication sectors, its processing is prepared by a consortium of market players (Van der Heijden, 2002). The value chain is created when these players work together towards a linked set of activities with the objective of adding value to the end product (Bridgefield Group, 2006). The end product, in this case, is a secure and efficient mobile payment service that makes customers lives easier and at the same time benefits the economy by securing end-to-end straight-through processing (Tumpel-Gugerell, 2006). To achieve this, various roles need to be managed within the value chain. These include service or product providing, customer authentication, payment authorization and payment settlement (McKetterick & Dowling, 2003).

The following section aims at describing these market players, which are necessary to complete a mobile payment. For purposes of this research the value chain will be split in two groups of entities, Active Players and Passive Players. Active Players will list the entities that are part of the direct transaction between a merchant and a customer through a B2C model. Passive Players will represent the entities that allow Active Players deliver that transaction. Unlike Porter's Value Chain model, the model described in this section will point at the key players that have for responsibility to deliver value, instead of pointing main activities. Comparatively to Porter's

model, Active Players will represent the Primary Activities and Passive Players will represent the Support Activities.

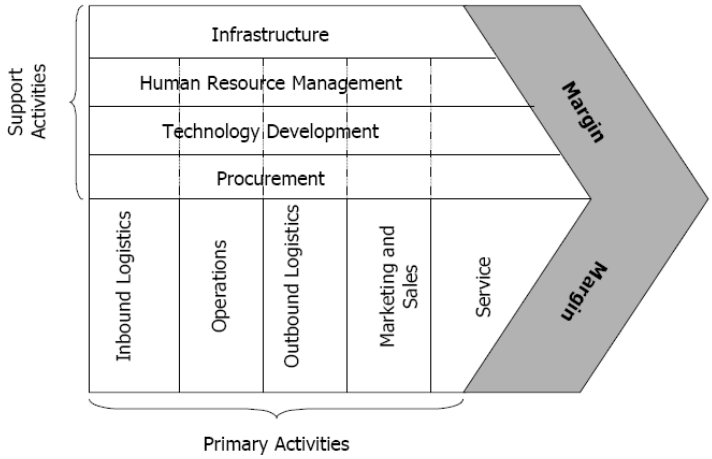

Figure 9: Porter's Value Chain Model (Recklies, 2001)

The following diagram shows an adaption of Porter's Value Chain Model to the Mobile Payment Arena. The different parts and entities of the diagram were picked from different literatures related to the Value Chain in mobile payments. Please notice the use of entities instead of activities.

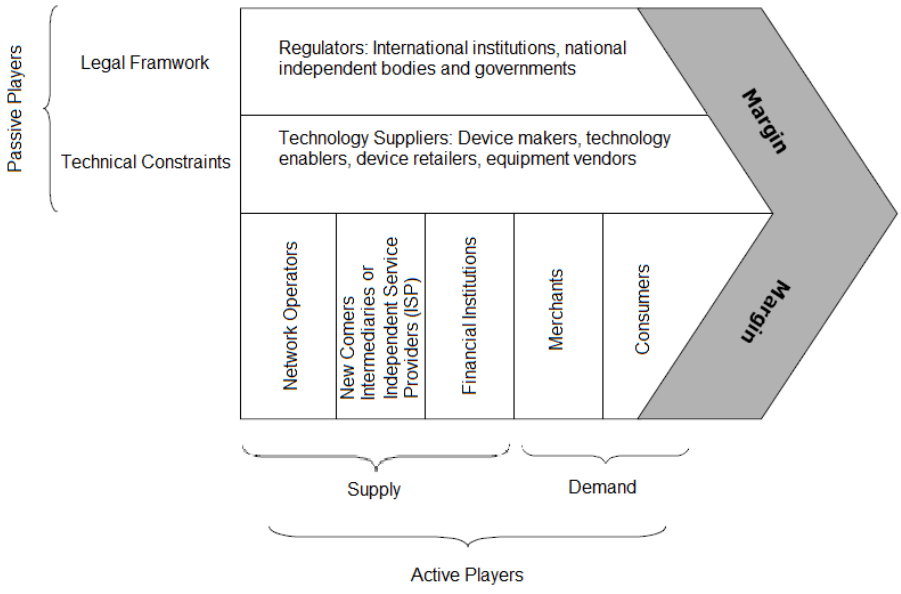

Figure 10: Mobile Payment's Value Chain, adapted from Porter's Value Chain Model

Please notice that the Value Chain can always vary depending on the business model used. Some of the main models include (Alliance, Smart Card, 2008):

- *Operator Centric Model:* Mobile Operator acts independently and acts as the sole link to deliver a mobile payment application from the merchant or content provider, to the end-customer. In this model there's no intervention from any other entity to clear and settle a payment. The billing for this model can be pre-paid or charged to mobile phone bill.

- *Bank Centric Model:* In this model it is only the Bank who deploys a mobile payment application and ensures that merchants acceptance. Again, only the bank deals with the clearing and settling of the payment, which is processed over a traditional financial network.

- *Independent Service Provider (ISP):* It provides secure payments between customers or between customers and merchants. Companies such as Obopay or PayPal deploy mobile payments solutions without the interference of Banks (Financial Institutions) or MNO.

- *Collaboration Model:* Banks, mobile operators and trusted third parties collaborate to manage the deployment of mobile applications. Such is the case with NFC enabled phones. Consumers phone would have an NFC chip, provided by a TTP, linked to a bank account (credit or debit) and at the moment of paying, the MNO could charge airtime minutes if the customer is required to go online. If not, then the participation of the other entities would still be necessary.

The models before mentioned describe how the different value chhain entities would interact depending on the business model. Regardless of their interaction, the Active and Passive players will still co-exist. Below is a description of these players and their role in the value chain.

1.2.1 Active Players

These are the entities that participate directly in a mobile payment transaction, from a merchant or service provider, to the end customer.

- Network Operators (Supply)

Also known as Mobile Network Operators (MNO) or telecommunications company (Telco), their main business is to provide network connections to mobile devices (Pousttchi, 2004) by enabling telephony and data communications. The convergence of the latest two brought together telephony technology such as GSM, GPRS, etc. and data communication technologies, such as WLAN, Bluetooth, NFC, etc.

Although MNO do not own the special reliability and security knowledge of financial institutions, their experience in conducting very cost-effective billing makes it a good candidate to be involved in the payment process. Their involvement in this process is well suited for micro payments of digital content, such as ringtones, etc. Many of the competing charging systems are just too expensive for the smallest transactions and this gives the mobile operators a competitive advantage over others.

Other advantages of MNO include the fact the they own the networks, they have the means to identify who uses their network, have the billing systems to charge its users, and more importantly, they own the relationship with the mobile phone user, which allow them to access a bigger customer base (Bray et al., 2001). The following graph shows the top 10 mobile network operators in the world in 2009. They are ranked based on their number of subscribers.

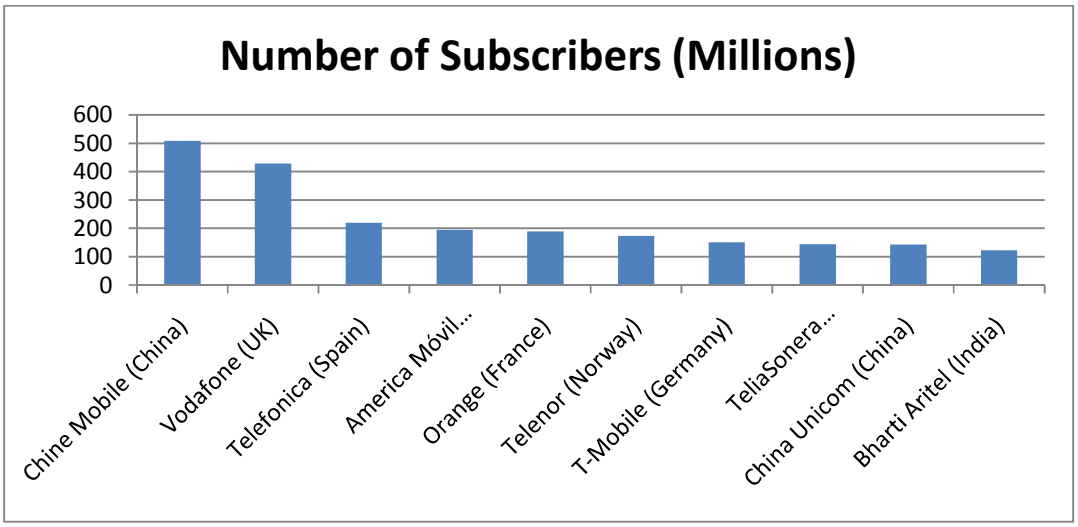

Figure 11: Number of Subscribers of the Top 10 MNO in the world in 2009. Adapted from (Company Logos, 2009)

- New Comers Intermediaries or Independent Service Providers (ISP) (Supply)

Their objective is to propose a well-integrated solution in the current mobile payment market with the current popular technologies in use such as SMS (Short Message Service) and USSD (Unstructured Supplementary Service Data). They use the mobile communication network to transmit the data and control the veracity of the payment process with a financial company (Ondrus, 2003). They are necessary within the value chain because of the missing standard that should exist to be used by MNO and financial institutions.

New comers intermediaries, or ISP, can be considered facilitators of the various mobile payment models (Adrian, 2002), and they do not affect the real-time transaction. Their main strength is that mobile payments procedures are its core competency and is the only type of mobile payment service provider (MPSP) who would be able to provide a financial institutions and MNO an independent solution (Pousttchi, 2004) . Because of this, they draw the future of mobile payments. However, their weakness is that they usually do not have a strong established brand name (Ondrus J., 2005).

Some intermediary new comers, or ISP, include PayPal, LUUP and Obopay (ReportLinker, 2006). All of these companies allow the customer to pay, send or receive money via their mobile devices. While they are not financial companies, they provide the link between the merchant, financial institution and the end-customer.

- Financial Institutions (Supply)

Financial institution comprises banks and card providers, such as Visa and MasterCard. Their main goal is to ensure integrity of the payment system and to reduce the risk of fraud. Their main advantage is their already existing customer base. Also, because of their core business is the completion of payments, financial institutions are widely trusted by customers, as they have experience recognizing fraud, checking of credit-worthiness and management of claims (Pousttchi, 2004). Unfortunately, on the other hand, financial institutions do not own the networks, neither own, manage or control the devices from which their customers initiate a mobile payment. Also they are limited in their ability to support billing of large volumes of small transactions (Bray et al., 2001).

Within the phases of mobile payments, financial institutions can be Payment Service Providers (PSP), by offering their customers mobile payment solutions or they can be Third Trusted Party (TTP), in which they can clear or settle a payment (Kreyner et al., 2002). Whether they are one or the other, financial institutions are constantly looking for the opportunity to develop systems in which mobile phones can be used as a personal secure payment terminal (Jyrkönen & Paunonen, 2003).

Different payment schemes exist where a bank will deduct payment from a mobile user's account to pay for a service or virtual product. In fact, financial institutions around the world are implementing mobile banking service, to allow its customers check their balances, transfer money, buy stocks, and/or pay their bills. These options are embedded into what is called Mobile Banking. For example, In the U.S., Bank of America's mobile banking service allow customers to check their balance, transfer money and pay bills via text message, mobile web (WAP) and downloadable application for Smartphones (America, 2010).

On the other hand, credit card companies are issuing contactless cards to customers through banks. These cards, depending on the bank, can be pre-paid, debit or credit. The main benefit of these cards, for financial institutions, is the absence of MNO intervention within the payment process and their direct relationship with the customer. Some banks around the world issuing these cards include: Chase, Bank of America, Wells Fargo, Fortis, Barclays, among others.

- Consumers and Merchants (Demand)

The customer is the person owning the mobile device and is willing to use it to pay for a service or product. Besides representing the major target for all mobile payments initiatives, they also have the power to determine its success, since they decide if they want to use a mobile device for monetary value transactions. Their main expectation is that their payments have to be fast, easy, personalized, and secure (McKetterick & Dowling, 2003).

The content provider (CP) or merchant, depending on whether digital content or physical goods and services are being purchased, is someone or some organization that sells products to the customer. Their roles may include: forwarding purchase requests to the Payment Service Provider (PSP), relaying authorization requests back to the customer, and delivery the content.

They also want any payment scheme to facilitate swift and easy completion to ensure they get paid on a timely manner (Ondrus, 2003). Their main motivation to implement mobile payment is to make the customer transaction convenient, quicker, and location independent, to encourage impulse payments, and thus profitability and volume of sale (Bray et al., 2001)..

The following diagram show how, in a B2C scheme, all these entities interact within a mobile payment transaction.

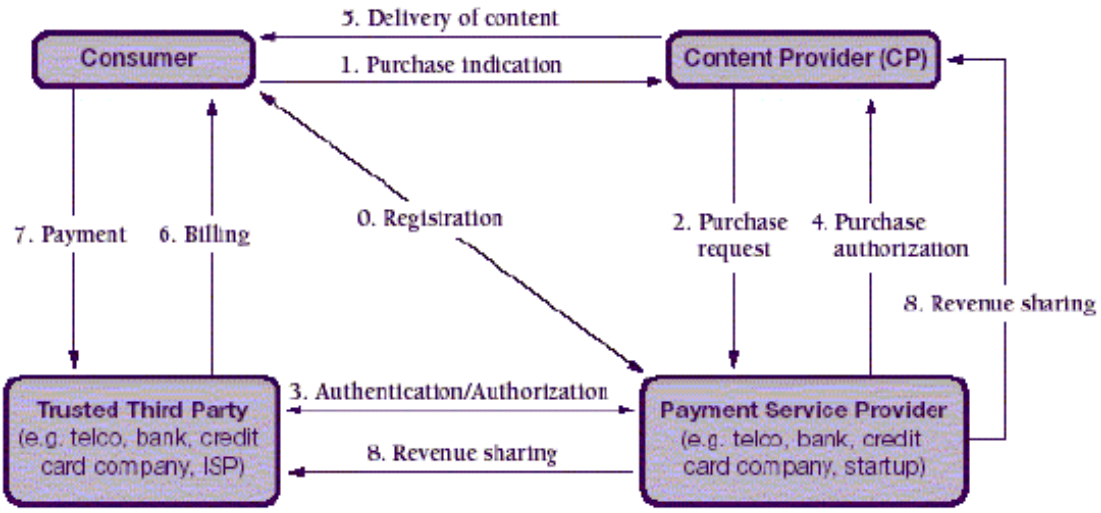

Figure 12: Mobile Payment Phases (Ondrus, 2003)

As you can see in the above diagram, network operators (Telco), financial institutions and service providers (new comers and independent) can act as Trusted Third Party or direct Payment Service Provider (PSP) to settle a transaction

The PSP is the party responsible for the payment process. They control the flow of transaction between the mobile customer, the content provider and the TTP. On the other hand a Trusted Third Party (TTP) is a company used to perform the authentication and the authorization of transaction parties and the payment settlement. TTP's main role is authentication and authorization of payment requests (McKetterick & Dowling, 2003).

1.2.2 Passive Players

These players are the ones that allow a mobile payment transaction to take place, in an indirect manner, by providing the necessary regulations and technology.

- Legal Framework - Regulators

This group is constituted by the different international institutions, national independent bodies and government regulations. Their main role is to make the rules that control mobile payment applications (Ondrus, 2003). Although they have the capability to promote and develop widely use standards, they can also set entry barriers to mobile payment related companies.

Some international groups that have been formed to promote the standardization of mobile payment in some type of way include (Lalopoulos et al., 2006):

- *Mobile Payment Forum:* A global, cross-industry organization aiming to develop a framework for secure, standardized, and authenticated mobile payment that encompasses remote and proximity transactions, as well as micro-payments. It also is taking a comprehensive approach to the mobile payments process and creating standards and best practice for every phase of a payment transaction, including the setup and configuration of the mobile payment devices, payment initiation, authentication, and completion of a transaction. Members include American Express, Master Card, Visa, Japan Card Bureau, Nokia, TIM, and so forth.

- *MeT—Mobile Electronic Transaction:* It was founded to establish a common technology framework for secure mobile transactions, ensuring a consistent user experience independent of device, service, and networks, and building on existing industry security standards such as evolving WAP, WTLS, and local connectivity standards such as Bluetooth. Members include Ericsson, Motorola, Nokia, Siemens, Sony, Wells Fargo Bank, Verisign, Telia, and so forth.

- *Mobey Forum:* A financial industry-driven group, whose mission is to encourage the use of mobile technology in financial services. Activities include consolidation of business and security requirements, evaluation of potential business models, technical

solutions, and recommendations to key-players in order to speed up the implementation of solutions. Members include ABN AMRO Bank, Deutsche Bank, Ericsson, Nokia, Siemens, Accenture, NCR, and so forth.

- *Open Mobile Alliance (OMA):* The mission of OMA is to deliver high-quality, open technical specifications based upon market requirements that drive modularity, extensibility, and consistency among enablers, in order to guide industry implementation efforts and provide interoperability across different devices, geographies, service providers, operators, and networks. Members include Bell Canada, British Telecommunications, Cisco Systems, NTT DoCoMo, Orange, Lucent Technologies, Microsoft Corporation, Nokia, and so forth.

- Wireless Advertising Association: An independent body that evaluates and recommends standards for mobile marketing and advertising, documents advertising effectiveness, and educates the industry on effective and responsible methods. Members include AT&T Wireless, Terra Lycos, Nokia, AOL Mobile, and so forth.

In different countries, or communities there are different local entities or governments that control or regulate the payment system, including mobile payments. For example, In Europe, the European Commission (EC) influences the mobile payment industry through support research, design and development of new innovative mobile payment services. The EC also adjusts the legal and regulatory framework in order to ease pan-European mobile payment services (Karnouskos & Vilmos, 2004). Under the EC there are certain directives that have the power to create and administer policies, regarding payment systems in general. Such directives include (Adamec et al., 2009):

- *The E-Money Directive (EMD) 2000/46/CE:* It relates specifically to e-payments, and seeks to open the market for the issuance of E-money to non-banks through the creation of Electronic Money Institutions (ELMI) regulated under a lighter prudential regime than that required of credit institutions.

- *The Payments Services Directive (PSD) 2007/64/CE:* Its function is to set out levels of information access, obligations and liabilities on the payment processors, such as

banks and credit card companies. PSD is part of the direct action in the aid of creating a common market of payment services.

- *The Single European Payment Area (SEPA):* Launched in January 2008, its function is to open cross-border credit and credit-card services to EU wide competition.

Later on this research, specific examples will be given regarding the legal framework in the U.S. and the U.K's.

- Technological Constraints – Technology Suppliers

Mobile equipment manufacturers, technology enablers, device retailers, and equipment vendors are all part of this group. The objective of these entities is to provide new technologies to the mobile communication market. Their role is crucial because they continuously improve devices that will enable an easier and more secure mobile payment process (Ondrus, 2003). In the case of retailers and vendors, they have the responsibility of being the link point between manufacturers and customers by supplying the mobile devices.

Technology enablers include the mobile application developers that offer downloadable applications, which users can put into their devices to view cards, balances and transactions. Also those entities that provide secure chips for storing card information (Tyagi, 2010).

In the case of mobile manufacturers, their importance lies in their capability to provide the necessary technology to support mobile payments. Some of the technology necessary includes Bluetooth, WLAN among others, which are still very uncommon. Although other, more common, technologies may be available for mobile payments, such as SMS/MMS or SIM cards, the manufacturers still have the responsibility to provide newer and better technology to execute mobile payments (Pihlajamäki, 2004). The following graph shows the largest mobile manufacturers in the world and their market variation between 2008 and 2009. As you can see, the Finnish company Nokia leads the way in this field.

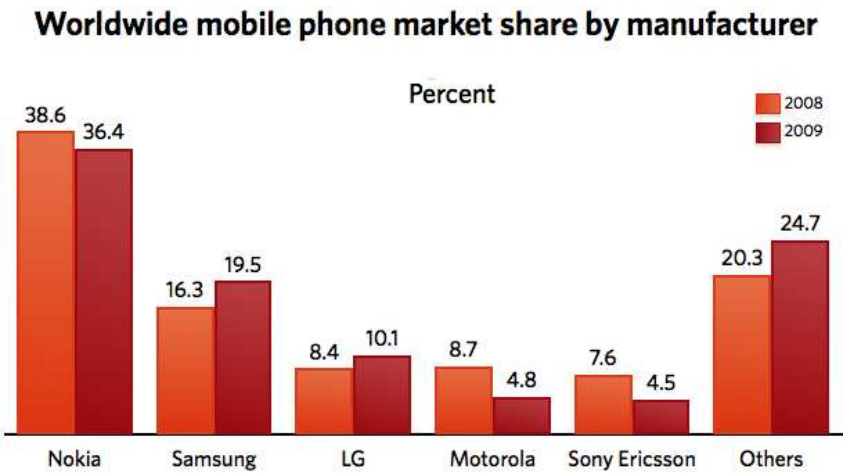

Figure 13: Mobile Manufacturers Market Share (Foresman, 2009)

1.3 Mobile Payments Classifications

The purpose of this section is to identify and interpret the different types of mobile payments, first, by explaining the types that co-exist, and then by explaining how they can be categorized based on previous research.

1.3.1 Mobile Remote vs. Mobile Proximity Payments

There are two principal types of mobile payments: Remote and Proximity (Terol & Light, 2008).

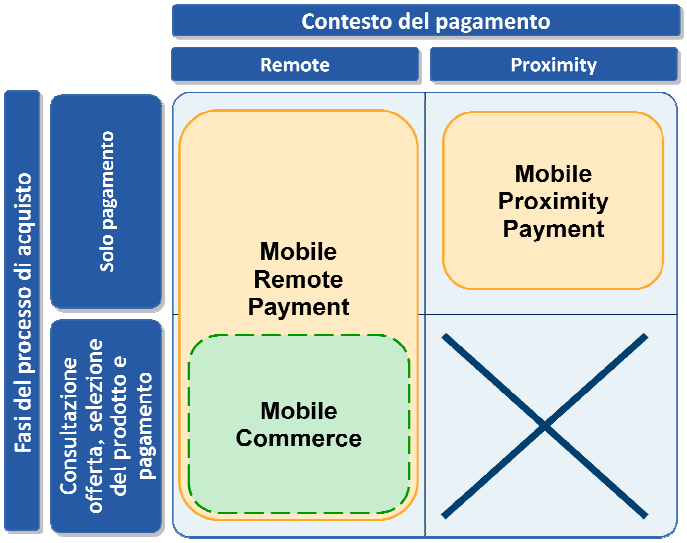

Figure 14: Remote vs. Proximity Payments

1.3.1.1 Remote Mobile Payments (RMP)

RMP refer to payments made when the buyer and seller do not physically meet to exchange goods or services (Saji, 2006). In other words, they are not in the same place during the transaction. RMP can take place through a Virtual POS or POS m-Payment. While Virtual POS allow customer to pay for products and/or service through fixed internet or WAP, POS m-Payments allow users to pay using their mobile device in a real store (Zmijewska et al., 2004). Regardless, its major benefit remains that the customer does not need to be present at the time of the purchase (Ondrus & Pigneur, 2004). Unlike other payments, this type of payment requires be initiating and settling through a mobile cellular phone network in combination with an associated

payment network. These payments rely on SMS text messaging, wireless Internet technology, or a downloaded application in order to execute the payment (Cheney, 2008).

More specifically, RMP can be executed through services such as (Schmeltzer et al., 2007):

- *Mobile Wallet:* It provides customers with a user-friendly way to pay for goods and services, using a WAP-enabled mobile device, on either WAP or the Internet with a selection of shops that have partnered with specific service providers (Ramasastry, 2005). The following diagram shows the functionality of a mobile wallet.

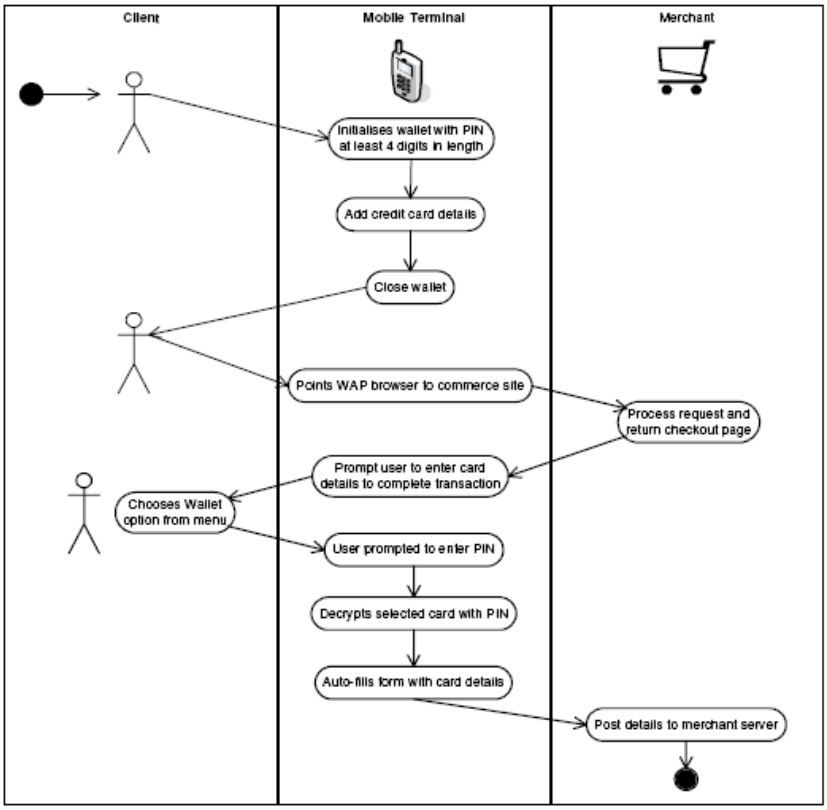

Figure 15: Mobile Wallet Functionality (Garner et al., 2006)

- *Text Based:* Consumer sees an advertisement and texts the number shown to purchase item. In this case the funds are transferred from the customer's registered account or mobile wallet. The registered account could be debit or credit. Operators using this scheme include PayPal Mobile and SmartPay in China (Ince, 2007).

Figure 16: Text Based Remote Payment (PayPal, 2010)

- *Regular Mobile:* Consumers use Mobile Internet Browsers to pay for goods and services over specially enabled websites.
- *Special Mobile:* Payments are made over the Internet using a phone ID and PIN.

Remote Payments take place within five different types of models. These are: Business to Consumer (B2C), Business to Business (B2B), Consumer to Consumer (C2C), Person to Person (P2P) and remittance. These can be further categorized as commercial transactions (B2C, B2B and C2C) and private transactions (P2P and remittance) (Choi et al., 2007).

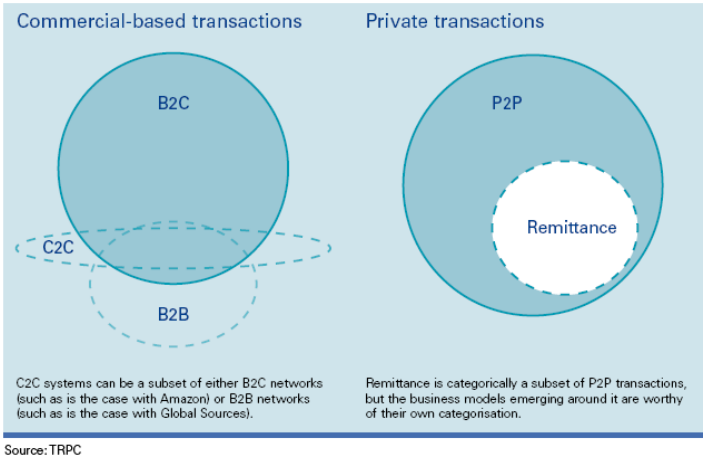

Figure 17: Mobile Remote Payments Models

Commercial-Based Transactions

- *Business to Consumer (B2C)*

B2C represents, in this case, a remote transaction in which a customer purchases a product or service from a merchant (Miller, 2001). Currently, most of the service scenarios deal with the exchange of products, services or information between businesses and customers. B2C service scenarios can be further divided into different categories corresponding to different m-commerce areas (Panis et al., 2002):

- Financial Services

The user experiences financial and payment related services via mobile device. The best example for this service is mobile banking, which provides the customer with time and place independence through the following services (Schmeltzer et al., 2007):

  - Account management and customer service: Consumer obtains account summary information, views unbilled transactions and statement transactions, and makes payments.
  - SMS Alerts: Bank notifies customers of account activity (e.g., balance, new transactions, etc.) via SMS.
  - Funds Transfer: Transfer of funds to another bank (subject to a limit, depending on the bank).
  - Bill Payment: Made to selected bill payers set-up by customer through a downloadable application or via WAP.

Current providers of mobile banking include, but are not limited to: Citibank (US), First Direct (UK), MPower (India), and La Caixa (Spain).

It is important to mention that, these types of service generally require that the customer creates an account online first, and setup some type of username of password.

- Mobile Information Provisioning

This includes services like Mobile Alert, Maps and Routing Direction, and Location Based Information. The information comes mainly either from users' private data like

calendar or address book, or it is content made available by a mobile shop or a Content Service Provider.

- Mobile Entertainment

This type of B2C transaction provides customers with entertainment during their leisure time (Baladi & Thaung, 2002). Mobile entertainment services and games are applications that provide entertainment to users on a per event or subscription basis. These could be on-demand, audio on-demand, and interactive games (Sheik, 2006).

- Mobile Shopping and Local Services

Mobile shopping allows customers to shop for goods and services remotely, anywhere and anytime, with a mobile device. On the other hand, certain local services allows customer to remotely purchase goods without a necessary physical interaction, but close to the actual POS. An example of such transaction would be a customer texting a Coca-Cola vending machine to purchase a soda.

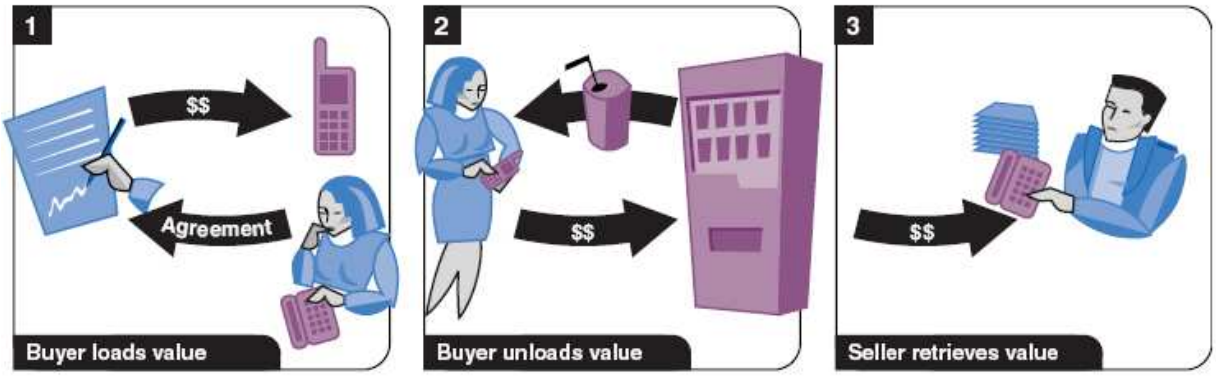

Figure 18: Example of a Local Remote Transaction (Bray et al., 2001)

Overall, B2C interactions represent a communication between a merchant and a customer. This interaction allows the purchase of goods and services with the help of a mobile device. The term B2C is analogue to P2B (Person to Business), since it represents exactly the same payment interaction as B2C.

- *Business to Business (B2B)*

B2B transactions represent the use of Web-based technologies to buy, sell or exchange information between two or more companies. B2B transactions can take place directly between companies or through a third party (an intermediary) who helps match buyers and sellers (Jewels & Timbrell, 2001). The objective of B2B transactions, applied to RMP, is to facilitate business process by providing industry solutions. Examples of B2B applications include procurement, Customer Relationship Management (CRM), billing, accounting, human resources, supply chain, and manufacturing (Medjahed et al., 2003).

In the case of a car manufacturer, these applications can be used to facilitate the purchase of all the elements, such as tires, metal, glass, etc., to completely manufacture the vehicle and sell it to the public.

- *Consumer to Consumer (C2C)*

C2C remote payments involves a transaction between customers, through a third party or business platform, to facilitate the exchange (Haag et al., 2006). The third party or business platform is present to match customers and don't have any type of responsibility for the quality of the products or services offered.

The following are a few examples of C2C applications (Choi et al., 2007):

  - eBay, which represents an online auction in which a customer posts an item for sale and other customers bid to purchase it.
  - PayPal, which has facilitated C2C e-commerce by holding customer's money in escrow accounts until the customer confirms the receipt of goods
  - Craiglist, which allow customers to post products or services through an online plattform, available to other customers to see and possibly purchase.

Private Transactions

Remittances can be viewed as a subset of P2P transactions, since it it is only a one way transaction. For example, a parent using their mobile device to remit a taxi fare for their child

across the city, or a domestic worker in the remitting their monthly wages to their family in another country (Choi et al., 2007). However, P2P transactions are much more than this. P2P payments are when funds are transferred between mobile phone users and then the funds are redeemed for airtime, goods or cash at selected merchants. P2P is seen as a social money payment mechanism in the developed world, for instance, to allow a group of friends to share payment for dinner at a restaurant or for parents to send funds to a child at college to pay for school books etc. In the developing world P2P has considerable potential to act as a major payment method as often there is a lack of traditional payment and banking infrastructure in these economies (Wilcox, 2010).

1.3.1.2 Proximity Mobile Payments (PMP)

Unlike RMP, for a PMP to take place the customer must be physically present at the merchant's POS (Dewan & Chen, 2005). To complete a transaction, the customer must initiate the payment using a mobile handset at the POS by passing the handset across a "reader," which scans the handset and completes the transaction using the financial information (credit card, debit card, etc.) stored on the handset (Terol & Light, 2008). With the advances of technologies, customers can also pay for merchandise, via proximity, with other wireless technology enabled devices, such as credit or debit cards, key fobs and watches (Lee et al., 2005).

Some of the ways in which PMP can be executed include (Schmeltzer et al., 2007)

- *Point & Buy:* Payments using infrared technology in mobile devices at (primarily) unattended vending terminals.
- *Text & PIN:* Text-based message communication between the purchaser /provider and provider/merchant.
- *Contactless:* Consumer waves a mobile device with embedded NFC chip over contactless reader to enable payment via registered payment method (Kadambi et al., 2009).

Figure 19: Proximity contactless payment applications with NFC enabled mobile devices

The most common and promising form of PMP is contactless payment, which is seen most commonly in smart cards and key fobs, but the latest form comes by way of mobile phone (Espin, 2008). PMP occurs when a mobile device communicates wirelessly with a reader at the POS, or with another mobile device with similar capabilities, through a short-range radio interface, usually at a distance under 0.1m (Andreoli, 2008). Some of the wireless technologies that allow this short-range radio interface are: Bluetooth, WLAN (802.11), infrared, RFID and contactless chip (NFC) (Pihlajamäki, 2004). Among all the available technologies, NFC is the forthcoming standard being promoted by the global trade association (GSMA), plus standardization bodies, bank associations, card companies, and handset makers (Andreoli, 2008). Section 1.6 will describe in detail the technologies applied to mobile payments.

Some of the application of PMP include, but are not limited to (Durix, 2004): Payment of product or service at merchant's POS, transportation, event ticketing, corporate control (access + time stamping) and tracking of workforce.

Figure 20: Bip! is an example of a PMP service used to pay for transportation in Chile

1.3.1.3 Comparison between RMP and PMP

The technical solutions to make mobile payments possible, secure and easy to use already exist. The focus has been given to using existing technology as much as possible to reduce the costs and ease the roll-out of mobile payments (Pihlajamäki, 2004). For PMP user would needs a modern mobile phone, or device to be able to use advanced technologies, like RFID or NFC, for local payments, which may inquire higher costs. On the other hand, RMP entails the use of technology already available, and thus at a lower cost.

Some of the main differences between RMP and PMP include (Dewan & Chen, 2005):

- *Enabling technology:* RMP depend on cellular technology to complete the transaction while PMP depend on RF or NFC technology. RMP rely on SMS text messaging, wireless Internet technology, or a downloaded application in order to execute the payment (Cheney, 2008). PMP requires the physical implementation of more sophisticated technology, such as Bluetooth, NFC and RFID.

- *Transaction process:* RMP are initiated by either using the mobile device's WAP browser or dialing the merchant using a cell phone. In case of dialing, applications require the customer to dial a payment-provider to initiate the payment. The customer then authorizes the payment by providing a PIN or password using the cell phone's keypad (Dewan & Chen, 2005). PMP are initiated by presenting the payment device within inches of the merchant's RF or NFC enabled reader. Then, the payment information is transmitted wireless over short distances (few inches), where the communications is direct between two devices without the need for a network or network routing (Schutzer, 2010).

- *Spatial distance:* RMP are made from anywhere cellular signals are available. Consequently, the customer and merchant do not have to necessarily be in the same vicinity. Conversely, PMP have to be made at a merchant's physical location.

- *Transaction time:* Even using speed dial and other inherent cell phone features, RMP are slower than waving a contactless device over a reader to initiate PMP, especially if manual data entry is required (Chen et al., 2006). This, because RMP rely on over the air

networks, which could not always work at the same speed, or that the mobile device is completely charged, which is not always the case. PMP allow customers to quickly tap the device on a reader without having the need of relying on a cellular signal or battery life to exchange data (Durix, 2004).

- *Authentication strength:* RMP can authenticate the customer by requiring them to enter a PIN or a password using the cell phone's keypad. During PMP transactions, the customer waves the contactless device over a reader, and additional authentication, if requested, is dependent on the merchant's risk tolerance strategy.
- Security: While RMP' Cryptographic capabilities are unlimited, PMP's are very limited.

Table 5: Summary of Comparison between RMP and PMP

Criteria	RMP	PMP
Enabling Technology	Cellular Technology	RFID, Bluetooth and NFC
Transaction Technology	WAP or dialing the Merchant	Present the payment device within inches of the merchant's RF or NFC enabled reader.
Spatial Distance	Anywhere where cellular signals are available	Merchant's physical location
Transaction Time	Slower (rely on Network)	Faster (tap)
Authentication Strength	PIN or Password	After waiving device, further authentication depends on Merchant
Security	Unlimited cryptographic capabilities	Limited

Regardless of their differences, both types of payment have the same primary business drivers, which are:

- Increase the number of transaction and revenue
- Increase acquisition, activation, and retention rates
- Improve operational efficiency
- Opportunities for data mining

1.3.2 Mobile Payments Categorization

Establishing a good way to categorize mobile payments allows researchers to organize their knowledge. It also enables a better understanding of the current scenario, and provides a summary of what is happening (Zmijewska et al., 2004). The different dimensions allow a more complete view of mobile payment.

Besides allowing a complete view of the current situation, classifying mobile payments allow researchers to predict future trends. Having different dimensions when looking at mobile payment systems provides a framework of work, which allow researchers and proper stakeholders to make conclusions about what makes a system successful. Moreover, it can determine specific categories or dimensions that are doing better or worse than others.

The categories considered within the mobile payment classification framework can be very minimal. Seah et al. (2001) proposed only two categories to analyze mobile payments: devices with applications, and devices without payment applications. Xi & Han-Ping (2007) proposed a classification of mobile payments depending whether the transaction took place via internet, at a POS or through an application. In 2002, Kountz's classification of mobile payments was equally basic. The dimensions included: value of payments, settlement methods, and content type. Besides it included whether the money came from a mobile device, smart card or a regular bank account. In 2008, Madlmayr stated that a good classification of mobile payments was determined by the amount of money spend (micro vs. macro payment), type of POS (proximity vs. remote), Clearing and settlement method (prepaid, post-paid, in-time paid) and Operation Methods (online, or offline).

Buhan et al. (2002) propose a more detailed analysis. They believe that potential systems fall into the following categories: transaction settlement (pre-paid or post-paid), transaction type (pay per view, per unit, subscription), content type (ticketing, voting, digital goods, hard goods), and content value (micro or macro). To evaluate several current solutions the authors use a table where one more category is added: level of upgrade/customization needed (for customer, merchant, PSP, or third party).

A more comprehensive view of the different mobile payment dimensions is introduced by Telecom Media Network (2003) and adapted by Ondrus (2003).

Table 6: Mobile Payment Dimensions introduced by Telecom Media Network and adapted by Jan Ondrus

By means	**Cash, Paper** (Cheques, Bankers draft), **Card** (Credit, Debit, Smart), **Electronic** (e/m-commerce, virtual money, e-wallet, stored value account), **Tokens/money surrogates**
By size	**Micro-payments** (generally below 10 Euros), **Macro-payments**
By place of Purchase	**Real-world or F2F**, **Remote** (Internet, Mail and telephone orders)
By Seller/Buyer Origin	**B2B** (rare for m-payment), **B2C**, **P2P**
By Type of Purchase	**Physical goods, Digital/electronic goods, Rights** (rich media)
By Clearing and Settlement Method	**Bilateral, Multilateral** (joint clearing house), **Using intermediaries**
By Type of Transaction	**Pay Per View** (PPV), **Pay Per Unit** (PPU)
By Time of Payment	**Pay now** (debit), **Pay later** (credit), **Pre-pay** (against stored value)
By Geography	**Domestic, Cross-border, Single currency, Multiple currency**
By Location of Payer's Account Details	**Network-/server-based, Device (client-based), Chip (client-based)**

Unlike other mobile payment classifications, this one provides a wider range of dimensions to better determine mobile payment trends.

Ondrus (2003) found the previous table a bit restrictive, so he came up with his own multidimensional mobile payment classification framework. Unlike the Telecom's table, this one classifies the system in types (client-based, server-based and hybrid solutions), then select who the provider(s) is or are (mobile network operators, financial institutions, newcomers/intermediaries), define the type(s) of relationship that the payment system can handle (B2C, P2P), determine the location(s) where the transaction can happen (face-to-face and remote) and at last the time when the payment is completed (pre-paid, direct pay, post-paid).

Table 7: Ondrus' multidimensional table

Name Of The Existing System	M-Payment Solution Type			Dimensions									
				Mobile Payment Solution Providers			Relationship		Location		Payment Time		
	Client-based	Server-based	Hybrid	MNO	Financial Institution	Newcomer/ Intermediary	B2C	P2P	F2F	Remote	Pre	Direct	Post

Zmijewska et al. (2004) designed a mobile payment classification framework from the customer's point of view (User-Centric). The purpose of this framework was to decompose different mobile payment systems from the customer's point of view, so researchers could draw conclusions on which features make customers accept a specific mobile payment system. The following table shows the proposed framework dimensions.

Table 8: User-Centric classification Framework

Change of phone requirement
Registration requirement
Available phone operating company to which the user has to subscribe
Available applications
Communication of consumer's number to start transaction
Communication of transaction details to user
Acceptance of transaction by user
Confirmation to customer
Payment occurrence
Brand visible to consumer
Value of payment
Registration fee (yearly)
Transaction cost for consumer
Time of transaction

Heinomen and Pura (2005) proposed a four-level framework for classification of mobile services. Their classification represents aspects that influence the value of mobile services. Their framework classifies mobile payment by consumption type (news, parking payments, music downloads, friend finder, mobile chat, games and ringtones), temporal and spatial criticality (time-tables, tram ticket payment, location directions, stock quote request, music download, games), social interaction and environment (weather reports, m-banking, friend finder,

multiplayer games, mobile chat, search for directions, and presence service), relationship, based on their frequency of use and customer relationship.

On the other hand, institutions such as the Electronic Payment Systems Observatory have been able to establish their own mobile payment classification framework, which, unlike previous classifications, it included internet payments (not only mobile). Their classification framework categorizes each system as follows: initiated by (bank /near-bank, non-bank, mixed profile), status (pilot/announced/terminated), prepaid (smartcard based/software based/dedicated account), virtual accounts channeling systems, near bank (credit/debit), value (micro/macro), mobile payment or extended over mobile, cross border potential, user cost, loyalty scheme, real POS, virtual POS, and combined with electronic banking. Unfortunately, the categories do not seem to give a clear picture of each system. Many of them depend on the attributes of the preceding one. Some categories only require a mark on the table, indicating a presence or absence of a feature, whereas others require possible listings (Carat, 2002).

Because of the wide number of researches done on mobile payments classifications, different classifications have taken place, some with very few criteria and others more complete. Reviewing at the different payment classification frameworks will allow the construction of a unique method to provide a better picture of mobile payment services and trends in the U.S. and the U.K.

1.4 Issues Governing Mobile Payment Applications

The literature reviewed for this section aimed at describing the main issues that govern mobile payment applications. The main issues reviewed include:

- **General Acceptance**

This tends to be the chicken and the egg problem. On one hand, customers will not use the procedure unless a significant number of merchants accept it; on the other hand merchants will not be willing to accept the procedure unless a significant number of customers use it (Pousttchi, 2004). At present, there are not enough opportunities for customers to use and become familiar with mobile payments. Mobile payments should not be exclusive to customers of certain financial and telecommunication service providers but widely available for all customers of different banks and mobile operators, so mobile payments can reach a critical mass (Mallat, 2006). Reaching a critical mass of users is crucial. The unavailability of a sufficient range of services and inadequate demand can reinforce each other in a downward spiral, and thus conclude in failure (Saji, 2006).

Upgrading terminals and mobile devices is certainly another hurdle in the process. Switching technologies is not free. For example, contactless payments rely on RFID technology; therefore, merchants must have an RFID reader incorporated into their payment terminal. To upgrade existing terminals with such capability increases merchants' acceptance costs. To date, payment networks have made only limited investments in helping some of the larger merchants, such as McDonald's, to offset terminal replacement costs, estimated to be US$100 per terminal (Boyer, 2008). As of 2006, industry estimates show that the number of merchant acceptance locations for contactless payments in the U.S. is about 45,000 outlets (Balaban, 2007). This compares with a total of over 6 million acceptance locations for MasterCard and Visa credit and debit cards, or a penetration rate of less than 1 percent among merchants. A study by the Aite Group estimates that the penetration of contactless-enabled merchant locations in the U.S. will reach only 2.5 percent by 2014 (Aite Group, LLC, 2008).

Not only infrastructure costs limit mobile payment acceptance, but also transaction costs, which can be very high in the case of micro purchases. In the US, 40 percent of online merchants want

to offer items for fewer than US$10, but transaction fees of most payment procedures do not allow this in a cost-effective way (Kreyner et al., 2002). In most cases merchants have to pay between 3 percent and 5 percent, which makes it a system of low attraction for them. They would rather have the customer use a less costly method (Ding & Hampe, 2003).

On the other hand, some costs are transmitted to customers. In some cases they must pay a premium price. For example, if the customer uses SMS to remotely pay for an item in a vending machine, the item paid for with a mobile phone cost commonly more than the same item paid for with cash (Böhle et al., 2000). If using NFC technology to pay, customers should also replace their current phone, which incur a higher, and not desired, cost for customers. SMS based mobile payments could be very expensive to merchants as well, as SMS operators retain up to 50 percent of each transaction(Garner et al., 2006). Saji (2008) divides costs in direct relationship costs, which are considered to be the expenses that the user has to incur to be able to use the payment solution, and indirect relationship costs, which are those that occur if the offering does not function as promised and psychological costs materialize when a customer fears that problems will occur in the relationship.

Another issue that restrains mobile payments from being widely accepted is the complexity of mobile payments using SMS. The formats are often complicated and slow to key in, various payment codes and premium service numbers are difficult to remember, and instructions for making payments are difficult to find. In addition to SMS, complex registration procedures and separate billing arrangements can cause additional complexity in payment system use. Separate accounts for mobile payments require money transfers to and from the mobile account and because it is difficult to follow up the mobile account's balance, it could generate conflict (Mallat, 2006).

Lastly, another important issue that affects the general acceptance of mobile technology is the value proposition. It is highly unlikely that the average user will embrace mobile payments just for the sake of technology. There has to be something more to draw him away from other set payment methods. An important ingredient for uptake of solutions is an acceptable value proposition. Disparities in success of individual solutions can be traced to the lack of value propositions answering specific needs of the customers (Saji, 2006). For example, to be able to

conduct proximity transactions will require the customer to purchase a new handset with new technology. Therefore, customers must see enough value in mobile payments that they will readily spend the money to upgrade to the new phones (Terol & Light, 2008). Unless mobile payments offer a clear value add over set methods the user is unlikely to use these methods over existing solutions like cash and credit cards.

- **Coordination**

Multiple industries may participate within a mobile service, including financial services firms (both banks and nonbanks), telecommunications companies, technology providers, and handset makers. Such broad participation can make this market complex. The most basic obstacle is the issue of who owns the customer relationship. At this point in time, there is no clear answer. Although every entity would like to be the main conduit to customers, one ultimately must emerge to avoid confusing customers and hampering the roll-out of the channel because of lack of ownership clarity. In the U.S., this coordination problem relates to how telecommunications companies and card issuers address the business model economics of such programs. Telecommunications companies control the mechanism through which such mobile banking and payments are initiated: the mobile cellular phone. On the other hand, bank card issuers or their card networks are responsible for all aspects (authorization, processing, settlement, fraud risk, and customer service) of the banking or payment process once instructions have been transmitted from the mobile cellular phone to either the financial institution or the merchant terminal. The question arises as to how to share or appropriate revenues among telecommunications companies and others, such as third-party technology providers and handset makers, and bank card issuers and their networks. Their respective regulatory agencies will also need to consider how to coordinate in areas such as compliance issues, customer protection policy, nonbank controls, and data security guidance. Ultimately, the objective is to develop a supportive regulatory structure that balances innovation in mobile financial services with the regulatory responsibilities. Moreover, to the extent that mobile financial services, such as mobile-based money remittances, involve international transactions, coordination will also become necessary among international regulators to focus on areas such as money laundering and cross-border fraud perpetrated via mobile payment devices (Cheney, 2008).

- **Physical Form**

The fact that there are many forms to make a mobile payment can be confusing to customers. Although both methods (with mobile phone and smart cards) could be highly effective, one must prevail to provide a certain standard. Mobile phones seem to be a good candidate since the market penetration is very high. However, smart cards are also very attractive for many types of purchases. Moreover, they are cheap and more reliable than mobile phones in general. Furthermore, financial institutions prefer using a device they can operate, as opposed to any mobile device related method that is totally controlled by the mobile network operators. Still, contactless card technology (e.g. RFID) could be embedded in mobile phone (Ondrus J., 2005).

- **Size of a Payment**

The size of a payment does matter. Mobile payments are interesting only if the volume of transaction or profit margin is high. Macro payments are conducted for purchases with a higher margin and therefore more profitable, but its volume is usually low (Ondrus J., 2005). Unfortunately, most of the initiatives support micro payments. Not many technologies provide a secure method to make macro purchases, for now only smart cards, but with a certain limit. A lack of standardization and high transaction costs is causing a division as to whether to use mobile payments only for micropayments or for any type of payments (Böhle et al., 2000). A mobile payment solution should be able to support micro payments and macro payments.

- **Security and Privacy**

Security in mobile payments is certainly one of the most important issues to be considered. In fact, there is no guarantee of total security while sending sensitive information over an open network like the Internet (Ondrus, 2003). Securing the mobile channel presents many of the same concerns that have been and continue to be addressed with online banking, including authenticating customers' identification, keeping the data transfer process safe from viruses, malware, and phishing attacks. A recent survey by Javelin Strategy & Research found that 33 percent of respondents described mobile banking as "too risky". To the extent that customers continue to be very concerned about the security of mobile devices, adoption of this channel as a means to manage bank accounts or to make payments will be affected (Cheney, 2008).

Security guarantees required for macro payments and micropayment are obviously different. Macro payments need stronger security mechanisms because of the large amount of money involved and the greater possibility of fraud. For micro payments, this is not as important as concerns regarding simplicity and speed. Ideally, the all mobile transactions should be secured with a legally enforceable digital signature, for which technology is already available.

Salvi and Sahai (2002) suggest four increasing levels of security which can be applied to the payment service:

Table 9: Foue Leves of Security Depending on Payment Size

Level 0	No PIN is required. For making micro payments.
Level 1	PIN to authorize payments
Level 2	PIN + digital certificate signed by a third party on behalf.
Level 3	Digital certificate stored in the mobile and protected by a PIN.

The reliability and security of a mobile payment is extremely important as a whole, especially in the early stages, since disappointing performances of the wireless communication system will make customers suspicious of its ability to deliver on promises of security. At the same time, any error within a mobile payment process can trigger distrust towards the customers' first experience.

According to Dewan and Chen (2005), a secure electronic transaction must embody the following four elements:

1. *Authentication*: Data exchanged during the transaction will be restricted to legitimate users only.
2. *Confidentiality*: Data exchanged during the transaction can only be read and understood by intended users.
3. *Non-Repudiation*: Participants of the transaction cannot deny their participation in the transaction.
4. *Data Integrity*: Data exchanged during the transaction are accurate.

If the mobile payment application is secure enough, people will trust it, and thus use it. Confidence is critical for the customer so a new payment system can be used.

- **Standardization**

Mobile payments lack of a set of cohesive technology standards that can provide a universal mode of payment. One of the main factors that contribute to mobile payments low success is the lack of standards, which give rise to fragmented versions of different mobile payments offered by different entities. A fragmented market provides non-standard solutions, in which entities are still looking for a main role within the value chain (Dahlberg & Oorni, 2007), and during the process the customer gets lost and confused as to whether use one application or another. In the meantime another conflict arises, as different entities must divide the revenues.

Without global standards, the industry will not be able to achieve the interoperability necessary for worldwide adoption (Terol & Light, 2008). Interoperability is essential to be able to support various types of payments and currencies across multiple operators and countries. Moreover, a set of technological standards for mobile phone manufacturers can provide the necessary interoperability, which could determine the success of mobile payments (Ding & Hampe, 2003), as it is expected to be the main medium of operation to process a transaction.

Standards need to address security and privacy concerns of customers as well as interoperability between various implementations. Standards formation is a process of negotiation between various stakeholders; it is rather more political negotiations in nature rather technical discussions. First movers benefit from this situation by creating de facto standards and major market share. There is no consensus among the players in terms of mobile payments standards setting (Carr, 2007).

- **Consumer Habits**

It is a well established fact that the force of habit dictates the continuation of the same type of behavior. It is noted that once behavior has become a habit it becomes automatic and is carried out without conscious decision. This is true of, both the retailers and the customers (Saji, 2006).

Nowadays a number of merchants readily accept bank-promoted financial instruments. At the same time a large pool of customers already are in the habit of making payments with plastic cards, which have become a problem for payment service providers. While merchants are already in the habit of accepting credit cards, customers are used to paying through credit cards. Unfortunately, changing customers' payment habits will not be an easy task (Fredrich et al., 2005). On the other hand, when dealing with small amount purchases, customers are used to paying with cash.

Although it may take a while, habits can change considering certain factors. Firstly, customers have become accustomed to the use of multiple payment habits (instruments) in responding to different payment needs. Secondly, payment habits (instruments) become all the time more electronic and mobile. The widespread diffusion of mobile phones, Internet, and information technologies in general speeds up the acceptance of mobile payments. Thirdly, financial institutions, payments service providers, and merchants have interests to influence customers' payment habits, for example via marketing and pricing. Finally, payment infrastructures and commerce cultures differ between countries. A standard payment infrastructure and commerce culture is needed in order to successfully change customers' payment habits (Dahlberg & Öörni, 2006).

1.5 Critical Success Factors

The success of mobile payments will not happen overnight, or by accident. There is a group of factors that are critical, if well managed, for mobile payment success. The focus of this section is to determine what can make a mobile payment application successful, based on the issues reviewed on the previous section. Based on the literature reviewed the following list represents the most significant critical success factors:

- *Ease of Use:* This criterion refers to the degree to which a person believes that using a particular system would be free of effort (Ondrus & Pigneur, 2007). According to Chen & Dewan (2006) a mobile payment application should be integrated seamlessly into purchasing processes, making it fun and easy to use, so it's compatible with the customers' lifestyle. Having a mobile payment that is easy to use is critical so the customer can quickly adapt and switch from a different payment method.

- *Cost:* The lower the costs, the better chances a mobile payment application has to reach mass consumption (Ondrus, 2003). Costs to be considered can be direct (cost of the technology, cost of implementation) or indirect (infrastructure operation and maintenance) (Ondrus & Pigneur, 2007). Regardless of the costs, these must be reachable by merchants and consumers to expand mobile payment application usage, and thus payment trends.

- *Reliability:* As stated in the previous section, first mobile payment experience is critical for consumers' perception of a new application. If a mobile payment application is not free of error, then its failure is almost secure (Van der Heijden, 2002). A reliable mobile payment experience will provide the necessary confidence to customers to use this payment system and return to the merchant.

- *User/Market Acceptance:* It means the degree to which the user and the different stakeholders are already consenting to accept a technology for payments (Ondrus & Pigneur, 2007). As stated in the previous section, acceptance is a big issue that needs to be well managed. Accessibility of the necessary technologies for customers and merchants is determinant for a possible success.

- *Security:* This is really big for customers, as they are handling their money to different entities to process a transaction. It is fundamental that a mobile payment application secures and protects the customer's personal information (Terol & Light, 2008). A secure payment system translates in providing a reliable payment method that ensures privacy, consumer protection and anonymity, so consumers can feel comfortable paying for goods or services (Van der Heijden, 2002).

- *Universality:* It refers to the degree in which technology can be adapted in many different applications, in other words, how interoperable and standardized the technology is (Madlmayr et al., 2008). Mobile payments must provide for transactions between one customer to another customer (C2C), or from a business to a customer (B2C) or between businesses (B2B). The coverage should include domestic, regional and global environments. Payments must be possible in terms of both low value micro-payments and high value macro-payments (Carr, 2007). Having a mobile payment universally accepted by merchants ensures convenience to customers that want to use a specific mobile payment application anytime, anywhere. According to Böhle & Krueger (2000), there are certain factors to consider in order to be able to provide an interoperable payment system. These are: market demand, economies of scale (may induce interoperable solutions), innovation and exclusion (strategy of advancement may slow down advance solutions), and implementation (may be tedious process to switch to a interoperable process).

- *Value Proposition:* As stated in the previous section, payment habits among customer will not change unless a value proposition takes place in a new payment method. This critical success factors aims at the importance of the value that the technology can bring to the customer. Consumers establish habits in payment and technology usage can determine the success of a mobile payment application (Chen et al., 2006).

- *Maturity:* It is important to consider as well the development state of the technology. As you can see on the image below, in order to reach a decent volume of sales, the technology must be mature. Otherwise, its success is not secure.

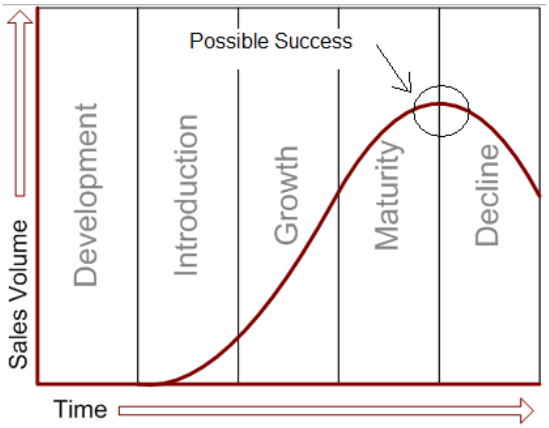

Figure 21: Lifecyle of a Technology or Product

- *Speed:* The speed of a transaction is very important, as it provides convenience to both, the customer and the merchant. For merchants it can increase sales by reducing transaction time, now merchants can process more sales in less time. On the other hand, having a fast mobile payment system can enable customers to pay at retail outlets with no lines and at unattended point-of-sale machines (Terol & Light, 2008).

- *Scalability:* Refers to the potential it may have to be used in small and large environments (Ondrus & Pigneur, 2007). This critical success factor has more to do with its potential to grow over time. It is more directed towards a long time success, instead of an immediate success. Although it is not the most important, compared to the other factors, it is equally necessary to think about how a new technology can evolve over time to provide multiple applications and respond to multiple needs.

1.6 Mobile Technologies

As stated previously, it is extremely important to consider already existing technologies as much as possible to reduce the costs and ease the roll-out of mobile payments (Pihlajamäki, 2004). The following section will firstly aims at providing an overview of the existing network technologies and their evolution. Then the different mobile payment technologies will be explained, depending on whether the mobile payment was remote or local (proximity).

1.6.1 Overview of Mobile Network Technologies

Mobile network technologies have evolved from analog based systems to digital based systems. This evolution can be described by different generations of mobile technologies, i.e. first generation (1G), second-generation (2G), 2.5G, third-generation (3G) technologies and fourth-generation (4G). Some of the main standards for each generation technology are (McKetterick & Dowling, 2003):

- 1G: Advance Mobile Phone System (AMPS) in North America, Total Access Communication System (TACS) in UK, and Nippon Telegraph & Telephone (NTT) in Japan.
- 2G: Global System for Mobile Communication (GSM), Code Division Multiple Access 2000 (CDMA2000), High Speed Circuit Switched Data Technology (HSCSD).
- 2.5G: General Packet Radio System (GPRS) and Enhanced Data Rate for GSM Evolution (EDGE).
- 3G: Universal Mobile Telephone Standard (UMTS).
- 4G: Long Term Evolution (LTE) and Worldwide Interoperability for Microwave Access (WiMAX)

First generation mobile networks (1G) were developed during the 1970s. Cell phone signals were based on analogue system transmissions and were comparatively less heavy and expensive than the prior models. This technology allowed users to have voice calls and text messages, but

unfortunately, this technology only allowed communication within a certain perimeter or nation, no roaming was offered. The appearance of the 1G system caused the annual mobile phone market growth to rise from 30 to 50 percent and number of subscribers reached 20 million approximately by 1990 (Hill, 2010).

Later, during the early 1990s, 2G phones using GSM technology were introduced. GSM, which was developed by the European Telecommunications Standards Institute (ETSI), uses digital modulation for improved voice quality but offers limited data services due to its low data transmission speed (Carr, 2007). Also internet browsing using GSM phones is subject to charging of on-line duration and reconnection is necessary for each browsing session, as opposed to with GPRS (General Packet Radio Service), charging is based on the data received or viewed, with all time connectivity is available (Zmijewska et al., 2004). On the bright side, 2G developers worked hard to improve its technology and enable phones provide better transmission quality and coverage. The 2G mobile technology provided users with services such as paging, faxing, messaging and voicemail. Additional services included Web Application Protocol (WAP), High Speed Circuit Switched Data (HSCSD), and Mobile Location Service (MLS).

GSM's technological competition is CDMA, which, unlike GSM, it does not provide the user with a SIM card. With CDMA technology the user must store all of his or her information in the phone's memory. If the user wants to upgrade the phone, he or she must return to the MNO. On the other hand, GSM technology involves the use of a SIM card to store any information onto the phone, so if an upgrade is desired, then the SIM card can be switch to another GSM enabled phone, without unnecessary intervention. CDMA is prevalent in the U.S.; however, over 80 percent of the world's mobile phones run on GSM networks (GSMA, 2010). Both CDMA and GSM continue to grow. Verizon Wireless and Sprint use CDMA, while AT&T, a distributor of the Apple iPhone in the U.S., leverages the GSM standard.

In between 2G and 3G, 2.5G mobile technology was introduced, which uses the GPRS standard. GPRS enables services such as Wireless Application Protocol (WAP) access, Multimedia Messaging Service (MMS), and for Internet communication services such as email and World Wide Web access in mobile phones. On the other hand, EDGE allows better connectivity by offering a higher bandwidth version of GPRS (Hill, 2010).

The 3G mobile technology provided a whole new range of services. This technology allows the use of audio, graphics and video applications, which includes the possibility of watching streaming video or to do video telephony. One of the main objectives behind the developments of 3G was to have a single network standard instead of different types, adopted in Europe, U.S. and other regions. The 3G phones have some of the highest speed available to the mass market to date (up to 2Mpbs). 3G mobile technologies, also known as UMTS, sustain higher data rates and open the way to Internet style applications. With UMTS, global roaming was also made possible, as it allows users to connect to the Internet from any location (Peter, 2010).

Lastly, 4G technology was born, and it is still being developed. This technology allowed increased data transfer speeds, and enhanced security measures. Unlike 3G technology, it allows customers to remain connected even if moving between different coverage areas. 4G technology is not constituted by any established industry set of standards, so for now the term 4G is mostly a marketing term. (Lister, 2010).

Within the U.S., there are two major systems using 4G mobile technology. One is known as WiMax and is backed by Clearwire, a firm whose majority owner is Sprint Nextel. It began testing services in Baltimore in 2008 and was set to expand this into major new markets in 2009. Sprint intended to have 80 cities covered by the end of 2010. WiMax allow a solution for delivering broadband to the home, and also creates wireless “hot spots” in places like restaurants, colleges, etc. Based on the IEEE 802.16 Air Interface Standard, WiMax delivers a point-to-multipoint architecture, making it an ideal method for carriers to deliver broadband to locations where wired connections would be difficult or costly (Blacharski, 2010). The rival system, Long Term Evolution or LTE, is backed mainly by Verizon. It was expected to be ready for testing in 2010 but not available for widespread use until 2012. LTE is under development to enable wireless providers using CDMA and GSM networks to transition from 3G to 4G networks and equipment. For consumers, LTE will enable existing applications to run faster, plus make available new mobile phone applications. Enhanced video and presentation mobile phone applications may also be included (Shanley, 2010).

1.6.2 Mobile Payment Technologies

1.6.2.1 Remote Mobile Technology

- Short Message Service (SMS)

This type of technology was created to send and receive short text messages, of 70-160 alphanumeric characters in length, to and from mobile phones (McKetterick & Dowling, 2003) . Short messages are stored and forwarded by SMS centers. SMS most common applications are voicemail/fax notifications, delivery of replacement ring-tones, operator logos and group graphics, unified messaging, personal communication (text messaging), and information services. Basically, any information that fits into a short text message can be delivered by SMS. In terms of mobile payments, SMS can be informational, to provide information about the status of one's account with the bank, or can be transactional, to transmit payment instructions from the phone (Carr, 2007). For example, the Helsinki City Transport offers tickets using SMS. A user sends an SMS before entering the train, bus or tram and gets a message with a specific code as the receipt. The ticket is valid for an hour. The service is charged on the phone bill and needs no registration from the user (Kalliola, 2004).

SMS text messaging is the most widely used data application in the world, with 2.4 billion active users, or 74 percent of all mobile phone subscribers (Vivas, 2008). In 2009 The Wireless Association (CTIA) estimated that 1.5 trillion SMS were sent worldwide. That's up from just over one trillion in 2008 and amounts to nearly five million messages per day.

- Web Application Protocol (WAP)

Wireless Application Protocol is a technology which provides a mechanism for displaying internet information on a mobile phone or any wireless device. This is done by translating internet information in to a format which can be displayed within the constraints of a mobile device. WAP is an open standard, developed by the WAP Forum, which has over 500 members. Its founder members include the major wireless vendors of Nokia, Ericsson and Motorola, plus phone.com (Foo Sms, 2008). To obtain Internet access on a mobile device, the device should be WAP-enabled and the web site information should be described in WML (Wireless Markup Language) format. WML is the mobile equivalent to HTML for web pages. A WAP gateway is

also necessary between the client mobile device and the WML host server, to translate the WAP request. The response from the host server is translated into a WAP response by the WAP gateway, which can be displayed on the mobile device. An application environment, called WAE (WAP Application Environment), is defined by the WAP standard to enabling the development of advanced services and applications. These include micro-browsers, scripting facilities, e-mail, www-to-mobile messaging, and mobile to telefax access (Carr, 2007).

Some examples of WAP applications include (Erlandson & Ocklind, 1998):

- *Information retrieval on the Internet:* The wireless application protocol can be employed to reach information on the Internet. However, the WAP browser cannot be used in the same way as an ordinary "surfing tool," since the mobile phone sets some limits on input and output capability, memory size, and so forth.

- *The "serviceman application":* With a WAP-enabled mobile phone, servicemen on duty can access their company inventory to check whether or not a spare part is available and directly inform customers about the situation. Of course, they can use the same application to order spare parts, and will immediately receive a confirmed delivery date.

- *Notification applications:* By means of agents residing in servers, users can be notified of e-mail and voicemail messages that have been sent to them. They can interactively request that more information be sent to their phones, or order a printout on a fax machine of their choice. Users interested in buying or selling shares can define a buying/selling profile that shows, for example, what stocks they are interested in, and at what quotation they might be willing to buy or sell. When a specific quotation has passed a defined trigger value, the agent notifies them and asks if they want to make a transaction.

- *Mobile electronic commerce:* Users can have access to payment services for bank transactions, and to ticket offices and wagering systems.

- *Telephony applications:* A user can have access to services that handle call setup, in combination with other services provided by a wireless operator. A typical example

involves a menu, defined by the user that is displayed for each incoming call. This menu allows the user to decide whether to answer or reject the call, or to forward it to another extension or to a voice-mail service.

- Unstructured Supplementary Services Data (USSD)

Unstructured Supplementary Service Data (USSD) is a technology unique to GSM and works on all existing GSM enabled phones. It is a capability built into the GSM standard to support the transmission of information over the signaling channels of the GSM network. USSD provides session-based communication, enabling a variety of applications. USSD is session oriented transaction-oriented technology, unlike SMS, which is a store-and-forward technology. Turnaround response times for interactive applications are shorter for USSD than SMS (MobileIn, 2004).

- Mobile Application

The most representative example is the Mobile Wallet, which represents an m-payment application software that resides on the mobile phone with details of the customer's bank account details or credit card information (there could be multiple accounts) (Carr, 2007). This mobile application allows secure buying possible, while buying in a more easier and faster fashion. Besides, it can be programmed to fill forms automatically or include links to bank services with passwords, so users do not have to remember them when shopping. Wallets are protected with passwords like PIN code, but PIN passwords are different from wallet password. So it is not a problem if mobile phone is stolen or lost when usable (Kalliola, 2004).

- SIM related Technologies

SIM cards can be equipped with secure technology to make it possible to store secure data in them. There are three kind of solutions suggested to use SIM card as a part of mobile payments. First one is that SIM card is equipped with the bank's debit or credit card application. This is fairly good solution, but it requires cooperation between the operator and the bank, which can cause communication conflict. It also make users dependent on operator, so switching is not possible without having a new agreement with a bank also. The other solution is a dual chip technology. Operators provide their own SIM and banks deliver their own payment chip card

(WIM18) to make able to buy with phone. One of the main drawbacks of this technology is that banks have to give out two bank or credit cards, one normal size card and another small size card. Also customers would have to invest in dual chip mobile devices (McKetterick & Dowling, 2003). The third alternative is the dual slot phone, which represents a phone that has two types of card slots; one for small SIM cards and another for traditional size cards. In this case banks would offer only one regular size card, then the user would put the card on the phone and pass it through a reader when the customer is ready to pay (Kalliola, 2004).

- I-Mode

Launched in 1999, I-mode (I stand for information) is a wireless technology, analogue to WAP/GPRS, developed by a Japanese company called NTT DoCoMo, which enables the access to Internet services via their cellular phones. I-Mode can be used to exchange e-mail with computers, personal digital assistants (PDAs) and other I-Mode cellular phones (Cellular, 2006).

I-Mode's underlying technology is based on the Asian cellular standard PDC and uses Compact HTML (cHTML) markup language. cHTML is basically a scaled down version of HTML. It is relatively easy and it takes little time to rewrite HTML into cHTML. I-Mode's transmission speed is slower than WAP, but fast enough for its services. DoCoMo operates a packet-switched network, which means that customers do not pay for time elapsed but for the packets of data they download. Packet switching also means that I-Mode is always on, so customers don't have to log into the service or wait for a connection, but have immediate access to services, similarly with GPRS (McKetterick & Dowling, 2003).

- Web Clipping

Web clipping is a Palm proprietary format for delivery of web-based information to Palm devices via synchronization or wireless communication to the Palm platform. Web clipping may coexist with WAP in the fragmented US market. However, in Europe it is likely to be surpassed, even on the Palm platform, by WAP based services (McKetterick & Dowling, 2003).

1.6.2.2 Proximity Mobile Technology

- Bluetooth

Bluetooth is a local over the air connection technology for mobile devices designed to wirelessly interconnect and exchange data between personal devices into a personal area network (PAN) (Durix, 2004). Bluetooth is usually a chip consisting of two parts: baseband chip and a radio chip. The radio chip handles the connection to the outer world and baseband interacts with the device where Bluetooth chip resides. It uses 2.4 – 2.48 GHz ISM band and reaches 723.2 kb/s asymmetric or 433.9 kb/s symmetric transfer rate. Asymmetric transfer is used for data and symmetric for voice. The range is about 10 m and because of its radio form, it does not need visual contact and different Bluetooth devices can locate in different rooms or behind obstacles (Bluetooth, 2009)

Bluetooth has some established and widely used applications like headsets that are connected to mobile phone via Bluetooth. Bluetooth could also serve as connection tool for mobile payment service, but there is not much encouraging examples about it. The drawback for it to succeed is long connection set-up-time. It varies depending on the quality of connection. In test cases the connection delay can vary from almost instant to more than 20 seconds. For non-time-critical solutions it is acceptable, but as a general payment method it is not. The Bluetooth chip is also more expensive than its alternatives, costing usually around 5 Dollars. It's highly probable that Bluetooth will not be largely used as a connection tool for mobile payments (Kalliola, 2004).

- Infrared

Infrared is an invisible optical radiation that can be used to interconnect two devices. This peer to- peer technology is already widely used for audiovisual remote controls, or to interconnect and exchange data between a personal digital assistant and, for example, a mobile phone. The financial industry has added a security protocol, called infrared financial messaging or IRFM, on top of this technology to use it for proximity payment transaction. A big plus for infrared is that many mobile devices are already equipped with it. As with Bluetooth, Infrared technology requires power at both ends of the communication chain. Infrared could be suitable for some proximity data transfer and payment applications but it does not offer the flexibility, the user convenience, and the inherent security required by all proximity applications (Durix, 2004).

An example of a technology that uses infrared is IrDA, which works at a range of about one meter and the connection establishing takes about one second. IrDA has advantages over many

technologies because it is the smallest, cheapest, fastest and most power efficient technology for short distance communication. It has also lower security risk because of short range and low possibility of eavesdropping. But it suffers from a basic fact that it is difficult to use. It requires line-of-sight and with a range of one meter and maximum angle of 20 degrees, it means the whole duration of transfer both equipments need to be still (Kalliola, 2004).

- Near Field Communication (NFC) – Radio Frequency Identification (RFID)

NFC technology is based on Radio Frequency Identification (RFID). RFID is a technology that was developed for automatic identification systems. RFID systems consist of two components, besides the antenna, the transponder, also called contactless target or simply tag and the transceiver also called read-write-device or simply reader or writer, depending on its functionality. The transponder is attached to objects that are to be identified and contains information like an identification number, a product price, or a date. The transceiver is either only able to read the tag's information or also to alter it, assuming the tag is re-writable. The transceiver emits an electromagnetic signal that activates the tag and enables to read from and possibly write to the tag. Usually the reader is attached to a computer on to which the data is passed. RFID readers are small enough to integrate them into mobile phones, PDAs or tablet computers easily, eliminating the need for a standalone reader-device. In the recent years, efforts were made to integrate RFID technology into mobile phones. In 2005, Nokia brought the first commercially available mobile phone onto the market that is equipped with a built-in RFID reader (Nokia, 2004) .

NFC is based on RFID technology and uses the same working principles. The NFC standard was issued in 2003 and is an interface technology for short-range data communication working in the frequency band of 13.56 MHz. NFC is standardized in ISO/IEC 18092 and is compatible to ISO/IEC standards 14443 (proximity cards) and 15693 (vicinity cards) and to Sony's FeliCa contactless smart card system. Thus, NFC can be used with existing infrastructures based on the standards mentioned, eliminating the need for a separate NFC infrastructure (NFC Forum, 2010).

The key feature of NFC devices is that they can read out RFID transponders and emulate them. Furthermore, peer-to-peer communication is possible when two NFC devices are brought together. By contrast, classical RFID systems are designed with only a read-write device

attached to a computer. NFC was designed to enable intuitive communication with other entities and to offer an intuitive way of sharing data between electronic devices.

A higher evolved form factor of RFID technology is that of the smart card. Smart cards are made of highly secure, powerful chips and are used for applications such as payment, telecom, ID, corporate security, etc. Smart cards (contactless RFID equipped cards) rely on NFC to send data stored on the smart card to host devices equipped with NFC readers (example: Sony Felica). Because the card lacks of a user interface, users must fully trust the host devices to deduct the agreed amount. Contactless smart cards (NFC chips) can be combined with mobile phones to form NFC-enabled phones. In this case the phone is used to secure data. An NFC-enabled phone is a cell phone with a smartcard microchip embedded that can communicate with a local host computer within a small range (<10 cm) over a RF channel (13.6 MHz). The NFC-based microchips have two security features: Public Key Infrastructure (PKI) based cryptographic functionalities, and a well-controlled, point-to-point, short range communication range (Kadambi et al., 2009).

NFC technology combines two paradigms, the communication between devices that both have active power supply and computing capabilities, and the communication between powered devices and passive tags. The supported range of NFC systems is approximately up to ten centimeters. NFC is designed to make communication between two devices very intuitive. Users wanting two devices to communicate simply bring them close together. Then, a protocol will automatically be initiated enabling communication in a peer-to-peer fashion. The required close distance between two NFC devices aggravates overhearing information exchange from outside and adds perceived security to data communication. NFC is expected to support a variety of applications in the future. Mobile payment, ticketing and peer-to-peer data exchange are expected to be realized using NFC devices. NFC suits the requirements for physical mobile interactions very well. Objects can be augmented with passive RFID tags and mobile devices can be equipped with NFC chips. This enables interaction between mobile devices and objects, and between two NFC devices (Falke et al., 2007).

1.7 Global Scenario of Mobile Market

After reviewing the main concepts related to mobile payments, it is equally important to take a glance at how the mobile market is evolving throughout the world. Moreover, this section aims at providing a wide picture of the current and past mobile market situation and what has been predicted for the near future, in terms of development. The mobile market, in this case, includes statistics regarding media penetration, number of mobile subscribers, people with access to mobile internet, Smartphone's penetration, expenditure on mobile advertising, and mobile payments.

- Global Mobile Media Penetration

It is important to highlight the importance of mobile devices compared to other technologies. The penetration rate of mobile phones was 4 billion as of February of 2009. That means there are two phones for every three people in the world (Incentivated, 2010).

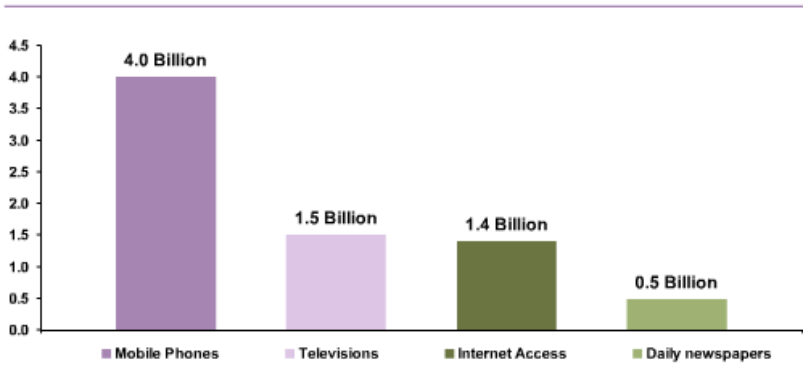

Figure 22: Global Media Penetration in 2009

1. Mobile Subscribers

According to the International Telecommunication Union (2010), in 2009 there were 4.6 billion mobile cellular subscriptions globally. The ITU expects this to reach 5 billion in 2010. Taking into consideration that the world population in April 2010 was 6.8 billion, this is a staggering number driven mainly by the growth of advanced services and handsets in developed countries and increased take-up of mobile health services and mobile banking in the developing world.

In 2009 the world's most populous nations had the most mobile subscriptions, China and India lead growth (Elkin, 2010).

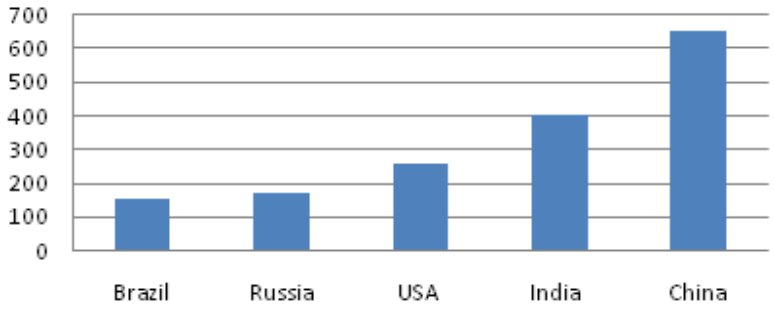

Figure 23: Top Countries by Mobile Subscribers (in millions)

In Europe most of its markets exceeded 100 percent penetration at the end of 2007, with more than 750 million mobile subscribers. The European mobile market still continues to grow, 76 percent of those mobile users are in the top 10 European nations. The number one is Russia with a share of 22 percent (Van den Beld, 2010).

If we look at a wider picture, at developed and developing countries, we can see how developed countries have taken and keep taking the lead on the number of people subscribed to mobile services.

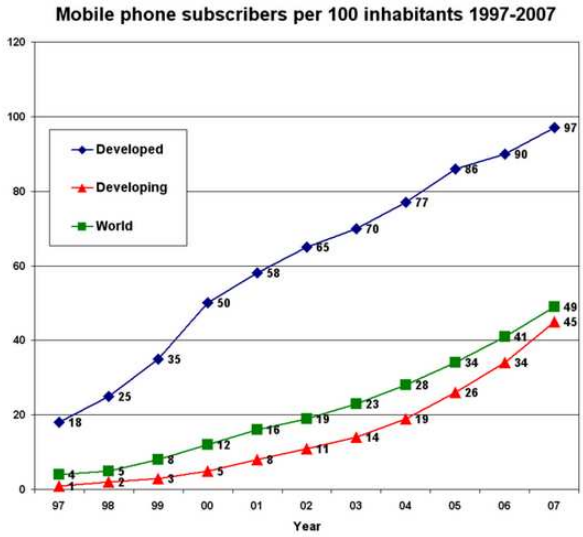

Figure 24: Mobile Subscribers in the World 1997-2007. Source: ITU

As of 2010, 67 percent of the world population is mobile subscribers. This number represents around 4.6 billion people, up from only 1 billion in 2002, indicating staggering continued growth. In developing nations, however, the uptake is even more substantial with 57 percent of the total population in these nations being mobile subscribers, even though other technologies are scarce.

The potential for mobile marketing is obvious, especially in developing nations, with cellular penetration more than doubling in developing nations such as Africa and India since 2005. The cellular penetration in emerging markets exceeded 50 percent for the first time in 2009, reaching an estimated 57 percent by the end of the year (Montgomery, 2010).

2. Mobile Internet Access

The number of people accessing the mobile Internet is growing fast and is expected to overtake the PC as the most popular way to get on the Web within five years (Parkes & Teltsher, 2010). By the end of 2009 almost 530 million users browsed the mobile Web on their cell phone. This is forecast to rise to over 1 billion by 2015 (MacQueen, 2010).

The country with the highest number of mobile internet users is China, with 233 million users, which accounted for 60.8 percent of the total mobile internet users by the end of 2009 (CINIC, 2010). When looking at the mobile internet penetration as a percentage of the total amount of mobile subscribers, the U.S. leads the way, followed by the U.K.

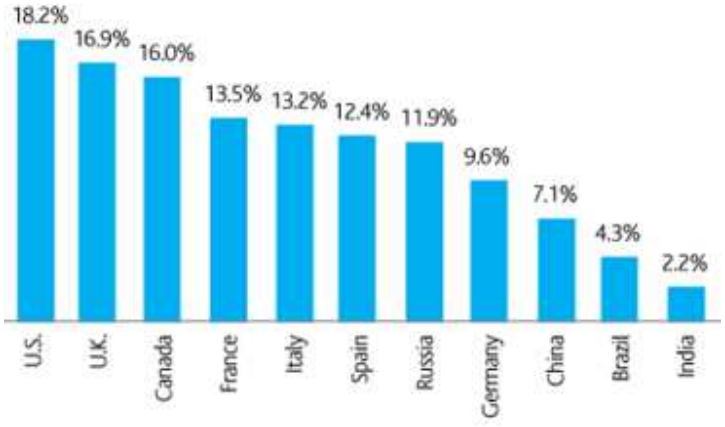

Figure 25: Mobile Internet Penetration as a percentage of Total Mobile Subscribers in 2009. Source: Nielsen Mobile

3. Smartphone's (3G) Penetration

According to Morgan Stanley (2010), the top region for 3G handset penetration is Western Europe with a 39 percent. The following table shows the different values of 3G penetration, depending on the region. Please take into consideration that Japan is included as a sole "region" because of its unique advancements and differences with the rest of the Asian region.

Table 10: Top Regions for 3G Penetration

Region	2009 (%)	2014 (%)
Western Europe	39	92
North America	38	74
Eastern Europe	9	40
Asia Pacific (without Japan)	7	37
Japan	91	100
Middle East & Africa	7	35
South & Central America	4	17
Global	**15**	**43**

According to the same source, the top countries for 3G handset penetration are:

Table 11: Top Countries for 3G Penetration

Country	percent
Japan	87
South Korea	71
Australia	52
Singapore	41
Israel	39
Spain	38
USA	37
Sweden	37
Austria	37
Portugal	33
Italy	33
Global	**11**

If we look at the current 3G subscription scenario globally, as the number of subscriptions increases, so does the revenues and its gap from the number of subscriptions.

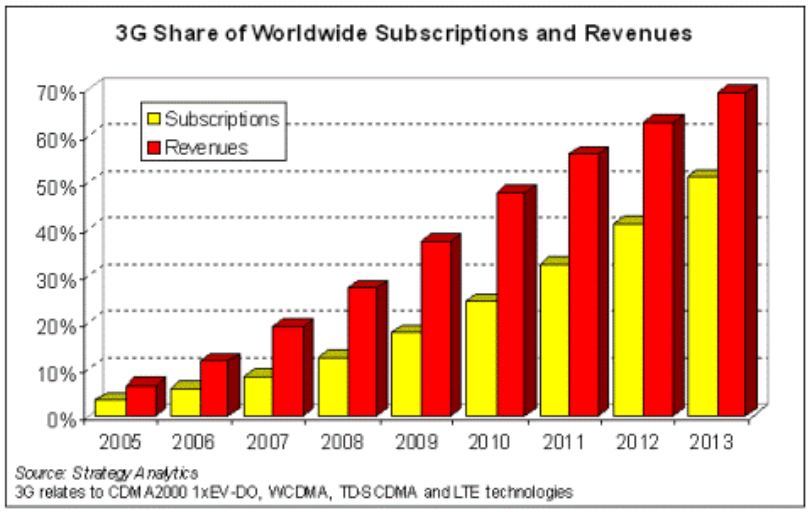

Figure 26: 3G Share of Subscriptions and Revenues

If we look at the mobile applications for Smartphones, North America and Europe are leading the way in terms of revenues. According to the Figure 26, the trend will prevail over the years (at least until 2012)

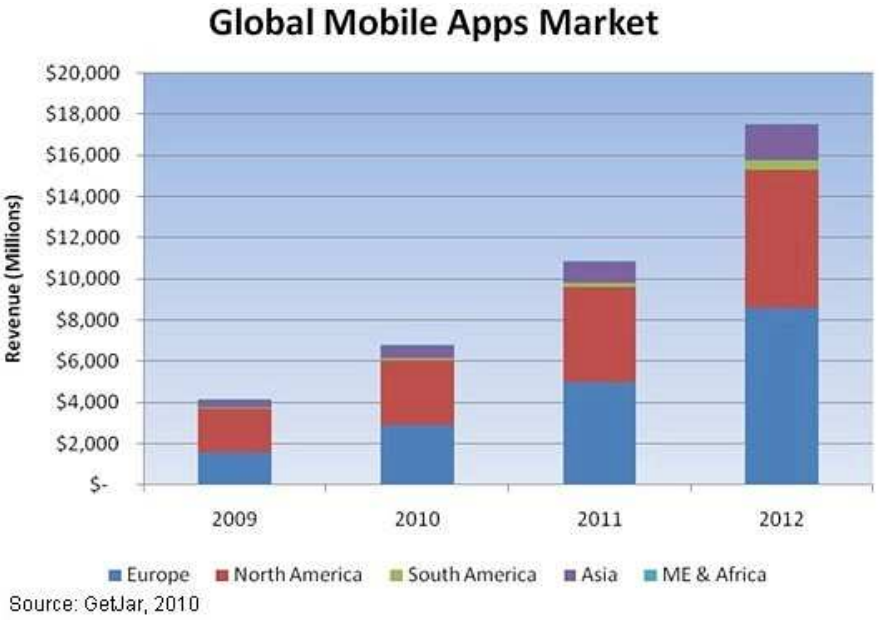

Figure 27: Global Mobile Apps Market

4. Mobile Advertising and Marketing Worldwide

In 2009 the global expenditure on mobile marketing and advertising reached US$7.5 billion, and it is expected to grow 200 percent by 2012 (Gallen, 2009). Mobile advertising is defined as placing an advert within a variety of mobile media formats including mobile Internet, games and applications, mobile video, mobile TV, streaming music, text and media alerts (MacQueen, 2010).

In 2008, the U.K. led the way in mobile advertising within European countries with €194 million.

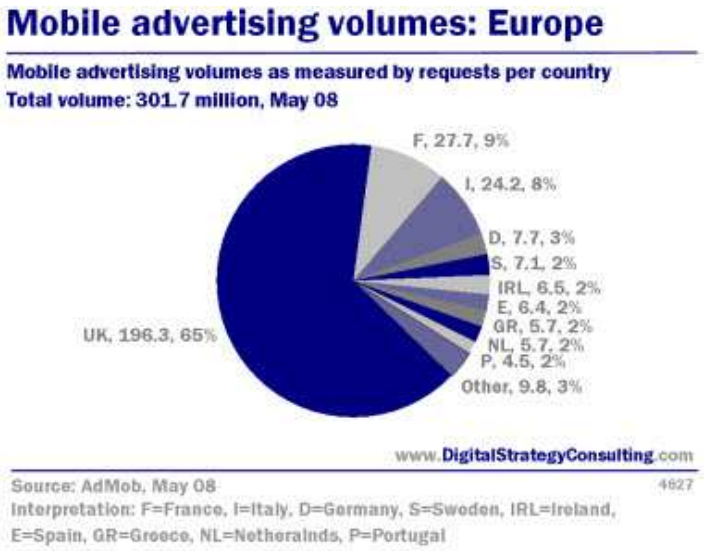

Figure 28: Mobile Advertising in Europe 2008

In the U.S. the spending in mobile advertising in 2008 reached US$320 million and it is expected to keep growing over the years. Part of this grow is because Apple's iPhone.

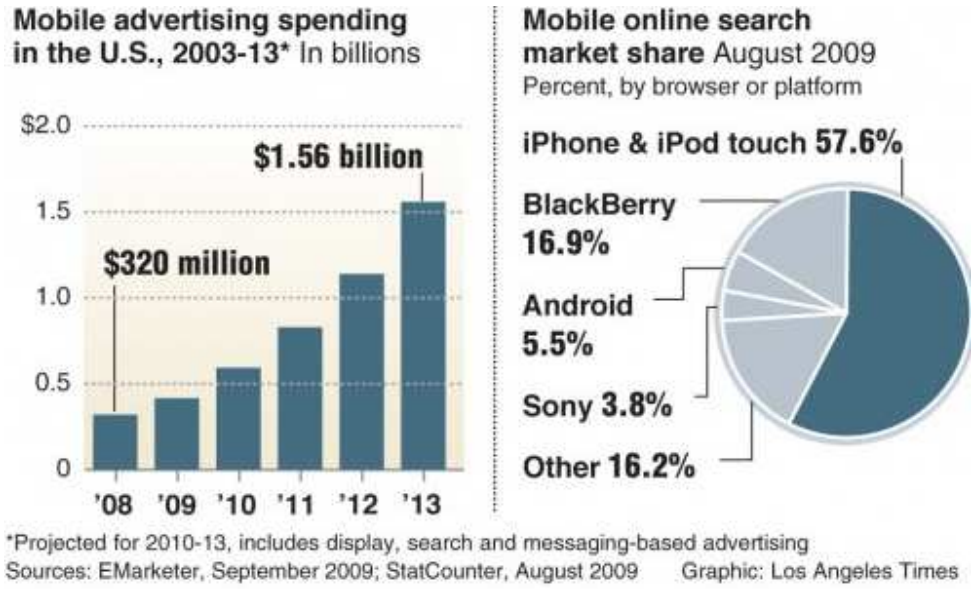

Figure 29: U.S. Spending in Mobile Advertising

In Asia, Japan leads the way when it comes to mobile advertising, based on its highly developed mobile Web. Mobile marketing and advertising expenditures in Japan in 2009 was ¥103.1 billion, that's US$1.14 billion. Year-on-year growth was 12.9 percent (dotMobi, 2010)

5. Mobile Payments

In 2009 there were 81.3 million people worldwide using their mobile device to make payments (including in-app payments, mobile ticketing and mobile coupons). By the end of 2014, this is forecasted to rise to nearly 490 million (8 percent of mobile subscribers) (Portio, 2010).

When it comes to how much was spent in mobile payments, in 2009 the volume of mobile payments was $170 billion dollars, and it is expected to grow to $630 billion by 2014. On the other hand, this is only represents 5 percent of ecommerce retail sales (PRWeb, 2010).

The following graph shows, per region, the distribution of a transaction value of mobile payments from 2007 until an expected 2011. Mayor spending is noticeably coming from Far East and China.

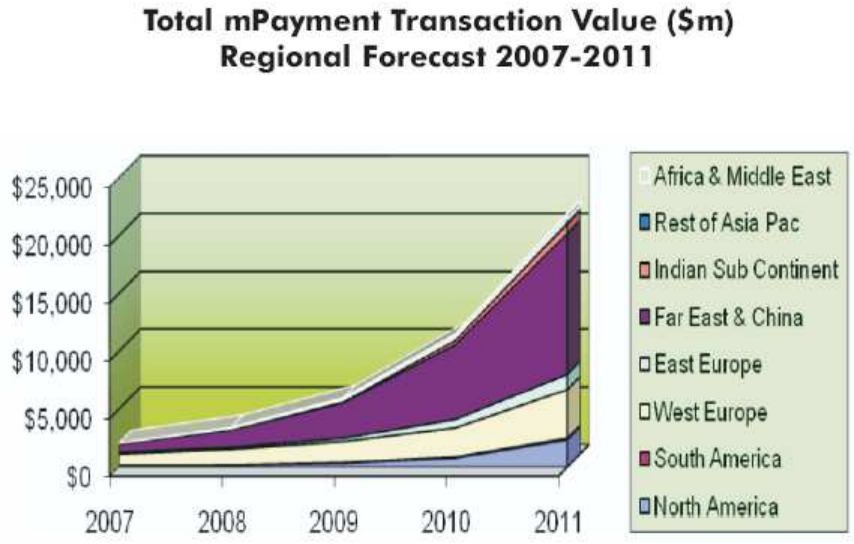

Figure 30: mPayments Transaction Value per Region

Within the Far East region, Japan leads the way in mobile commerce. In 2009 mobile Web shopping exceeded US$10 billion. On the other hand, in the U.S., mobile Web shopping reached only US$1.2 billion (Gallen, 2009).

There is certainly a great difference about the uses of mobile payments depending on the region of the world. Because of the lack of financial systems, developing nations such as the Philippines, India or Kenya are using mobile text messaging/SMS for remittances & money transfers between people. This can occur because of the high mobile phone penetration rates in such nations. On the other hand, developed nations tend to use mobile phones with NFC (near field communication) or contactless cards to pay for low value goods and services (Crowe, 2010).

Looking at the different regions and their potential, it is possible to develop the right strategy depending on the technology availability and usage patterns. The following graph shows the mobile payment market opportunity in different regions. It is possible to identify the market opportunities for developing nations (using SMS) and developed nations (NFC).

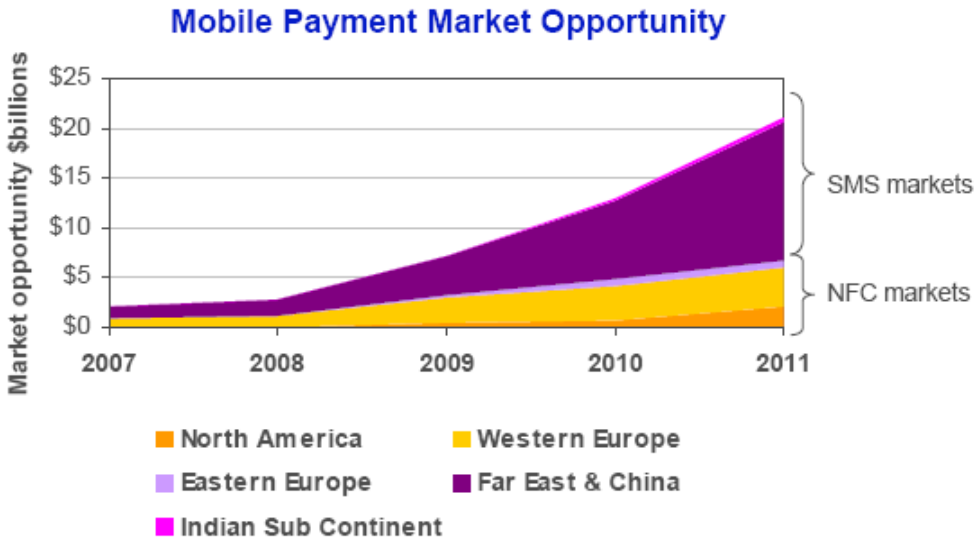

Figure 31: Mobile Payment Market Opportunity Depending on Region (Baxley, 2008).

1.8 Payment Culture

Many mobile payments are somewhat determined by regional differences and individual market dynamics. For example, in Japan, the success of mobile Internet services can be attributed to the high concentration of populations in urban areas, long commute times, consumer s comfort with small electronic devices, and the lack of a ubiquitous fixed-line Internet infrastructure. In Europe, mobile top-up for prepaid phone services is popular. In individual markets in Asia-pacific, Europe and U.S., there is a drive to implement proximity payments in environments such as road-tolling, fast-food drive-through, and service stations (Xi & Han-ping, 2007).

When analyzing mobile payments, certain differences can be perceived by looking at the payment systems. If we look at Europe and the U.S., a noticeable difference between them is the lack of P2P payment systems in Europe. This can be explained by two factors. Firstly, in the US the spread of P2P payments is mainly due to the success of eBay (e-auctions). Since on-line auctions are not as popular in Europe, e-commerce has created considerably less demand for P2P payments. Secondly, within a European country P2P is not a large problem because credit transfers are conventionally used in almost all countries. With the emergence of home banking and Internet banking, these transfers have become even more convenient. What is missing in Europe, however, is a convenient way to send money across borders whether is P2P or B2B (Böhle et al., 2000).

Globalization is already taking place. Technology providers already have to think globally and payment service providers too. For years new payment schemes have been imported from the US. Virtual accounts enabling P2P and B2C payments are anchored in on-line auctions and private money transfers. The trend was first set in the US with PayPal and other competitors such as Yahoo with PayDirect. These services combine e-mail payments and remote access to a virtual account at a payment server.

What is really interesting about cross-border payment culture is when certain similarities or cultural approaches become visible between neighboring countries or otherwise culturally related countries: e.g. Germany and Austria, Belgium and Netherlands, Scandinavian countries, or the U.K. and the U.S. The U.K. – U.S. case is particularly important because U.S. payment methods often enter to Europe through the U.K. (Bohle & Krueger, 2001).

The U.S. has been a powerhouse for years when it comes to technological advances. Its cultural similarities with the U.K. are undeniable, starting from the fact that they speak the same language and that the U.S. was colonized by the British. These similarities have transcended over the years to their technology usage, payment systems, mobile habits and social patterns.

The following table, which is an adaptation of a comScore report, shows how to a certain extent the U.S. and U.K tend to behave more similarly when using a mobile phone. The table shows the U.S. and the top five European countries.

Table 12: Mobile Content Usage Pattern between the U.S. and EU5. Adapted from (comScore, 2010).

Reach (%) of Mobile Subscribers by February 2010 - Mobile Content Usage							
	UK	DE	FR	ES	IT	US	Absolute Difference US-UK
Sent an SMS/Text	90.30%	81.60%	81.70%	84.50%	79.50%	64.00%	26.30%
Mobile Browsing	30.80%	17.40%	21.70%	19.90%	20.70%	29.40%	1.40%
Accessed Social Networking Site or Blog	18.20%	6.50%	10.20%	9.50%	11.70%	18.00%	0.20%
Accessed News	13.70%	7.50%	9.00%	6.70%	10.40%	15.10%	1.40%

Similar Numbers

The table is not conclusive. The U.S. is still way behind European countries when it comes to text messaging. However, their usage in mobile browsing, and social networks or news accessing is very similar to the U.K.'s, which could translate into a mobile usage pattern.

The indirect influence that the U.S. has upon Europe, through the U.K. in mobile payments can be better understood by comparing these two nations and analyzing their mobile payment technology to determine if these two nations behave similarly when using a mobile phone.

1.9 Country Analysis

Based on the previous section, it is imperative to analyze the U.S. and the U.K. independently and see how they are structured. This comparison will assist in further developing an argument to whether or not these nations relate to each other. The analysis will cover from very broad general information (demographics, economical and social) to technology availability, more specifically, mobile payments technologies and main players.

Please take into consideration that almost all of the information used for this section was collected in late 2009, and because of that, some of the most recent numbers are from 2008.

1.9.1 United States of America

1.9.1.1 General Overview

6. Political Variables

The U.S., also known as the Federal Government of the United States, is represented by a central government established through the U.S. constitution, which shares sovereignty with State governments. There are 3 branches within the Federal Government, which are: Legislative, Executive and Judicial. The powers of the federal government as a whole are limited by the Constitution, which, per the Tenth Amendment, indicates that all powers not expressly assigned to the federal government are reserved to the states or to the people (Thomson & Davis, 2001).

In terms of its territory, the U.S. is composed of 50 states and a few dependent areas, such as American Samoa, Puerto Rico, Virgin Islands and Wake Islands, among others. Within the U.S., the most important city is New York, which happens to be a power influence over worldwide commerce, finance, culture, fashion, and entertainment. Among U.S largest cities are New York City-New York, Los Angeles-California, Chicago-Illinois, and Houston-Texas (U.S. Census Bureau, 2000).

U.S. is represented by democracy and minority rights protection. The current president is Barak Obama, from the Democrat Party, whose tendencies are rather socialist. Democrat's opponents are the Republicans. The country political stability has been defined by its constant presence in

world issues. Currently, the country is still present in Afghanistan to fight against terrorism. Military spending in 2008 reached little over $600 billion dollars (SIPRI, 2008).

7. Economic Variables

According to the Center Intelligence Agency (2009), in 2008 the GDP was an estimated US$14.44 trillion. The GDP (Purchasing Power Parity) was US$14.44 trillion, and the GDP (per capita-PPP) was US$47,500.

More recent reports of the U.S. Bureau of Economic Analysis indicate that the real gross domestic product , which represents the output of goods and services produced by labor and property located in the U.S., increased at an annual rate of 3.0 percent in the first quarter of 2010, (that is, from the fourth quarter to the first quarter). In the fourth quarter, real GDP had increased 5.6 percent (BEA, 2010).

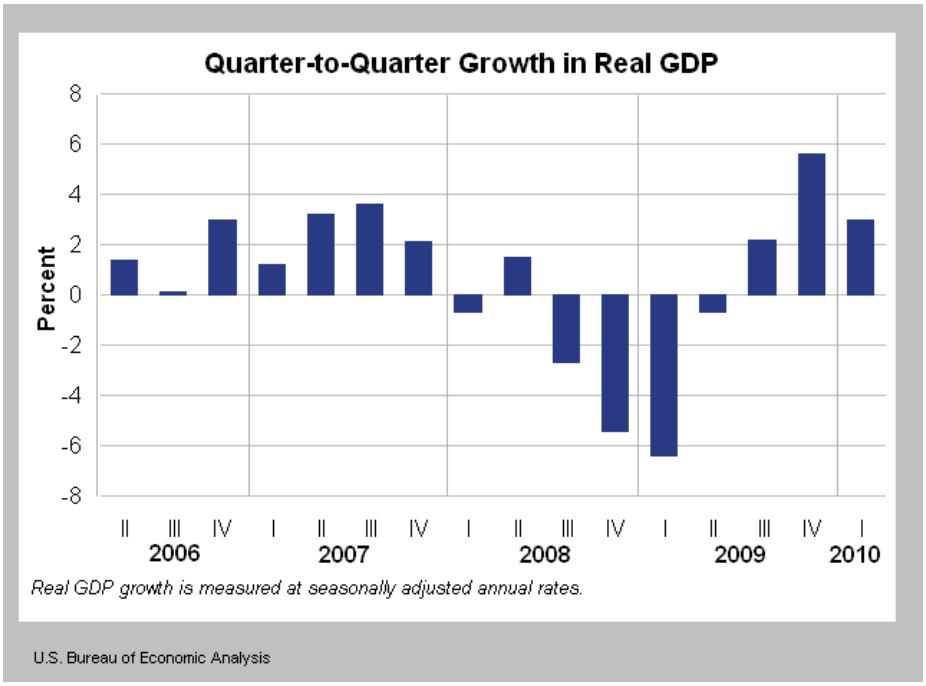

Figure 32: Quarter-to-Quarter Growth in Real GDP

The inflation during the past five years had ups and downs (InflationData, 2009).

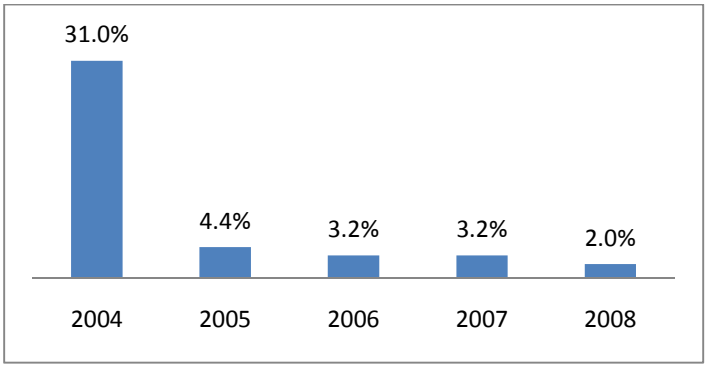

Figure 33: U.S. Inflation over the past 5 Years

The U.S. economic growth has stagnated from growing when compared to its performance over the past years (Mundi, Index, 2009). At the same time, in 2008, on average, each dollar was traded for €0.6827.

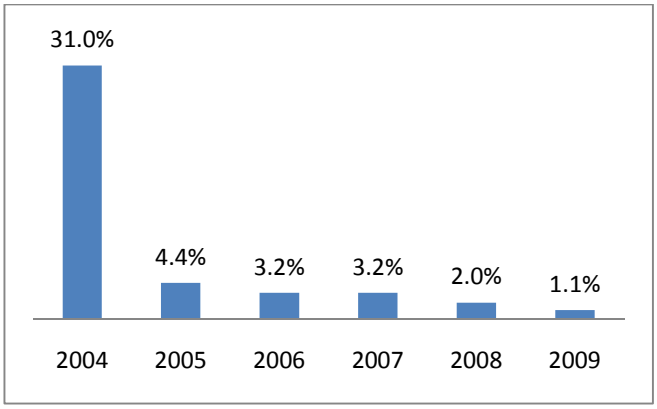

Figure 34: U.S. Economic Growth of the past 6 Years

The GDP composition by sectors is: Agriculture – 1.2%; Industry -19.2%; Services 79.6%. From this information we can easily conclude that the U.S. economy is driven by the service industry. The U.S. is also a leading industrial power in the world, with highly diversified and technologically advanced knowledge in the following industries: petroleum, steel, motor vehicles, aerospace, telecommunications, chemicals, electronics, food processing, consumer goods, lumber, and mining.

8. Social Variables

As of 2009, there are 307,212,123 people in the U.S., which makes the U.S the third largest country in the world. The growth rate, for the same year, is 0.975 percent., which represents an increase of 11.36 percent compared to the growth rate in 2008 (CIA, 2009).

Nowadays the life expectancy is 78.1 years. Overall there are more women than men in the U.S. The age structure is: 0-14 years: 20.2 percent (male 31,639,127/female 30,305,704); 15-64 years: 67 percent (male 102,665,043/female 103,129,321); 65 years and over: 12.8 percent (male 16,901,232/female 22,571,696)

Because the U.S. is said to be a "melting pot", which means it is a very multi-cultural country, there are many religions and cultures that represent its people. As of 2007, Protestant represented the majority of the U.S. with a 51.3 percent of the population, Roman Catholic 23.9 percent, Mormon 1.7 percent, other Christian 1.6 percent, Jewish 1.7 percent, Buddhist 0.7 percent, Muslim 0.6 percent, other or unspecified 2.5 percent, unaffiliated 12.1 percent, and none 4 percent (CIA, 2009).

As of one of the most multi-cultural countries in the World, there are many spoken languages in the U.S. English accounts for 82.1 percent, Spanish 10.7 percent, other Indo-European 3.8 percent, Asian and Pacific island 2.7 percent, and other 0.7 percent. The rate of literacy is very high, with a 99 percent.

9. Technological Variables

According to the World Bank, as of 2008, 72.4 of every 100 habitants of the U.S. had access to the Internet. The leading Broadband provider is SBC Communications (AT&T) with 14.8 million subscribers as of 2008 third quarter (Goldman, 2008). Other leading companies include Comcast, Time Warner and COX communications. Broadband penetration is now treated as an economic indicator; it refers to the percentage of the Internet access market that high speed has captured in a single country. In March 2009, broadband penetration in active Internet user U.S. homes dropped to 93.13 percent, creating the second consistent decrease from its peak of 93.38 percent in January 2009 (PressRelease, 24-7, 2009). In 2008 U.S. ranked 15th out of 30 countries

in broadband penetration rates, ranking behind other developed nations, such as UK, Germany, France, Denmark, Switzerland and Canada (Hesseldahl, 2008).

On the other hand, is drastically decreasing. The number of cell phone subscribers in 2006 reached over 233 million people, while the number of landlines was 146 million (EveryCall, 2008). The gap keeps increasing as the new trend indicates that more U.S families are dropping the landline and using only mobile phones. Preliminary results from the July-December 2008 National Health Interview Survey (NHIS) indicate just that. More than one of every five American homes (20.2 percent) had only wireless telephones (also known as cellular telephones, cell phones, or mobile phones) during the second half of 2008, an increase of 2.7 percentage points since the first half of 2008. This is the largest 6-month increase observed since NHIS began collecting data on wireless-only households in 2003. In addition, one of every seven American homes (14.5 percent) received all or almost all calls on wireless telephones, despite having a landline telephone in the home (Blumberg & Luke, 2008).

When it comes to personal computers diffusion, in 2006 the U.S. ranked sixth in computer ownership (Israel was first). There were 76.2 people that owned a computer for every 100 (Economist, The, 2008). Ownership and penetration of TV's is very high in the U.S. 99 percent of households have at least one television. The U.S. has now moved to digital television. A law passed in 2006 required over-the-air stations to cease analog broadcasting by February 2009, but was delayed to June 12th. In 2008, there were an estimated 327 million television sets in the US (FCC, 2009). Historically, cable is the most popular household video entertainment medium in the U.S. As of June 2006, more than 59.1 percent of U.S. households had cable service. On the other hand, satellite growth is occurring rapidly (25 percent of U.S. homes have satellite). Although it remains less prevalent than cable, satellite has had an impact on cable growth across the country.

Another technology that is worth considering is RFID. Worldwide, in absolute numbers, RFID is used most in the U.S., followed by the U.K. and Japan. RFID is used in the U.S. in passports, libraries, contactless payment cards, shipments (through Wal-Mart), and highways for toll payments.

10. Legislative Overview

Founded in 1987, The U.S. Telecom Association (USTelecom) is the trade organization for broadband service providers and their suppliers. The association represents the broadband industry before the U.S. congress, Federal Courts and the White House. At the same time, there is the Federal Communication Commission (FCC), which is an independent government agency that regulates interstate and international communications by radio and television and wire and cable satellite. The FCC works towards six goals in the areas of broadband competition, the spectrum, the media, public safety, homeland security, and modernizing the FCC. On the other hand, the payment industry is governed by the Federal Reserve Bank and the Electronic Payment Association (Kelley, 1997).

1.9.1.2 Market Overview of the Payments System

In the U.S. the banking sector's short-term liabilities as of October 2008 was 15 percent of the GDP of the U.S. or 43 percent of its national debt, and the average bank leverage ratio (assets divided by net worth) is 12 to 1 (Norris, 2008). According to the Federal Deposit Insurance Corporation (FDIC), there were 8,430 FDIC-insured commercial banks in the U.S. as of August 22, 2008. Regarding international banks, their presence and importance in the U.S. as significantly increased over the years. A decade ago, the U.S. corporate debt market (one of the biggest business for investments banks) was dominated by American banks. Although they still occupy the top tier, foreign banks have muscled their way in (Bowley, 2009).

The following figure shows the fragmentation of banks and the incorporation of foreign banks over the years.

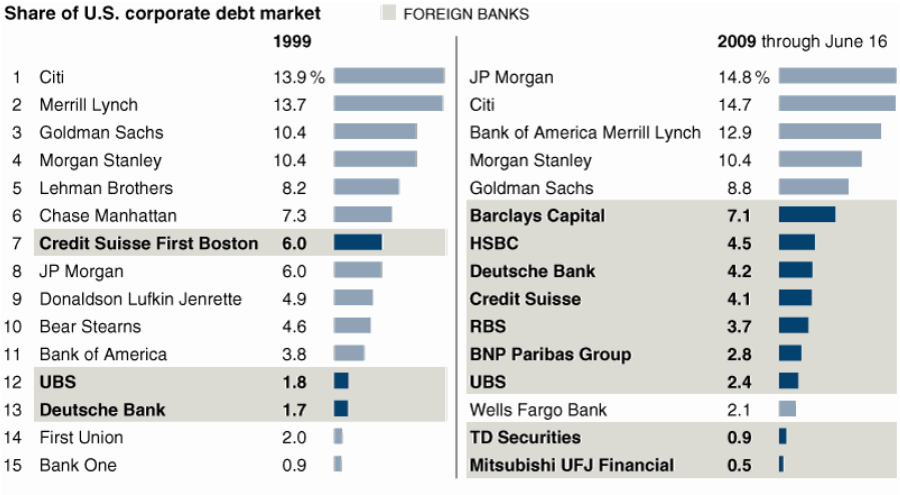

Figure 35: Foreign Banks in the U.S.

When it comes to electronic payment networks, in 2008 the U.S. market share for general purpose credit cards indicated the following distribution:

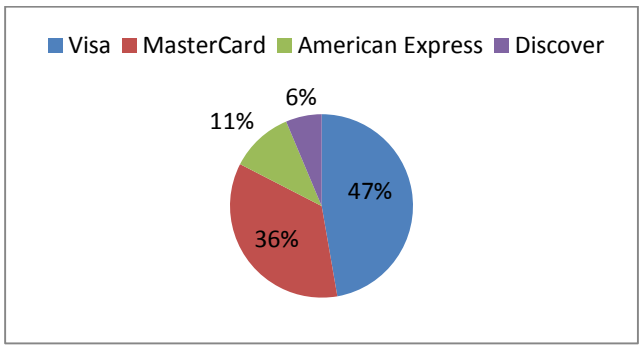

Figure 36: Credit Card Distribution in 2008

Regarding debit cards, as of September 30, 2008, there were 314 million Visa debit cards in circulation in the U.S. As of December 31, 2008, there were 126 million MasterCard debit cards in circulation in the U.S. Debit card usage grew from 2007 to 2008, with 66 percent of consumers indicating they used a debit card in the month preceding the September 2008 survey, compared to 57 percent of consumers in 2007 (Woolsey & Schultz, 2009). In the U.S. in 2007, the average household had between 13 and 15 credit cards, 2.5 debit cards, not to mention 5 or more loyalty cards. This translates into a very settled payment habit that governs the U.S. payment system (Schatt, 2007).

Regarding diffusion and usage of payments systems, according to a research developed in 2007 and sponsored by the Federal Reserve System, between 2003 and 2006, check payments decreased 6.4 percent electronic payments increase 12.4 percent (this includes: Debit and Credit Card transactions, ACH transactions and electronic transfers), ATM withdrawals decreased only 0.4 percent. The following figure illustrates the distribution of the number and value of non-cash payments in the U.S. in 2006.

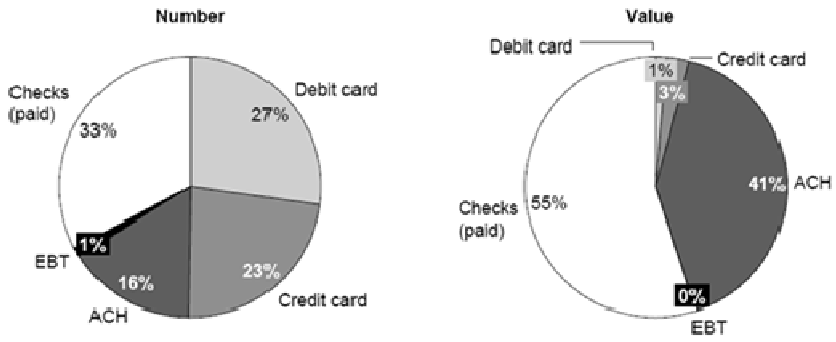

Figure 37: Distribution of the Number and Value of Non-Cash Payments in the U.S. in 2006

The following graph shows another way to look at how the different payment instruments and how they have evolved over time. It is clear to see how ACH payments (which include direct deposit and electronic payments) have increased, while the use of the checks is dramatically decreasing. The growth and change of other payments have not changed as much (Crowe, 2010).

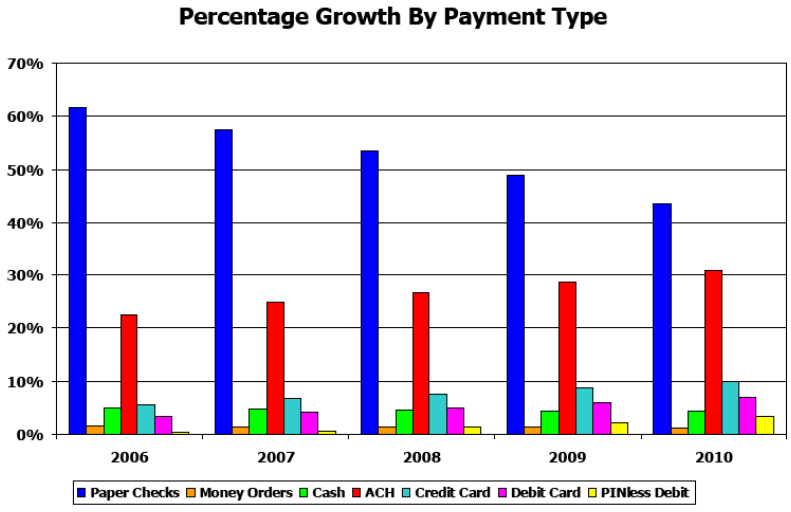

Figure 38: Percentage Growth by Payment Type

Nowadays, credit and debit cards are practically accepted everywhere in the U.S., with only a few exceptions. According the same research sponsored by the Federal Reserve System, Credit and Debit card transactions accounted for 50 percent of the non-cash transactions in 2006. When it comes to direct micro-transactions, cash is the most common method of payment.

ATM's diffusion has had a great impact in U.S. payment systems as well. As of 2004, there were 370,000 automated teller machines across the U.S., about 1 for every 296 people (Sullivan, 2004).

E-commerce has also impacted the U.S. economy. From 2007 to 2012, sales will increase at an 11.3 percent average annual growth rate (eMarketer, 2008).

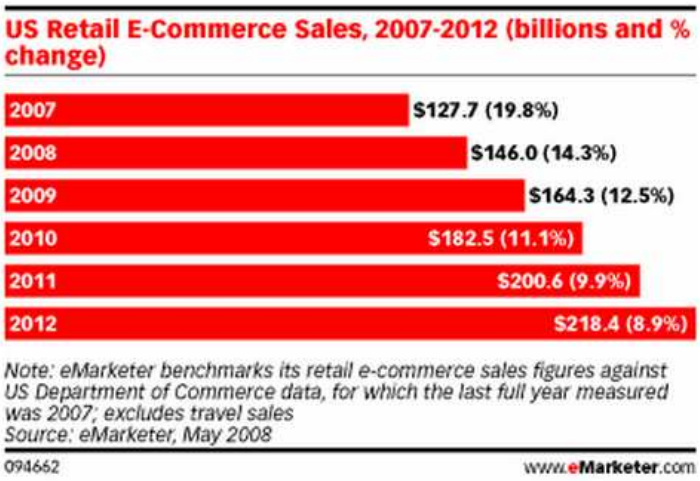

Figure 39: U.S. Retail E-Commerce Sales 07-12

eMarketer defines an online buyer as any individual age 14 or older, who has purchased within the past year. Most individuals who shop online eventually take the leap to become online buyers. Last year, 83 percent of online shoppers made a purchase on the Internet. By 2012, 89 percent of online shoppers are expected to convert into online buyers. On average, U.S. online buyers spent US$1,243 in 2008, growing to US$1,549 in 2012. In the US, as of 2008, 94 percent of internet users have shopped online, which puts the US in fifth place after South Korea, UK, Germany and Japan (Achille, 2008). According to the Census Bureau of the Department of Commerce, U.S. retail e-commerce sales for 2006 reached $ 107 billion, up from US$ 87 billion in 2005 (22 percent increase) . In 2006 e-commerce sales were 2.7 percent of total sales (U.S.

Embassy, 2008). E-commerce represents a small portion of the U.S economy, but as it grows, its importance and relevance to U.S economy will grow as well.

In the U.S., some electronic commerce activities are regulated by the Federal Trade Commission (FTC). These activities include the use of commercial e-mails, online advertising and consumer privacy.

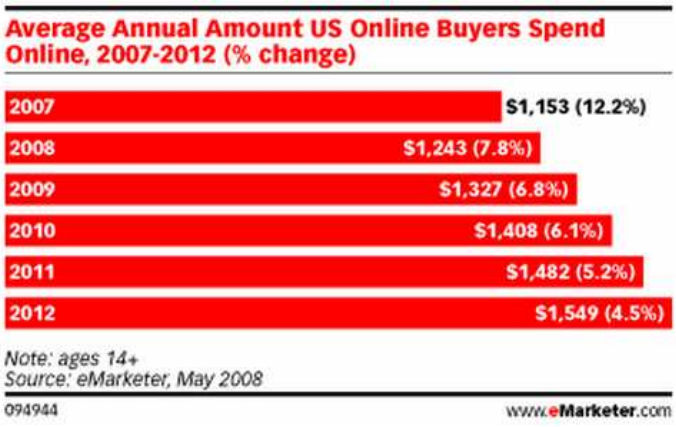

Figure 40: Average Annual Amount U.S. Online Buyers Spend

The payment system and the banks are directly controlled and regulated by the Federal Reserve System. In the U.S., some electronic commerce activities are regulated by the Federal Trade Commission (FTC). These activities include the use of commercial e-mails, online advertising and consumer privacy.

1.9.1.3 Mobile Market Overview

11. Market

The U.S. Mobile Operators Research forecasts that the total wireless subscribers in USA will increase from 270.3 million in 2008 to 352.5 million in 2013. Verizon Wireless will continue to be the largest mobile operator in the country. The publisher's model predicts that Verizon Wireless subscriber's base will increase to 127.4 million in 2013.On the other hand; they forecast that AT&T Mobility will have 111.9 million subscribers and T-Mobile will have 43.1 million subscribers in 2013.

As of 2009, the country has little over 293 million subscribers in total, or an 89.0% penetration rate (CTIA, 2009).

Operator	Subscribers	Market Share
Verizon Wireless	89,000,000	30.33%
AT&T	82,500,000	28.11%
Spring Nextel	48,300,000	16.46%
T-Mobile	33,430,000	11.39%
TracFone Wireless	13,201,000	4.50%
MetroPCS	6,322,000	2.15%
U.S. Cellular	6,131,000	2.09%
Virgin Mobile	4,978,000	1.70%
Cricket	4,656,000	1.59%
Qwest Wireless	786,000	0.27%
iPCS	720,100	0.25%
Cellular South	700,000	0.24%
Clearwire	555,000	0.19%
Cincinnati Bell Wireless	546,300	0.19%
nTelos	438,300	0.15%
Pocket	300,000	0.10%
SouthernLINC	275,000	0.09%
Movida Wireless	217,000	0.07%
Alaska Communication Systems	139,700	0.05%
Bluegrass Cellular	130,000	0.04%
GCI Wireless	120,500	0.04%
TOTAL	**293,445,900**	**100%**

Figure 41: MNO Market Share in the U.S. as of 2009

According to research firm Chetan Sharma Consulting, the U.S. mobile data services market posted quarter-over-quarter revenue growth of 7.3 percent during the fourth quarter of 2008, which represents a 38.7 percent increase over fourth-quarter 2007 figures, to generate total revenues of US$9.4 billion. Overall, the U.S. mobile data segment yielded revenues of US$34 billion in 2008 (FierceMarkets, 2008). Regarding mobile voice services, mobile voice revenues are still larger than those from mobile data, but mobile data revenues are growing five times faster in the U.K., France, Germany, Italy, USA, Canada and Japan, according to UK regulator Ofcom. While during the last five years mobile voice revenues increased by 31 percent, mobile data revenues have increased by 171 percent (Morrison, 2008).

Unfortunately, the IE Market Research group has estimated that the ARPU growth will continue to be negative. Moreover, it is expected that the industry-average monthly ARPU level will fall

from $51.29 in 2008 to $49.64 in 2013. However, the overall ARPU decline is largely driven by smaller operators. It is expected that Verizon's monthly ARPU level will increase from US$50.26 in 2008 to US$52.83 in 2013, and AT&T's ARPU will remain at approximately US$50.80 over the next several years (Group, IE Market Research, 2009).

Within the mobile phone industry different contracts can take place, they can be pre and post paid, flat rate, etc. According to a research done by New Millenium Research Council, in 2008 there were 29 million prepaid pay by the minute prepaid cell phones users in the U.S. (Mitchell, 2008). This represents, approximately, an 11 percent of total cell phone users.

The diffusion of handset has played an important role within the mobile market. In 2008 Research In Motion (Blackberries) dominated the Smartphone market with a 52 percent market share. On the other hard Apple's iPhone captured 23.3 percent of the market. Sales of the iPhone jumped 365 percent in the second quarter, compared with the same quarter in 2008, according to the market research firm. RIM's shipments of Blackberries jumped 29 percent in the same quarter. Also notable in the U.S. Smartphone market was the market share increase of HTC, which increased from 5.6 percent to 8 percent (Gardner, 2009). Also, recent figures released by ComScore put RIM and Apple as the main systems used in the U.S. The BlackBerry is still the most popular by far, totaling nearly 15 million users in that country. Apple and iPhone are in second place with just over 8 million. For now, Android borders the million, while Windows Mobile seems to have stalled in the 7 million users (EMOL, 2009).

12. Network technologies

The number of U.S. subscribers with 3G enabled devices has grown 80 percent to 64.2 million (about 21 percent of U.S. population) during the past year. The market has responded enthusiastically as mobile vendors have rolled out their enhanced networks and a new crop of 3G enabled devices. The only individual major European countries exceeding the U.S. in 3G penetrations are Italy and Spain (Cellular-News, 2008).

When using a mobile phone there are different ways of being billed, whether is for the usage of the carrier’s service, or the purchase of digital content. In the U.S., in 2006, only MT billing was accepted, while in Europe both MT and MO billing were possible (Becker, 2006). As of 2008

WAP transactions increase as carriers were increasingly looking for more efficient ways to conduct business with third-party content partners. Because the number of WAP transactions is so small, any increase will remain a small figure. It is expected that, as the adoption of WAP billing increases, it will become the standard way to purchase content. Premium SMS will continue to be a good fit for some mobile transactions, such as polling and some other kinds of interactive activity, while Internet-based billing will naturally ramp up as traffic on the mobile Web increases (Gibbs, 2008).

Regarding mobile broadband usage and diffusion, there are new revenue reports from major telecommunication companies that suggest that the U.S. is the world's largest consumer of mobile data. In 2008, combined U.S. data revenues totaled US$20.6 billion, while the next largest market, Japan, totaled US$16 billion. And while AT&T's revenue increased greatly, Verizon generated the most revenue from data, proving that the iPhone (offered only by AT&T) is not the only factor driving mobile data growth. Smartphones in general have already achieved a 40 percent penetration rate in U.S. markets, and it's projected that the U.S. will have the most 3G users in the world by 2011 (Cizek, 2009).

13. Legislation and Regulation

In the U.S. the Federal Communication Commission works towards six goals: broadband, competition, spectrum, media, public safety and homeland security, and modernizing the FCC. The organization is organized into seven bureaus (FCC, 2009):

1. Consumer & Governmental Affairs
2. Enforcement Bureau
3. International Bureau
4. Media Bureau
5. Wireless Telecommunication Services
6. Wireline Competition Bureau
7. Public Safety and Homeland Security

Through the FCC, its bureaus and offices, the government influences the telecommunication industry. For many years, the FCC and state officials agreed to regulate the telephone systems as

a natural monopoly. The FCC controlled telephone rates to limit the profits of AT&T and ensure nondiscriminatory pricing. This came to an end in 1982, when the Justice Department sued AT&T for holding a monopoly. In 1996, the congress enacted the Telecommunications Act of 1996 which encourages and supports fair competition (Schumacher, 2009).

Besides the great number of regulatory and supervisory agencies applying a broad range of very confined rules, there also are many regulators at the state and federal level. Among them, the Uniform Money Services Act (UMSA) aims at creating a uniform legal framework in order to give non-banks the opportunity to comply with the various state laws when conducting business on a nationwide level. UMSA covers a wide range of financial (payment) services, not just e-money activities (Lalopoulos et al., 2006).

1.9.1.4 NFC & Mobile Payment Services Analysis

The most used remote and proximity services in the U.S. are the contactless cards, such as PayPass (offered by MasterCard) and Paywave (offered by Visa). Also, Although NFC payments via mobile phones have been tested for a few years; still it is not a widely accepted service. The first contactless payment system, called SpeedPass, was launched in 1997 by Mobil-Exxon. When using contactless cards, any transaction over US$25 requires a signature or proof of ID to complete a transaction. These cards are linked to a bank account, so there's no limit per transaction. For micropayments the use of mobile phones is more popular when buying digital content, whether is Facebook, Hi5, or mySpace, users can enter their phone number and complete a micro-transaction using services such as Boku. Another way to make micro or macro payments is P2P. Services such as Obopay allow users to send small and large amounts of money to other people via cell phone.

The activation mechanism to start using a mobile payment service or application varies depending on the service. Today, as stated earlier, Visa PayWave and MasterCard PayPass require the activation though the issuing financial institution. Others, for example Boku, do not require activation, the user just enters his phone number and the amount shows on the regular phone bill. There is a wide array of other services that allow users to make P2P payments or person to merchants that require, first, the user to create an account and register online before

completing any transaction. Services like Obopay, Mobile Money and TextBuyIt require this modality.

Currently, an accurate number of users cannot be determined since many services are undergoing tests, or are not popular yet. For popular contactless payments, such as PayWave, in 2007 they had issued 9 million cards within the U.S. (AllBusiness, 2007). In 2008 more than 60 million contactless cards were issued in the U.S., and in 2009 over 100 million.

In 2006, the total purchase volume in the U.S. with cards with a contactless feature neared an estimated US$15 billion, registering a 700 percent CAGR from 2004 to 2006. That figure should increase significantly as the number of contactless transactions was nearly 777 million in 2006. By 2011 they are expected to reach US$2.2 billion (ContactlessNews, 2007).

Considering contactless as the most popular contactless payment service in the U.S., there are over 130,000 locations that allow contactless payments from close to 50 different merchants. This number is expected to keep growing as acceptance increases (Aite, 2008).

Figure 42: Percentage of Contactless-Enabled Locations in the U.S.

The most common merchants accepting contactless payment are fast food places, movie theaters and supermarkets. Some of the U.S. brands accepting contactless payments include: Wawa, Seven Eleven, CVS Pharmacy, Sheetz, Subway Express, Carls Jr., Arby's, McDonalds, Cold Stone, Wallgreens and Whole Foods Market (Crowe, 2010). Other services that can be acquired through a Remote Mobile Service or NFC are digital content, P2P and e-commerce. According to a survey performed in 2006 by IPSOS and PepperCoin to illustrate on what type of services

the consumer had the most demand, showed that most of the people in the U.S. are willing to use contactless payments in gas stations, and followed by food and groceries and fast food.

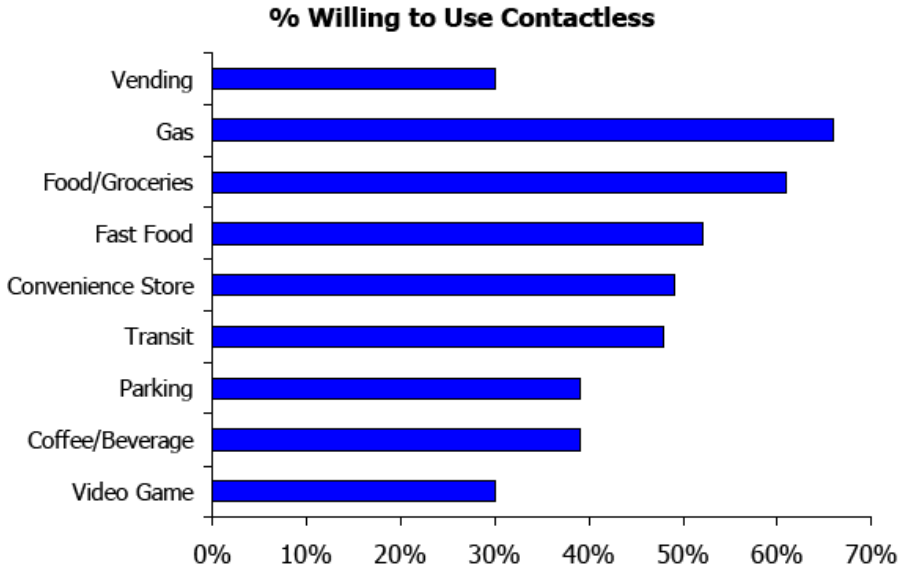

Figure 43: Services in Which People are willing to Use Contactless Payments

In 2007 the most of the contactless enabled merchants in the U.S. were pharmacies, followed by QSR (quick service restaurants) and gas stations (Crowe, 2010).

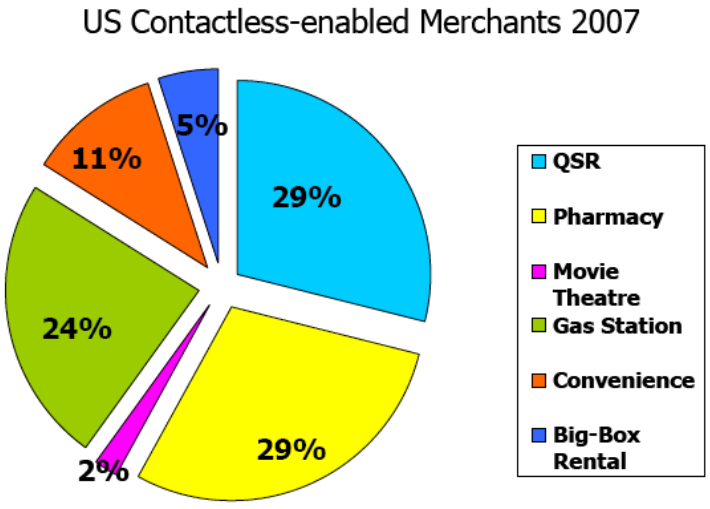

Figure 44: U.S. Contactless Enabled Merchants in 2007

When looking at the different merchants and services being offered it is possible to see a low verticalization of mobile payment services. Contactless cards are being used widely in the U.S. to make purchases at multiple points of sale. Plus, services in the U.S. allow the consumer to pay for more than one good or service, whether is parking, transportation system, money transfer, digital content and P2P, verticalization is low.

As stated throughout this research, transactions can be small (micro) or big (macro). For micro-transactions the most promising market is digital content and public transportation system. For macro-transactions the use of mobile NFC to purchase fast moving consumer goods and durable goods is promising as well. Also e-commerce could have an impact when taking place via mobile phones.

The technology available is really important to successfully implement a mobile payment service or application, whether is NFC or contactless. To complete a transaction remotely, SMS texts is the most common way. On the other hand contactless cards and NFC allow mobile payments via proximity. The platforms for each service in particular vary depending on the technology provider, service, and partners. For bank applications, the platforms are very similar but for the rest, each one is unique and designed for a specific service. Considering the most popular contactless payment methods, Paywave and PayPass, the interoperability is high, because with one specific type of reader, contactless cards from different financial institutions, whether they are PayPass, PayWave, Zip or ExpressPay, can be read and processed with no problem. Other services, such as Boku, that allows payments for digital content, there are specific games and social networks that allow payments via mobile phone. Interoperability is lower depending on the service. In the U.S. this happens because there are too many different services, and each operates with its own.

When using a mobile device to complete a transaction, different charging modalities can take place. Financial institutions that issue contactless cards do not disclose their fees. For Mobile Remote Payment usually the user pays for airtime minutes of internet. Text messages costs depend on each user's plan.

1.9.1.5 Players and roles in the Value Chain

From the mobile payments alternatives available today in U.S., the main key players are the financial institutions, with their contactless cards. They already established their customers, with the right marketing and development of contactless payment they will be the most influential player. Other key players on the value chain that are taking more important roles in the development of mobile payments are mobile carriers, technology providers, and cell phone manufacturers. In the development of NFC or contactless payments, several business connections have been established. Visa and MasterCard have associated with many banks across the U.S. to offer their contactless cards.

In the U.S. the main motivation behind key players is competitiveness and efficiency. One entity cannot do it all. A team of service and technology providers must be formed to have a chance to succeed in a very fragmented market, where many companies are trying to take the lead. Companies developing new mobile payments need the expert knowledge of others to succeed in an industry that has not been well established yet.

1.9.1.6 Service Development

The main driver that leads to the implementation of initiatives by merchants is to increase the number of transactions, and thus revenues, by decreasing service time, while improving the customer's payment experience. On the other hand, as service providers of the past, present, and future, banks have to be up to par with technology to offer the latest technology considering the different social trends. Because people never want to wait for anything (we want the best service as fast as possible), Banks main driver to implement mobile payments (contactless) is to increase customer satisfaction according to such social trend. Another driver is business attractiveness. As competition evolves, banks need to distinguish themselves from the rest to attract more customers.

Unfortunately there are a number of barriers that impede the mass adoption of mobile payments. In the case of NFC, the main barrier has been the technology needed to make NFC payments. The number of handsets in the U.S with NFC technology is very limited. Nokia is a pioneer in NFC enabled phones. Nokia's 6212 (NFC enabled) model costs little over US$300, which makes

it less reachable by people. Another barrier in mobile payments is awareness of the services, in terms of what exactly the service does, how it does and how secure. Today there's no standard way of making mobile payments, U.S. people is overwhelmed with too many services that operate differently. For merchants the costs to implement the right technology are the main barrier to adapt new forms of payments.

1.9.2 United Kingdom

1.9.2.1 General Overview

14. Political Variables

The United Kingdom is represented by constitutional monarchy, in which Queen Elizabeth II is head of state of the U.K. as well as of fifteen other Commonwealth countries. The U.K. has an un-codified constitution (Carter, 2001), as do only two other countries in the world. The Constitution of the U.K. thus consists mostly of a collection of disparate written sources, including statutes, judge-made case law, and international treaties. The head of the U.K. government is the Prime Minister and it is appointed by the Monarch. The Prime Minister exercises the Executive Power, along with the Cabinet (BBC, 2007). The current U.K's Prime Minister is David Cameron, whom took over in May 11 of 2010. The U.K.'s three major political parties are the Labour Party, the Conservative Party, and the Liberal Democrats, who won between them 616 out of the 646 seats available in the House of Commons at the 2005 general election (BBC, 2002).

In terms of its territory, the U.K. consists of four countries: England, Northern Ireland, Scotland and Whales, which capitals are Scotland, Belfast, Edinburgh and Cardiff respectively (CIA, 2009). The largest conurbations in the U.K. are the Greater London Urban Area, with 8.5 million people, then the West Midlands Conurbation with 2.3 million, then the Greater Manchester Urban Area with 2.2 million, then the West Yorkshire Urban Area with 1.5 million, and finally the Greater Glasgow with 1.2 million.

Stability in the U.K. is very high. Even though the U.K. suffered a decline of its empire halfway through the 20th century because of its involvement in the world wars and its cost, the U.K.

remains a major world power with strong economic, cultural, military, scientific and political influence.

15. Economic Variables (CIA, 2010)

In 2009 U.K.'s GDP (official exchange rate) was US$2.224 trillion. GDP (Purchasing Power Parity) reached US$2.147 trillion, which represent a decline compared to the US$2.257 trillion reached in 2008. GDP per capita reached US$35,200 which ranks the U.K. on the 34th place of highest GDP per capita. On the other hand U.K.'s inflation went down from 3.6 percent in 2008 to 2.1 percent in 2009. In 2009 the British Pound exchange rate was, on average, US$0.6494 per each British Pound traded. With the Euro, in 2008 the average exchange rate was €0.78.

Economic growth trend in the U.K. from 2004 to 2009 shows a significant decline.

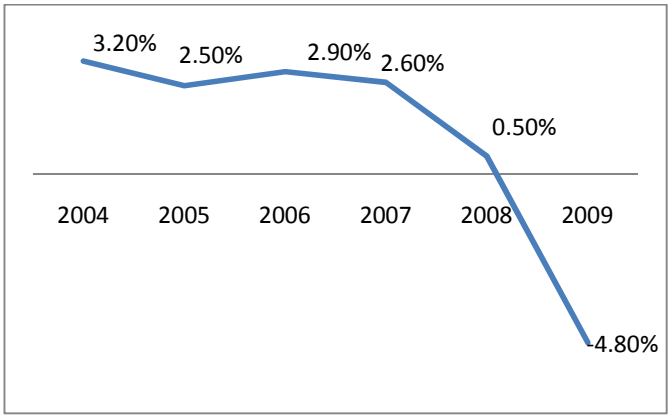

Figure 45: U.K's Economic Growth Trend 04-09

The last registered track of labor force took place in 2006. During this year most of the labor force worked in the service industry (80.4 percent), after comes the industry sector (18.2 percent), and the agriculture sector (1.4 percent).

16. Social Variables

As of 2009, there were 61,113,205 people in the U.K., which ranks 22nd in the world. The population growth rate for 2009 was 0.279 percent.The life expectancy of the country, as of 2009, was 79.01 years. 16.7 percent of the people are between 0-14 years, 67.1 percent are

between 15-64 years, and 16.2 percent are 65 years old or older. The average age is 39 (ONS, 2009).

When it comes to believes, the U.K. is mostly Christian. In 2001 the religions were distributed as follows: Christian (Anglican, Roman Catholic, Presbyterian, Methodist) 71.6 percent, Muslim 2.7 percent, Hindu 1 percent, other 1.6 percent, unspecified or none 23.1 percent. Literacy in the U.K. is high (99 percent), as a developed country. In U.K. the main language is English. However, 25 percent of the population of Whales speaks Welch, and about 60,000 in Scotland speak a Scottish form of Gaelic (CIA, 2009).

17. Technological Variables

As technology evolves, internet has become the cornerstone of technology. According to the World Bank, as of 2008, 79.4 of every 100 habitants of the U.K. had access to the Internet. The U.K. has an excellent broadband infrastructure, with DSL reaching 99.9 percent of the population and cable reaching more than half of all households. The market is fiercely competitive, largely as a result of regulatory measure to provide competitor access to British Telecom's exchanges. In recent years the broadband has been characterized by falling prices and a migration to higher speed services. In 2009, 8Mb/s DSL was available in most areas of the country while Virgin Media was moving to a 50Mb/s service and BT had plans for a FttC/VDSL service covering 40 percent of the population (Stats, Internet World, 2009).

Because of the evolution of technologies, which include the more use of internet and the increasing use of cell phones, the use of landlines has decreased. Between 2001 and 2006, in the U.K., the number of landlines fell by 5 percent to 34 million homes. Unlike other countries in which the landline usage has decrease by a greater percentage during the same period of time, in the U.K. most households require a landline in order to get a broadband service (OfCom, 2007). At this point it is clear that the usage of landline is decreasing, while the usage of mobile phones is increasing. In 2008 the number of calls made on landlines fell by 7.5 percent, while the number of calls made on mobile phone increased by 6.8 percent during the same period of time (Talbot, 2009). The ration of mobile cellular subscription to a fixed telephone line in 2008 was 2.3:1, according to the International Telecommunication Union (ITU, 2009).

Regarding personal computers and its diffusion, as of 2007, 70 percent of the people in U.K. owned a PC. In 1998 only 29 percent of the people owned a PC (Quicke, 2009). According to a survey performed by Olivetti Personal Computers, one out of three homes in the UK has a computer (more than U.S with 28%). Also, one in five computer-owning households is connected to the internet. In the survey fourteen European countries, U.S., Canada and Japan participated (Judd, 2007).

If we look at the usage of TV's, its technology and its penetration in the U.K, it is estimated that by 2012, every TV set will switch to digital. According to Ofcom, in 2008 two thirds of the 60 million TV sets (68 percent) in U.K. were digital (OfCom, 2008). In U.K. the leading satellite television broadcaster in is a subscription based service named Sky Digital, marketed by British Sky Broadcasting. Since May 2008, a subscription free alternative known as Freesat has been available as part of preparations to migrate the U.K. to exclusively digital TV broadcasting. The Freesat service is run jointly by the U.K.'s two largest broadcasters, ITV and BBC.

RFID is just as important as part of the technology evolution. The U.K comes second, after U.S. in usage of RFID. Currently, RFID applications in UK are used in libraries, public transportation system (oyster card), passports, contactless cards and coming soon, car license plates.

18. Legislative Overview

Oftel is the entity in charge of regulating the U.K. telecommunications industry. Broadcast transmission is also part of Oftel's remit. Oftel is a government department but is independent of ministerial control. It is headed by the Director General of Telecommunications, who is appointed by the Secretary of State for Trade and Industry. Ofcom inherited the powers of the following regulators (existing before Oftel's creation in 2003) Broadcasting Standards Commission, the Independent Television Commission, Oftel, the Radio Authority and the Radio communications Agency (BIS, 2009).

On the other hand, the U.K. Payments Association acts as a portal company for each of the respective sectors of U.K. payment services. The entity itself it's not a membership body but a service company that provides people, facilities and expertise to the U.K. payments industry. Their expertise covers a whole range of payment types and areas including: banking regulation

on wholesale and retail payments, cash, cash machines, CHAPS payments, cheques, chip and PIN, credit cards, cross-border payments, debit cards, direct debits, e-invoicing, Faster Payments, financial fraud prevention, authoritative market research on how payments are used, mobile payments, online banking, regulatory developments in consumer credit, security, SEPA advice and standing orders. The payments industry has different players and separate industry groups, which include: Bacs, CHAPS, Cheque and Credit Clearing Company, Dedicated Cheque and plastic Crime Unit (DCPCU), Faster Payments, Financial Fraud Action UK, Payments Council, the UK Cards Association and SWIFT UK (UKPayments, 2009).

1.9.2.2 Market Overview of the Payments System

It is very important to look at the banking presence to understand its influence on U.K's payment system. According to the Financial Service Authority, in the U.K. there are seven main British independent banks: HSBC, Barclays, Standard Chartered, Lloyds Banking Group (government owns 43 percent), Royal Bank of Scotland Group (government owns 70 percent) and Co-operative Bank. Unlike other major economies, U.K. does not have a big number of national banks. Part of this shrinking is the fact that some banks have been acquired by foreign banks. Also there is a number of small independent specialist or local banks (about 14) but the biggest of them represent a small fraction of the smallest bank of U.K.'s main seven. Some of these include: Airdrie Savings Bank, CAFBank, Halifax, Julian Hodge Bank and Unity Trust Bank. There is also a number of UK branding banks that are owned by other British companies (about 18), such as Bank of Scotland, Intelligent Finance, Sainsbury's Bank, Tesco Bank and The Woolwich. The international banking presence is strong in U.K. Virtually all of the world's leading banks have investment and commercial banking offices in the City of London. About 200 international banks have presence in U.K. Some of the international banks with presence in the U.K. include: Banco do Brasil, Bank of China, Bank if India, Bank of Montreal, The Bank of New York, Deutshe Bank Trust America London, American Express Bank, United Bank for Africa Banca di Roma, BNP Paribas, Citibank International and Merrill Lynch International Bank Limited.

When looking at the presence of the global electronic payment n in the U.K., we see that cards commonly in circulation include Maestro (previously Switch), Solo, Visa Debit (previously Visa

Delta) and Visa Electron. The U.K. has converted all debit cards in circulation to Chip and PIN (except for Chip and Signature cards issued to people with certain disabilities), based on the EMV standard, to increase transaction security; however, PINs are not required for internet transactions. In 2008, 46.7 million adults, or 94 percent of the adult population, held a debit, credit or ATM-only card issued by a bank or building society. There were 168.7 million cards in issue, 66.1 million credit cards, 6.4 million charge cards, 76.3 million debit cards, 19.4 million ATM-only cards and 0.4 million cheque guarantee cards (Association, UK Cards, 2009).

In 2008 plastic cards accounted for 66 percent of all of U.K. retail spending. Debit cards accounted for two thirds of this spending. Cheque usage fell by 4 percent. The following table shows the spending habits of UK's people in 2008.

Table 13: U.K. Retail Spending Habits in 2008.

Table 1	UK retail spending*				
	2005	2006	2007	2008	% change 07-08
Debit cards	£88.9bn	£98.0bn	£108.7bn	£116.1bn	+6.8%
Credit cards	£60.2bn	£59.9bn	£61.1bn	£60.7bn	-0.6%
Plastic card total	£149.1bn	£157.9bn	£169.8bn	£176.8bn	+4.2%
Cash spending	£80.9bn	£80.7bn	£84.3bn	£86.3bn	+2.4%
Cheques	£9.4bn	£8.0bn	£7.4bn	£7.1bn	-4.1%

***UK retail spending includes all transactions on the high street and online for example in supermarkets, clothing and furniture shops, chemists, newsagents and electrical and DIY shops**

The retail spending statistics in table 10 shows that of a total £269.9 billion (€300 billion) spent by consumers, 43 percent (£116.1 billion or €129 billion) was by debit card, 32 percent (£86 billion or €95.3 billion) was by cash, 23 percent (£60.7 billion) was by credit card and only 3 percent (£7.1 billion or €7.9 billion) was by cheque.

Table 14: U.K. Total Consumer Spending

Table 2	UK total consumer spending**				
	2005	2006	2007	2008	% change 07-08
Debit cards	£169.5bn	£195.5bn	£224.0bn	£245.4bn	+9.5%
Credit cards	£121.7bn	£120.0bn	£123.8bn	£126.2bn	+2.0%
Plastic card total	£291.2bn	£315.5bn	£347.8bn	£371.6bn	+6.8%
Cash spending	£260.7bn	£264.4bn	£264.9bn	£267.1bn	+0.8%
Cheques	£186.0bn	£187.0bn	£194.1bn	£180.6bn	-6.9%
Automated payments	£251.3bn	£283.3bn	£311.6bn	£333.1bn	+6.9%

****Total UK consumer spending includes all transactions on the high street and online to retailers and for other purposes such as for fuel, travel and entertainment and financial payments, which includes repayments on loans and savings and investments**

This table shows that debit card and automated payment use grew strongly between 2007 and 2008. In 2008 debit card spending grew by 9.5 percent to reach £245 billion (€271.6 billion), and automated payments by 6.9 percent to reach £333 billion (€369.2 billion). In 2008 cheques accounted for less than three quarters the amount spent by U.K. consumers on their debit.

Regarding U.K's points of sale (POS), almost all establishments that accept credit cards also accept debit cards (although not always Solo and Visa Electron), but a minority of merchants, for cost reasons, accept debit cards and not credit cards. When consumers make a purchase, most of them use cash to make micropayments at retail stores, restaurant or bar (Elizabeth, 2009). For digital content, cards are mostly used to complete a micropayment transaction.

For consumers to withdraw cash remotely they rely on ATM's machines. The number of cash machines in the U.K. has grown from 36,000 in 2001 to 64,000 in 2009. The number of free-to-use ATMs is at an all-time high of over 38,500. Almost 97 percent of all ATM cash withdrawals by U.K. cardholders in the U.K. are made free of charge (LINK, 2009).

Beside physical transactions, people in the U.K are more and more using the internet to complete an (electronic) purchase. In 2008, Internet sales represented 9.8 percent of the value of all sales of U.K. non-financial sector businesses. This was up from 7.7 percent in 2007. The value of these sales rose to £222.9 billion in 2008, an increase of 36.6 percent from the 2007 figure of £163.2 billion. Sales consisted of £104.7 billion website sales and £118.2 billion EDI (electronic data interchange) sales over the Internet (Pollard, 2008).

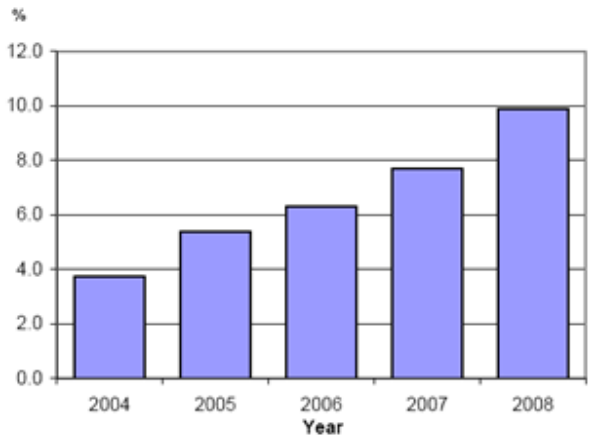

Figure 46: Internet Sales as Percentage of Total Sales 04-08

Payment systems are not just regulated by the banks. The Bank is just one of the bodies with an interest in promoting safe and efficient payment systems in the U.K. The Bank's oversight is concerned with the overall robustness and resilience of the financial system, and the extent to which systems could threaten financial stability through disruption and contagion. It does not extend to consumer protection objectives, which lie with the Financial Service Authority (FSA), the Office of Fair Trading (OFT), the Payments Council and other public bodies. For example, the FSA has a statutory objective under the Financial Services and Markets Act 2000 relating to consumer protection. The FSA will also be the competent authority for most aspects of the EU Payment Services Directive which was implemented in the U.K. during 2009. This Directive seeks to enhance competition, efficiency and innovation in payments while ensuring appropriate consumer protection, and deals with conduct of business issues such as the rights and obligations of payments providers and users. The OFT will be responsible for implementing the Directive's provisions that relate to competition and access to payment systems, building on its general statutory responsibilities in these areas. The Payments Council is a self-regulating body, formed

in March 2007 to be a strategic governance body for the U.K. payments industry. Its objectives are to help foster innovation, efficiency and co-operation in the U.K. payment services, ensure that payment systems are open and accountable, and maintain their integrity (Bank of England, 2009).

1.9.2.3 Mobile Market Overview

19. Market

To better understand the mobile market it is important to know the amount of mobile subscribers and its market penetration. The U.K. added over 3 million new mobile connections during 2008, to take the total base to 76 million, equivalent to 124% penetration (Cellular-News, 2009). Also, nearly ten million people have more than one mobile handset on the go, and 85 percent of the adult population has mobiles (Dennis, 2008). Since 2003 the increase of subscriptions increased closed to 42.6 percent, from 54.2 million to little over 76 million subscriptions.

In the U.K. there are five main MNOs. Taking into account the merger between Orange and T-Mobile, in 2008 the mobile market share is represented as follows (Wray, 2009):

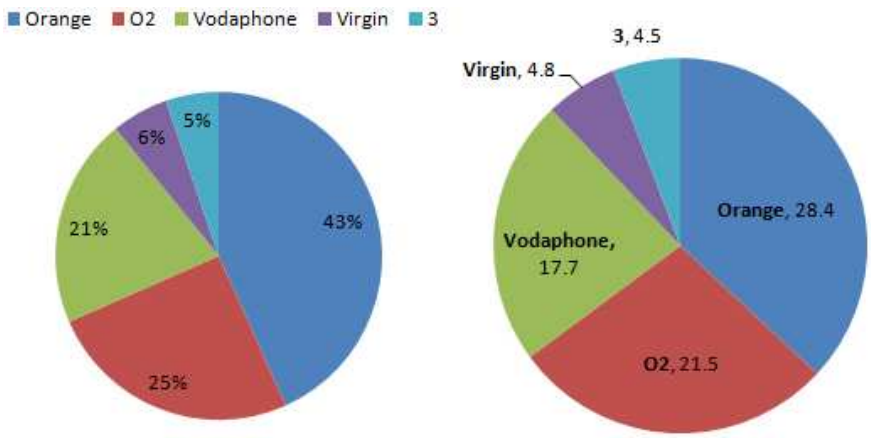

Figure 47: Market Share of MNO in % and Millions of Users

According to Ofcom, in 2008, 49.6 percent of U.K. retail revenues were earned providing mobile and data services, while 33.8 percent of revenues were earned from fixed and mobile data services. Mobile voice revenue growth was just 1.6 percent in 2008, compared to an average of 7.7 percent annual growth over the previous five years. Mobile voice generates nearly three-

quarters of total mobile revenue, but in 2008 total mobile services shrunk 2.2 percent, compared to the annual average of 9.6 percent growth over the previous five years and 15.5 percent over the previous ten years (Kim, 2009).

According to IE Market Research Corp, the ARPU levels in the U.K. will be stable from 2009 to 2013, with no significant changes. The ARPU in the U.K. is expected to be £22.13 per month in 2013. Vodafone's monthly ARPU it is expected to decline from £21.78 in 2008 to £20.77 in 2013 while Telefonica's O2 will decline from £23.85 in 2008 to £22.51 in 2013. On the other hand, Hutchison 3G, which has the highest ARPU level in the U.K., will also see its monthly ARPU decline from £28.72 in 2008 to £23.98 in 2013 (tmcnet, 2009).

Regarding contract types, it seems that there has always been a dominance of pre-paid (PAYG) contracts. Notice that although PAYG contacts are dominant, its trend is tending to decrease over the years (Incentivated, 2010).

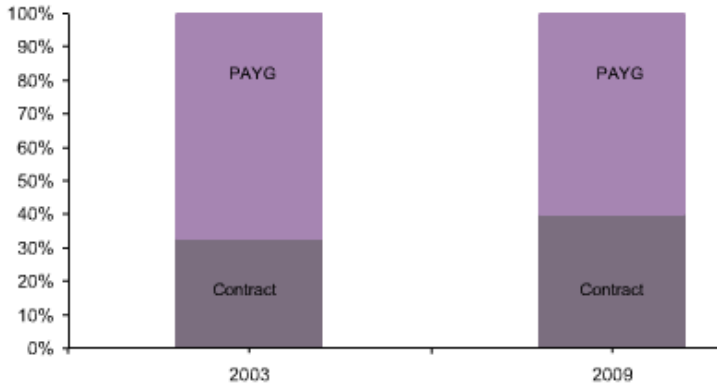

Figure 48: Contract Type in UK

If we look at past trends by MNO in 2007, we can see the same thing (SeekingAlpha, 2007).

Numbers	Prepaid		Contract		Revenue
	Total 000k	Net Adds (6m) 000k	Total 000k	Net Adds (6m) 000k	Service 2Q £m
voda	10,641	379	7,006	329	1,209
o2	11,411	-4	6,374	156	1,146
orange	9,982	-383	5,183	215	992
t-mobi	8,477	-190	3,893	178	727
virgin	4,116	-215	299	107	142
Total	44,627	-414	22,755	985	4,217
Percentages					
voda	23.8%		30.8%	33.4%	28.7%
o2	25.6%		28.0%	15.8%	27.2%
orange	22.4%		22.8%	21.8%	23.5%
t-mobi	19.0%		17.1%	18.1%	17.2%
virgin	9.2%		1.3%	10.9%	3.4%

Figure 49: Distribution of Sales by MNO and Contract Type

If we look at the diffusion of handsets and 3G technologies, it is possible that the U.K. is quickly adapting to the use of Smartphones. According to a research by the Nielsen Company, the number of Smartphone users in the U.K. rose 10 percent between the second and third quarters of 2009, from 5.6 million to 6.2 million (Ranson, 2009). TNS's Global Telecoms Insights study into the global mobile phone market in the U.K. shows that, Smartphone sales are on the rise, which will only increase operator's revenues through handset sales and data traffic. In 2008, 23 percent of all cell phones were Smartphomes, compared with 17 percent in 2007. At the present growth rate, they will generate extra sales worth £470 million in 2009. The impact of Smartphone sales translate into having both, operators and handset-makers, to focus on the Smartphone market (Curtis, 2009). The following graphs show U.K. Smartphone trends in 2007, and compare them to other European countries and the U.S. (Burk, 2008).

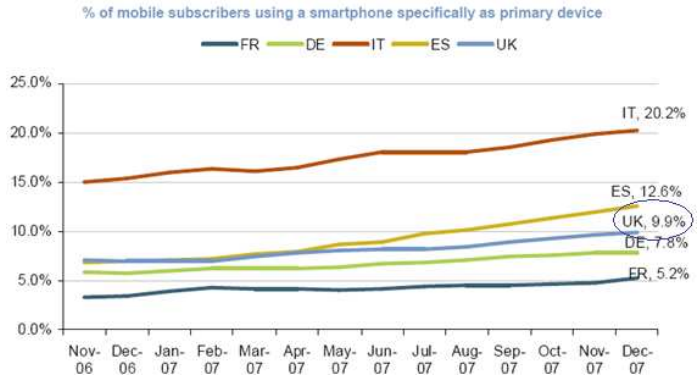

Figure 50: % of Mobile Subscribers using a Smartphone as primary device

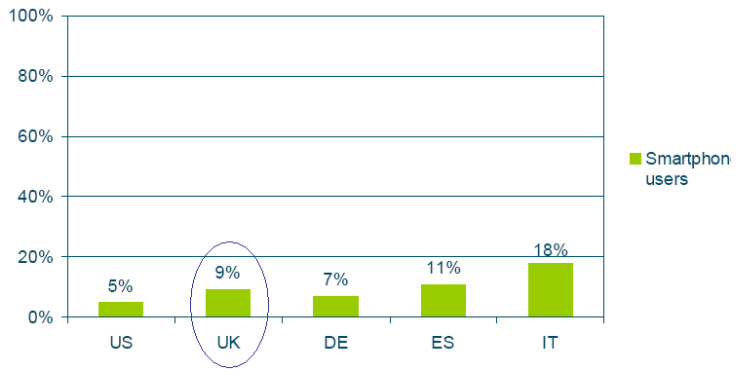

Figure 51: Smartphone Users in 2007

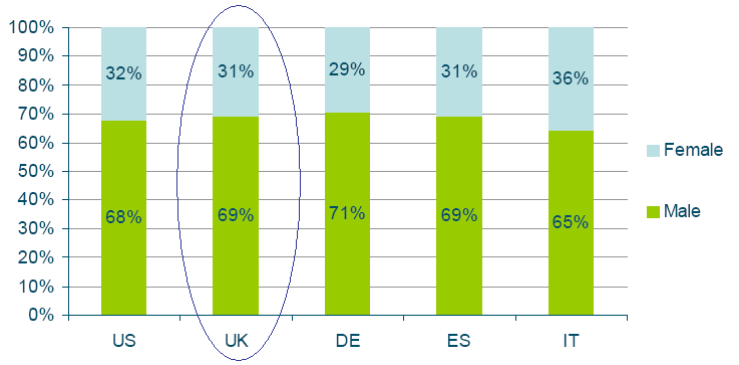

Figure 52: Smartphone Users by Gender

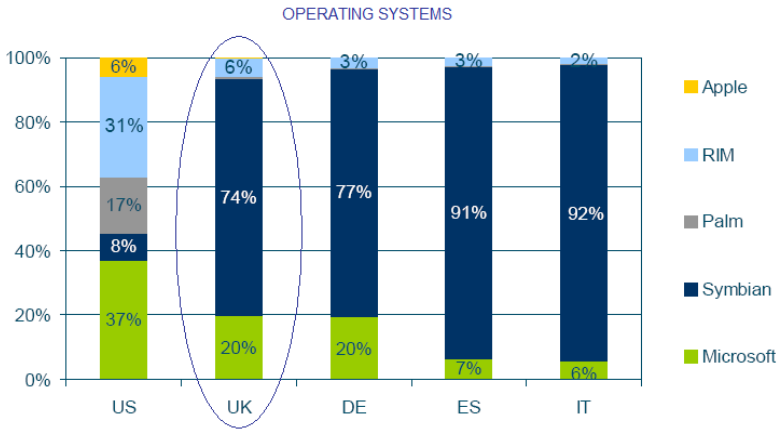

Figure 53: Smartphone's Operating Systems (OS)

Based on the previous graphs it is possible to see that in the U.K. that usage of Smartphones keeps raising. At the same time it is possible to see that the majority of users are male and most

of the Smartphone's OS are Symbian. On the contrary, the U.S. operating system market for Smartphones is very fragmented, with a clear division between RIM and Microsoft.

When it comes to cell phone usage of services, the biggest increase between 2007 and 2008 took place in listening to music and sending pictures and videos (Curtis, 2009).

Table 15: 2007/2008 Mobile Service Growth Rates

Service	Penetration	Growth from 2007 to 2008
Taking pictures	65%	33%
Sending pictures	44%	63%
Using Bluetooth	36%	-
Playing games	35%	59%
Listening to music	31%	72%
Making videos	31%	24%
Connected phone to computer	25%	-
Browsing the internet	24%	33%
Listening to the radio	22%	57%
Sending Videos	14%	75%

20. Network technologies

According to the Netsize Guide 2008, 16.2 percent of U.K.'s cell phone subscribers use 3G. The following table shows how the U.K. compares to other countries in this field and the number of subscribers in 2008 (Beattie, 2008).

Table 16: Top 10 Mobile and 3G Subscribers by Country in 2008

	Country	Mobile subscribers	Penetration rate		Country	Mobile 3G subscribers	% of subscribers
1	China	505,695,000	37.8%	1	Japan	68,155,000	65.8%
2	U.S.A.	261,368,000	86.2%	2	U.S.A.	41,700,000	16.0%
3	India	208,871,794	18.5%	3	Italy	22,349,000	25.4%
4	Japan	103,535,100	81.2%	4	South Korea	19,432,065	45.5%
5	Russia	98,964,426	70.0%	5	Germany	12,908,000	13.8%
6	Germany	93,292,000	113.3%	6	U.K.	12,083,000	16.2%
7	Italy	87,925,000	148.7%	7	France	11,496,170	22.8%
8	U.K.	74,487,000	122.9%	8	Spain	9,808,536	20.0%
9	France	50,498,000	78.8%	9	Portugal	1,841,000	13.4%
10	Spain	49,053,700	108.7%	10	The Netherlands	1,311,000	7.3%

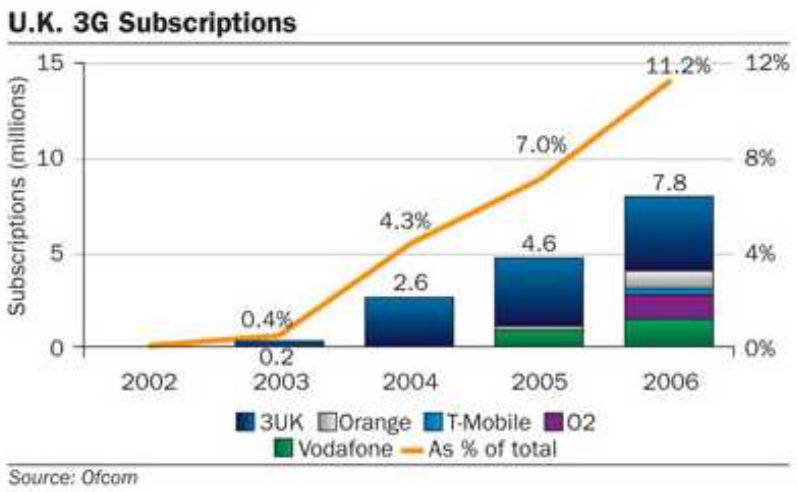

Figure 54: U.K. 3G Subscriptions by MNO

It is important to understand that table 13 ranks the countries by number of subscribers and not percentages. U.K. shows a high number but low percentage compared to Italy, for example. In regards to figure 50, it is possible to see a trend towards an equal increase in 3G subscriptions among MNO.

Another network technology is mobile broadband. According to a report released by mobileSQUARED, Mobile broadband connections will exceed fixed-line broadband connections in 2011. By 2011 the number of active 3G devices in the U.K. will be 36.3 million, as well as 6.4 million dongles/embedded devices, taking the total number of mobile broadband connections to 42.7 million versus expected broadband internet users of 42.5 million (ITU, 2009).

21. Legislation and Regulation

The Office of Communications (Ofcom), is the independent regulator and competition authority for the communication industries in the U.K. The government steps in when an abnormal or unfair situation takes place. For example, in 1984 the Telecommunications Act set the framework for a competitive market for telecoms services by abolishing BT's exclusive right to provide services. In the early 1990s the market was opened up and a number of new national Public Telecommunications Operators (PTOs) were given licenses. This ended the duopoly that had existed in the 1980s when only BT and Mercury were licensed to provide fixed line telecom networks in the U.K. (BIS, 2009).

Also there are other entities, such as The Trusted Mobile Payment Framework, which promotes a safe and trustworthy environment under which mobile phone users may purchase goods and services and charge the cost to their mobile phone accounts. It has been constructed under the auspices of the Cross-Mobile Network Operator forum of the Mobile Data Association (Short-Codes, 2007).

1.9.2.4 NFC & Mobile Payment Services Analysis

As established earlier in this research, there are two types of mobile payments: Remote and Proximity. Since 2003 the Oyster contactless card has allowed residents of U.K. to pay for their transportation fare via proximity. Since then other services have been offered. Visa Paywave and MasterCard PayPass are the most popular contactless cards, which were implemented to be used in UK since 2007. Other mobile remote payment services have emerged as well, such as PayforIt or MoLink; however, they have not been used widely by U.K. people.

Proximity or remote services application offered in U.K. allow only micropayments, even Visa Paywave and MasterCard PayPass, which can be used to make purchases for up to £10 only. Although most of the services can be activated via web, their activation mechanism varies. PayforIt does not require any activation, but Oyster requires the customer to register personally at a specific kiosk location. Contactless cards, such as Paywave and PayPass, must be issued by the customer's financial institution. At the end of 2008, 4 million of contactless cards were issued in UK (Squid, 2009). Unfortunately because new services keep rolling out and contactless card are finding its way to settle a new payment trend, it is practically impossible to find information regarding the amount transacted through mobile payments during a specific time frame.

On the other hand, there are quite a few merchants accepting mobile payments. The U.K. card association estimates that there are about 11,000 terminals across the U.K. accepting contactless transactions, in coffee and sandwich shops such as Pret A Manger, Caffè Nero, Coffee Republic, Krispy Kreme and EAT, as well as Threshers, the wine store, Books Etc and thousands of independent retailers (Squid, 2009).

Using Paywave and PayPass contactless cards users can make purchases in multiple food, wine, books and coffee stores, as well as movie theaters. Oyster contactless card allow U.K. residents to pay for their public transportation fare. Other remote mobile applications allow users to send money, pay for parking or digital content. Besides the contactless cards, current proximity and remote services allow the purchase of an array of goods or services. There is no standardization of remote/proximity payments which translates into a low industry verticalization.

The most promising industries in which mobile payment services and application can successfully unfold include, but are not limited to parking, e-commerce, digital content, and the use of NFC enabled phones to purchase durable goods or fast moving consumer goods.

If we consider the interoperability of these mobile payments, in the case of the most popular contactless payment method, Paywave and PayPass, the interoperability is high, because with one specific type of reader, contactless cards from different financial institutions can be read and processed in a standard way. Other services, such as Boku, that allows payments for digital content, provide payment services in specific games and social networks that allow payments via mobile phone. Interoperability is lower depending on the service. A more specific example is the transportation contactless card “Oyster” which only allows the purchase of transportation fares to move around London and its suburbs.

1.9.2.5 Players and roles in the Value Chain

In the U.K. the Oyster contactless card is the most well-known and widespread used contactless technology used. Oyster will still be a key player in the development of contactless payments. Other important players in the development of contactless payments are the financial institutions and the carrier operators, which should take the lead in implementing new payment trends.

The main connections that have taken place involve financial institutions; however, as time evolves, carrier operators and upcoming contactless services need to work together to provide the best possible service to people. For U.K., competition is higher as neighbor advanced countries are trying to take the lead in mobile payments. As competition increases, the need for better services increases, and thus, better mobile payments need to be offered to U.K. residents.

22. Service Development

The drivers that can lead to a successful implementation of a mobile payment initiative remain the same, regardless of the country. To increase the number of transaction, and thus revenues, by decreasing service time, while improving the customer's payment experience.

Banks main driver to implement mobile payments is to increase their customer base by satisfying their needs. For banks, to increase their customer base they must distinguish themselves from the competition. Business attractiveness is what is going to separate a bank from others by providing a portfolio with mobile options that can only attract customers to use their financial services.

Unfortunately, like everywhere else, there are certain barriers that need to be overcome in order to succeed in the mobile payment industry. In Europe, people mostly use cash, and thus, it is hard to change a payment behavior that it is so well established in U.K. society. Moreover, in the U.K., for all payments over £50, most people would rather use cash than a credit card (KnowyourMoney, 2007). For merchants the main barriers are the fact that there is a lack of verticalization (too many services) and different NFC enabled phones, which could end up affecting people's trust and adaptability to mobile payments.

2. METHODOLOGY

2.1 Objective

The main objectives of this thesis are:

- To find and describe U.S. and U.K. mobile payment services.
- To determine the features associated with Mobile Remote Payments (MRP) and Mobile Proximity Payments (MPP) in the U.S. and the U.K., to check any possible trend. To identify and analyze key differences between the mobile payment scenario in the U.S. and the U.K.

In order to achieve these objectives two methodologies were used:

1. Analysis of secondary sources to identify mobile payment services or applications in the U.S. and U.K. The sources were classified as follows:
    - Online: Most of the services to be analyzed were collected through online research of several websites and search engines.
    - Offline: Some services were collected via observation or through the ICT & Management Observatory, School of Management of the Politecnico di Milano.
2. Check legitimacy of U.S. services with on field analysis of their performance.

Because of the extensive and ever growing number of services and/or applications it is practically impossible to include every single service and/or application that is available in the U.S. and the U.K. Instead, a census was fit to the number of services and/or applications found so a relevant analysis with representative results can be performed.

The data collection took place from July 2009 until December 2009. From a total of 55 services or applications collected (including financial institutions), 38 are from the U.S., 11 are from the U.K. and 6 are mobile payment services that are running in both, the U.S. and the U.K. The parameters used for the analysis are the following:

- Technology (remote/proximity-NFC)
- Service Pattern (determines what type of mobile purchase was made, for example: transportation, durable goods, P2P, Digital Content, etc)
- Activation distribution (method of activation)
- Payment Source Distribution (whether is paid through the cell phone bill, credit card, checking account, etc.)
- Promoting Players (Key entities that promoted a mobile payment service or application when it started)
- Payment Size (whether it was micro or macro)
- Current Status (whether a service has just started or have been around for a while)

2.1 Object of Analysis

The object of the analysis is any mobile payment service that is currently being operated and used (as of 2009), either in the U.S. or the U.K. This will allow the accomplishment of the first objective and it will include trials, mobile wallets, banking applications, and any other third party provider that follows a B2C or P2P model. The list of mobile payments services do not comprise B2B or C2C models, or services and applications that may be considered mobile payments but are neither remote nor proximity mobile payments. For example, there are is a service called "Square" that allows people to swipe their cards on a merchant's cell phone attachment. Although it may be considered mobile payment, it is not for the purposes of this thesis.

The list of mobile payment services was collected between the months of July of 2009 and December 2009.

In order to accomplish the rest of the objectives, the different mobile payment services and applications found will be entered into a database to be further categorized and analyzed. As stated within the Literature Review section, establishing a good way to categorize mobile payments allows researchers to organize their knowledge. It also enables a better understanding of the current scenario, and provides a summary of what is happening (Zmijewska et al., 2004).

The following table shows the services analyzed.

Table 17: List of Mobile Payment Services or Providers Analyzed

United States	United Kingdom	U.S. and U.K
Amazon Mobile Gift Card	PulseOne	Boku
Amazon MPS	MoBank	Google Checkout Mobile
Blaze Mobile	Monilink	MasterCard PayPass
Bling Nation	Oyster	mPark
CitiObopay	PayforIt	PayPal Mobile
Express Pay	Zapa Tag	Verrus
Flybuy Sticker		Visa Paywave
Mobile Money SM		Zong
KushCash		
Money Send (MC)		
Mobile Money (MONITISE)		
mPavyy		
M-Wallet (Motorola)		
Obopay		
POPMoney		
SpeedPass		
Starbucks Card Mobile		
TextBuyIt		
TextPayMe		
Wells Fargo Mobile		
Zenius Mobile Pay		
Zip		

At the moment of entering the services into the database Visa Paywave and MasterCard PayPass will not be entered a sole services. Instead, depending on the country, the different Financial Institutions that issue the Paywave and PayPass will be entered separately. These entities will not be described separately when describing the different mobile payment services. Please notice that the number of financial institutions that issue contactless cards may have increased from the time this information was originally collected.

Table 18: Financial Institutions that Issue PayPass and Paywave contactless cards by Country

	Master Card PayPass	Visa Paywave
U.S	Citibank, HSBC, Union Bank of California and Metabank	Arvest Bank, BB&T, First Internet Bank of Indiana, INOVA Federal Credit Union, Suntrust, Wells Fargo and Zion Bank
U.K	HSBC, Natwest, and Royal Bank of Scotland	Barclays, Halifax Bank of Scotland, and Royal Bank of Scotland

2.2 Analysis Framework

In order to describe the different U.S. and U.K. mobile payment services, the following features were pursued depending on the availability of information:

- Year that is was founded
- Type of mobile payment: Remote, proximity, or NFC
- Description of the service.
- Usage statistics
- Sponsors
- How does it work
- Main focus of service (P2P/ Pay merchants, etc)
- Size of the payment: Macro vs. Micro payments
- Any fees associated with the service or application
- Partnerships

Once the descriptions are complete, they are to be input on a database that includes the following categories.

- Country: Name of the country
- Service Name: Name of the service
- Contactless / Mobile: Depending on whether a mobile phone is used or not. Notice that even though contactless cards are considered mobile devices, they are considered separate from mobile phones for this section.
- Remote (if Remote)
    - Client
        - Mobile browsing
        - Application (App)
        - SAT (Sim Application Toolkit)
        - Short Numberor Codes
    - Network
        - Sms
        - Data Transfer

        - Call
        - MMS
    - Other Remote Technology
- Proximity (if Proximity):
    - NFC
    - Bluetooth
    - QR Code
    - Other Proximity technology
    - Communication Technology for Proximity
        - Via App
        - Via SAT
        - Via Sms
        - Via Other
- Promoting Players
    - Telco: Name(s) of the Telco(s) supporting the project
    - Banks: Name(s) of the Bank(s) supporting the project
    - Tech & Service Provider: Name(s) of the Tech & Service Provider(s) supporting the project
    - Credit Card Network: Name(s) of the Credit Card Network(s) supporting the project
    - Other Merchant, etc: Nname(s) of the any other players supporting the project
- Launch Year
- Status: (Pilot, Started, Running)
    - Pilot: Pilot project that puts together a controlled number of individuals and merchants to test the project for a specific amount of time.
    - Started: Step after the Pilot in which the service starts to be commercially available.
    - Running: Project has stepped up the previous phases and now runs commercially without major concerns.
- Merchant Type:
    - Public Transportation

    - Parking:
    - Taxi:
    - Entertainment (movie theaters, Sky pass, theaters, etc)
    - Insurance
    - e-Commerce
    - Digital Content
    - Telephone Recharge
    - Vending Machine
    - Bars/ Restaurants
    - FMCG: (1/0)
    - Durable Goods
    - P2P (include remittances)
    - Other
- Merchant Quantity: Refers to an approximate number of merchants who accept the mobile payment service.
- Points of Sale: Number of points of sale that can accept the modality.
- < 10 Euros or Dollars
    - Micro
    - Macro
- Additional Fee (if any, who pays it?)
    - Merchant
    - User
- Payment Origin
    - Credit Card
    - Pre-Paid Card
    - Bank Account
    - Dedicated Credit
    - Phone Bill
    - Other

The purpose of the database is to quantify and be able quantitatively and qualitatively determine mobile payment services usage and/or patterns.

3. EMPIRICAL ANALYSIS

3.1 Services

The data collection took place from July 2009 until December 2009. From a total of 55 services or applications collected (including financial institutions), 38 are from the U.S., 11 are from the U.K. and 6 are mobile payment services that are running in both, the U.S. and the U.K.

The following sections aim at describing the mobile payment services found. Although Discover and American Express's mobile payment initiative are included in this description, other financial institutions (banks) are not included since most of them issue either PayPass (MasterCard) or Paywave (Visa). Instead the later two are described.

3.1.1 United States

- **Amazon Mobile Gift Card**

It was launched in 2008, and allows users, using their Amazon account, to send gift cards to anyone in the U.S. by sending a text message to the recipient's phone number. It works with the same carriers, and the only fee applied is the actual text message (depends on the carrier).

The main feature of this service is that the sender will receive a phone call right after sending the gift card and enter the PIN number. The recipient will get a claim code via email or text message which can be redeemed in the next transaction. If recipient already has an Amazon account with a registered mobile phone, the recipient's account will be credited with the full amount of the gift card.

WEBSITE: https://payments.amazon.com/sdui/sdui/personal/mobile

- **Amazon MPS (Mobile Payment System)**

Launched in 2009 by Amazon, the Mobile Remote Payment service allows mobile developers and merchants to provide payment options to their customers within mobile Web sites and applications. The service allows users to buy using Amazon's 1-Click, using their credit card information stored within their Amazon.com accounts.

Users making their first purchase will have to go through an authentication process. Afterwards they can make purchases without having to sign in into their Amazon account using the 1-Click functionality.

To use Amazon MPS, first, the customer clicks on the "Pay with Amazon" button which directs them to a mobile site hosted by Amazon Payments. From there, the customer can pick which payment method they want to use from the options they already have on file with Amazon. After the payment is authorized, the customer is then automatically redirected back to the original mobile website where they can then be offered the download they just purchased. The service allows users to make macro and micro payments using their Amazon account. To make

One of the first companies to launch the Amazon MPS is Handmark, a mobile content store where customers can shop for games and applications for Android, Blackberry, iPhone, Palm OS, Windows Mobile, Symbian, and Java devices.

Regarding fees, for users it is free to use the 1-Click functionality. However, for developers and merchants, fees are assessed on a per-transaction basis and vary depending on the payment method used and the transaction amount. On average they are charged the following:

- 1.5 percent + US$0.01 for Amazon Payments balance transfers
- 2.0 percent + US$0.05 for bank account debits
- 2.9 percent + US$0.30 for credit card

For really high selling volumes developers and merchants can qualify for lower rates.

WEBSITE: https://payments.amazon.com/sdui/sdui/business?sn=devfps/mps

- **Blaze Mobile**

In 2008, the California based company launched Blaze Mobile, a downloadable Mobile Remote Payment application that allows users to remotely purchase goods in real time at stores, view electronic receipts, pay bills, manage bank accounts from banks such as Bank of America, Citibank, Chase, Washington Mutual, Wells Fargo, Capital One, and many others, purchase

event tickets (with select versions of blaze), get directions/maps, and receive real-time redeemable coupons.

Once the application is downloaded into the Mobile Phone, the user must register must activate the account via TXT/SMS. Then the user must register a specific account from which the money will come when a transaction takes place. This account can be monitored using its Money Manager option inside the application.

Blaze Mobile have also partnered with Master Card PayPass to support its NFC sticker which enables payments at any of the more than 141,000 merchant locations that accept MasterCard PayPass. It is important to highlight the fact that, to make mobile proximity payments at wave-and-pay terminals, the user must sign up for a pre-paid MasterCard PayPass card.

To download the application costs US$1.99, and to use the NFC sticker the user must pay US$4.99 per month. The application allow users to make micro and macro payments.

The application works with multiple cell phones, such as LG, Motorola, Nokia, Pantech, Samsung, and Sony-Ericsson linked to AT&T, Alltel and T-Mobile accounts. There is also a downloadable application specifically designed for iPhones.

Blaze Mobile main partners include: Alltel, T-Mobile, AT&T, Apple, Appsolutely Everything, nTelos and MasterCard.

WEBSITE: https://www.blazewallet.com/

- **Bling Nation**

Founded in 2007 but gone live in 2009, the California based company provides a community payment network, in which consumers are able to purchase goods and services from local merchants using proximity NFC mobile technology. This technology links merchants to local banks to complete each transaction. The idea is that an RFID tag from a participating bank is placed on a customer's cell phone. When the user wants to make a transaction at a participating merchant, he or she taps the tag to a reader. The tag talks to the bank's back end and sends an

approval back to the merchant. After the transaction is complete the user receives a text message with details of the transaction.

For a transaction to take place the merchant, the user and the bank need to be registered with Bling Nation. Using this local network, merchants and financial institutions will be able to reduce their fees associated with the traditional method of processing a debit or credit transaction from 3 percent to 1.5 percent. The amount charged on each transaction is to be deducted from the customer's registered bank account.

Bling Nation's first financial institution to sign up was "The State Bank" in La Junta, Colorado, and has marketed the service under the name of Redi Pay Bling. It went live on Bling Nation's network in May of 2009 and already has 38 local merchants accepting the company's contactless-payment tags. So far, the bank has issued about 100 tags. Initially with only this bank, the service has the potential to reach 5,000 customers of the Colorado financial institution.

Bling Nation allows micro and macro payments. Regarding fees, on a $40 Bling Nation transaction, for example, the merchant will pay 60 cents. Bling Nation will take 12 cents, while the bank will get 38 cents, including 18 cents as an acquiring fee and 20 cents as the issuer. The bank incurs about 10 cents in issuing costs.

Bling Nation's main investors include Lightspeed Venture Partners, Meck and Camp Ventures, while its main technology partners are IBT, Micro Logica, Vincolo, SkyTel, Tecnocal and Mechanical Studio. Regarding cell phone service providers, Bling Nation's partnered with Colorado based cell phone carrier Viaero Wireless to launch its services earlier this year.

Bling nation launched its services in La Junta, a small community of Colorado of 8,000 habitants, and have been able to see clear success. The firm now plans to expand to communities with a population of 30,000 to 100,000, and hopes to sign up another 10 banks by the end of 2009.

WEBSITE: www.blingnation.com

- **Blink**

Launched in 2005 by Chase Bank, Blink allows Chase credit or debit card users to pay for purchases without swiping or handing over their card. The card, with RFID technology, allows bank users to make contactless purchases at any wave-and-pay terminal, just like MasterCard's PayPass or Visa's PayWave.

The card allow users to make micro and macro payments. However, for purchases over US$25 a signature or a form of identification may be requested.

The card is accepted in 47 different merchants, including Best Buy, CVS, 7-Eleven, Walgreens, Burger King, McDonald's, KFC, Petco and many others, at thousands of locations across the U.S.

To use this service is free. The only costs are the ones associated with the account held at Chase Bank, such as maintenance fee, which is not disclosed by the Bank.

WEBSITE: www.chaseblink.com

- **Citi Obopay**

Launched in 2008, the Mobile Remote Payment service, developed by Obopay, allows Citibank customers to send money to anyone in the U.S., regardless of their phone carrier. Users can use the service through web browsing, TXT/SMS or downloadable App, which can be downloaded into any iPhone, iPod Touch, Blackberry or Android cell phone.

The service offers the same options than Obopay and works the same way. The sender only needs the recipient's phone number to send the money, while the recipient can receive the money without signing up for the service for up to two times (for up to US$100 only). After that, the recipient needs to sign up for the service. The money received can go to a Citibank account or a different bank account.

To put money into the account a credit card or bank account needs to be linked. Regarding sending and receiving limits, on average a user can send up to 250 transactions for US$5,000 per

month and receive the same amount. The number on transactions and amount limits can vary a little bit depending on the type Citibank account.

To sign up for the service and receive money is free. However, if you wish to add money from a Visa Debit card or any MasterCard, there is a 2.5 percent charge. To send money, it costs US$0.25 to send up to US$50 and 1.5 percent of the amount sent if it is over US$50.

The P2P service allow Citibank users to make micro or macro payments to other people with their mobile phone from anywhere at any time.

WEBSITE: https://citi.obopay.com/consumer/FiWelcome.do

- **ExpressPay**

With its first pilot launched in 2002, and now active and available to all consumers, ExpressPay allow users to make contactless payment through American Express selected credit cards. The contactless card works just like other contactless cards, such as PayPass, PayWave, Zip or Blink. The main difference is that American Express issues ExpressPay cards with two different logos. One logo is the universal wave-and-pay logo, which is accepted at all wave-and-pay terminals, and the other logo is an exclusive “ExpressPay” logo, which is accepted in selected stores.

While the regular wave-and-pay logo is accepted in 47 different merchants, the “ExpressPay” logo is accepted at only 29. Some of these merchants include: CVS, Walgreens, AMC, Staples Center, Arby’s, Jack in the Box and Mc Donald’s.

The card allow users to make micro and macro payments. There are no transaction limits as it just depends on the user’s account balance. Regarding fees, the only applicable fee are the ones regarding the account, not ExpressPay.

For transactions over US$25 the user may be required to enter a PIN number, sign the receipt or present a form of identification.

WEBSITE:
https://www124.americanexpress.com/cards/loyalty.do?page=expresspay&module=3

- **Flybuy Sticker**

Launched in 2009 and developed by Oberthur Technologies, a French company, the Flybuy sticker will be distributed by three major world banks. Thanks to a partnership with MasterCard, the Flybuy sticker will be offered in the U.S. to PayPass users. The sticker is a contactless payment device that can be attached to any surface including a mobile phone, PDA, MP3 player or key ring. To pay, the user places the device with the FlyBuy Sticker attached in front of the contactless reader. It can be used as a normal payment card at any point-of-sale terminal accepting contactless cards.

The sticker was successfully tested internationally before deployment, and now it will start being shipped to the different agencies. Prices have not been disclosed yet, but it is assumed that they will vary depending on the issuing financial institution.

The Flybuy sticker in the U.S will be a form of PayPass proximity payment, and therefore, it will be accepted at all wave-and-pay terminals that accept contactless payments. Moreover, the Flybuy allows the user, just like any other PayPass device, to make micro and macro payments.

WEBSITE: N/A

- **Key Bank Mobile MoneySM**

In 2009, the Cleveland based bank Key Bank, has partnered with Fiserve to offer Mobile MoneySM, a mobile banking service that allows bank customers to access their accounts using any of the three primary mobile access modes: a downloaded application, mobile browser, or TXT/SMS.

The Mobile Remote Payment service allows customers to access to the following features:

- Balance inquiries and transaction history
- Internal transfers
- Bill payment (Micro and/or Macro payments depending on the account)
- Alerts and notifications (including two-way alerts)
- ATM and branch locator

The service is only on pilot, for which there is not much information regarding fees or how specifically the service can be used or using which type of phone.

Mobile MoneySM is the result of Key Bank's partnership with Fiserve, a global provider of information management and electronic commerce systems for the financial services industry from the U.S., and M-Com, which is an international mobile banking and payments solution provider based off New Zealand.

WEBSITE: N/A

- **KushCash**

Developed by Secure Wireless Transfers Corporation (SWT), based off California, KushCash was launched in 2005. The company offers its service through a free downloadable application that allows users to make P2P micro and macro payments from the web or any mobile phone.

To start using the Remote Mobile Payment service, the user must create an account and register his or her contacts, and account information. To add money the user can use a credit or debit card. Opening an account and sending money is free, but KushCash charges 2.8% + $0.30 when adding money and $0.50 every time the user receives money or withdraws money to his or her bank account.

To send a payment using a phone, the user must first register his or her contacts. Then, the user can access KushCash's WAP site or download the mobile App, log in, select someone in their contact list or create a new contact. Then you just enter the amount, click send, and the payment is instantly sent. Within their account, users can create a social money network of sorts by adding friends to their account. Once they have added friends, users can keep track of cash sent, received and pending "I.O.U.'s". If someone owes the user money, he or she can send them a "friendly reminder" to request the cash.

KushCash's main competitors are OboPay, PayPal and TextPayMe.

The company's main website has been inactive for some time now, for which it is uncertain whether the company it's still active or not.

WEBSITE: www.kushcash.com

- **MasterCard Money Send**

Launched in mid-2009, the service allows users to send and receive funds via TXT/SMS messages, by a mobile Web browser, a downloadable App, or over the Internet from a PC. The Remote Mobile Payment permits users to make P2P payments by linking their MasterCard or bank account to their mobile phone. The only bank on-side for this service so far is The Bancorp Bank, but with time more banks throughout the U.S. will join.

Users will be able to do micro and macro payments only with a MasterCard prepaid card issued by The Bancorp Bank. Later, they hope to add access to checking accounts, as well as MasterCard debit and credit cards.

After initiating the transfer by any of the means mentioned above, the sender approves the request by entering a MoneySend mobile PIN which is obtained upon registration. Then the recipient receives a text message confirmation of the transfer (for pre-registered users) or that the transfer is pending (for yet to be registered users). The funds can then be accessed by the recipient through an account designated during the registration process.

While receiving money is free, The Bancorp Bank is currently charging US$0.29 for sending up to US$50, up to $0.99 for transferring between US$50 and US$200, and up to US$2.95 for over US$200. The limit to send is US$2500 per month.

MasterCard's main partner in providing this service is Obopay, which provides the payment platform for mobile payments. This also means that the service works from any cell phone that can connect to internet or send TXT/SMS messages, and from any U.S carrier.

WEBSITE: http://www.mastercard.com/in/personal/en/moneysend/

- **Mobile Money – MONITISE (US)**

Formed in 2007, Mobile Money is currently working in UK and USA offering mobile remote banking services such as Balance Inquiries, Mini-Statements, Transfer Funds, Receive Alerts and

Pay Bills, to customers 24/7 using their handsets. In the U.S. the service is under the name of Monitise while in UK is named MONILINK.

To get started the user must first register online their financial institution and the respective accounts. The user can register multiple banking accounts, credit cards, and/or pre-paid cards and manage them from anywhere at any time with their handsets.

The service can be easily access from your mobile phone through:

- *Text messaging*: With this option it is only possible to check the account balance and receive alerts
- *Downloadable application (iPhones and Blackberries) and Mobile web browser*: Here users have available all the options previously described.

This service allows macro payments through the "paying bill" option. Users can pay any bill from their phone, such as cable, internet, electricity, credit card payments, etc. Monitise does not charge users for using text messages, the user pays for premium messages/sms, and the cost will depend on the carrier.

Monitise's rapid growth in recent months saw 100,000 new customers register for its services in May and it is on target to reach a total of one million subscribers by the end of 2009

Current key partners include VocaLink, Metavante, HSBC, Lloyds TSB, first direct, Alliance & Leicester, Royal Bank of Scotland, NatWest, Vodafone, Orange, O2, T-Mobile and Hutchison 3G

The latest partnership was established with Visa International in June of 2009. Visa's partnership with Monitise will help in the development of NFC payments that will enable users to use their mobile phones to buy goods and services, make payments, and receive valuable information and offers, and transfer money, all with their handset.

In the near future, Mobile money is expected to grow in Asia Pacific, India, and Africa and it is also expected to offer the following services:

- P2P Payments
- International remittances
- NFC payments
- Couponing
- Loyalty/Rewards Programs

WEBSITE: www.monitise.com

- **mPayy**

Founded in 2007, the Chicago based company allow users to shop or send money to friends online with their mobile phone, computer with internet access, or through a social network, such as Facebook. Regarding the mobile phone, mPayy works with any mobile phone that can access the Internet and can send/receive TXT messages from any network. It also works with iPhones and Blackberries.

The Remote Mobile Payment service offers different types of accounts:

- *mPayy for individuals*: Allow users to move money online, over mobile phones, or over social networks
- *IDEA for small businesses*: IDEA Accounts will allows users to sell through online auctions or their own website, or on the road with their Mobile Device
- *REACH for internet retail*: Targeted to large internet retailers
- *LIFT for fundraising:* For charities that host their own website so they can accept donations

To start using in it, the merchant or individual needs to create an account at mpayy.com. There the user will be asked to link a checking account, enter a mobile phone, and other basic information. Once the account has been set up, users and merchants can access to their account through their mobile phone by visiting http://mobile.mpayy.com. The process is the same when using internet from a computer, but they just have to visit www.mpayy.com. To complete a transaction, the will be provided with a list of ways to check out, one of them will be mPayy

Checkout. When clicking there, the user just enters the registered mobile number and password and the money will debited from the registered checking account. .Another option to send or donate money is a widget application for MySpace and Facebook.

It is important to highlight the fact that every player on the transaction needs to have an account with mPayy so the transaction is completed.

In less than a year since it started, the company had already registered 2000 members. Regarding fees, for buyers there's no cost for using the system, and they receive 1 percent cash back on purchases over US$50. To transfer money, the cost is zero too. Sellers who open a small-business account are charged 2 percent of the sale price per transaction, plus a US$.20 flat fee. Online retailers and charities are priced below that

The service allow users to make micro and macro payments. However, for buyers, they are limited to US$500 per rolling 30 days to make purchases unless they have a linked credit card, then their limit is US$1,000

Current mPayy partners include iOffer.com, LawbooksforLess.com, The Alliance for Lupus Research, mySpace, Facebook, and Performance Plus Tires.

WEBSITE: www.mpayy.com

- **M-Wallet – Motorola**

Launched in 2006, the Remote Mobile Payment platform developed by Motorola offers a user friendly interface that allows users to pay bills on time, transfer money to another person, perform basic banking operations, or make purchases at a retail store. The service also benefits companies to market their goods by virtually issuing loyalty, coupons, or gift cards directly to the user’s mobile phone. M-Wallet users must opt-in to receive coupons or other promotional services, allowing them to choose preferred merchants who participate in the program and thereby reducing spam.

The solution consists of two components: first, M-Wallet is the application that consumers and merchants download from the Internet; second, the Wallet Service Center allows the operator to

manage administration, registration, issuance of credit and debit cards, coupons, archiving, customer profiles and maintenance

Once the Motorola M-Wallet Solution is activated, the subscriber can begin enrolling other associated services, such as bill payment, bank/financial transactions, debit and/or credit cards for shopping, coupon access and redemption, and other types of transaction services.

For now, M-Wallet is compatible with all U.S. cell-phone networks, and it works with GSM/CDMA/iDEN technolgies and is compatible with Symbian, Pocket PC, Palm, J2ME, BREW and SimTk phones. The service currently targets the 2.2 billion mobile phones worldwide that are available and ready to use Motorola's M-Wallet application.

The person-to-merchant service allows micro and macro payment, as the transaction doesn't necessarily have a limit, and they will depend on the balance of the linked account.

In 2007 Motorola partnered with Discover to run a trial and offer users mobile banking applications through the use of Motorola's M-Wallet platform. The service supported NFC technology for RFID-based payments. A NFC chip inserted onto the user's mobile phone allowed users not only make purchases but also it allowed them to make P2P money transfers, redeem electronic discount coupons, and check their account balance. All this, by tapping their NFC enabled phone into a Radio Frequency reader. Results of this trial have not been disclosed for which the technology it is still under trial and it is still to be widely implemented among consumers in the near future.

WEBSITE: N/A

- **Obopay**

Founded in 2005 and active within the US in 2006, Obopay is a pioneer in Mobile Remote Payment services in the U.S. Obopay allows people to send money to anyone with a mobile phone number. Due to the fact that the company is not willing to provide usage statistics, the real success and usability of the system it is still unknown.

Some of the main Obopay investors include Redpoint Ventures, Onset, Richmond Management, Alliance Bernstein, Qualcomm, Citigroup, Société Générale, Essar Global, and Nokia.

Registered customers have the option of choosing among different types of accounts from which they can send money:

- *Obopay Mobile Money*: Customers use their Mobile phone to use Obopay via SMS, Mobile Application (initially available to Blackberries and nowadays being present in most of AT&T and Verizon smartphones) and web browser, The SMS technology only allows users to send, receive and request money while the other technologies have additional features such as balance checking, invite friends and transaction history checking.

- *Obopay Instant Checkout*: An Obopay Widget can be added to Facebook, MySpace, and other popular sites to receive payments, ask for donations, or get paid for goods and services.

- *Obopay Family Account*: An Obopay prepaid card can be charged for personal or family's purposes/expenses, or simply get cash from an ATM.

- *Obopay Pre Paid MasterCard*: All the options previously described are available with this type of account. . Money can be reloadable by phone, there's no minimum balance and automatic payments can be set up

Obopay's main service focus is P2P (Person to Person) payment which means users can pay to merchants as long as it involves paying to a specific person, such as a barber for example.

In order to cash the money received, the receiver must create an account (if the user does not have one), and once the money is received refunds are not allowed.

Obopay allows macro payments and has multiple options on the account limit depending on the type of service. However, in general, Obopay allows transactions for up to US$5000 dollars per month

For every transaction a fee of US$0.25 is charged to the sender. If the money comes from a bank account, there is no additional charge. If there are not enough funds on the bank account then Obopay charges US$6. A fee of 1.5 percent of the amount sent will be charged if the amount comes from a Visa or MasterCard.

Using the Family account, Obopay charges US$1.95 per month per card while it charges US$4.95 per month to keep a pre-paid MasterCard.

After setting up an account with Obopay, the user can add funds from a bank account or from a Visa Debit Card or any MasterCard (credit or debit) on his or her phone.

Regarding partnerships, Obopays established a partnership with Verizon in 2007, in which customers pay a monthly fee for subscription or data subscription. During 2008 Obopay has also partnered with Citibank and MasterCard. Citibank partnership allows customers to access to their Citibank accounts via Text/SMS, Browsing (WAP) or Client Application (downloaded), MasterCard partnership allows MasterCard users P2P payment service. The latest enables MasterCard issuers to offer their credit, debit and prepaid cardholders the option to send and receive funds through their mobile phones.

WEBSITE: ww.obopay.com

- **POPmoney**

Launched in 2009 and developed by CashEdge, it allows bank users to “Pay Other People” (POP) using the recipient’s email address, cell phone number or bank account information. Offered directly from within the bank’s current online or mobile banking applications, the service allows Mobile Remote Payments directly from the user’s bank account.

The P2P application allows users to make micro and macro payments through their banking institution online, sending and receiving TXT/SMS or using a mobile downloadable application.

The service does not charge users, but because the service is associated with a banking institution, depending on the bank, there may be a fee to be paid.

CashEdge already serves 600 financial institutions including seven of the nation's top ten banks and processed $50 billion in online funds transfers for bank customers in 2008. The company plans to market POPmoney to its existing clients that use the company's TransferNow service, which allows individuals to send money to other persons. But while with POPmoney senders only need the receiver’s e-mail address or mobile-phone number, TransferNow requires bank-

account and routing-and-transit numbers. Because of this, POPmoney is considered an easily integrated extension of TransferNow.

The service is expected to be fully operational at the end of 2009 while banks are implementing the service.

WEBSITE: www.popmoney.com

- **SpeedPass**

Originally launched in 1997, the contactless payment service, with RFID technology provided by Texas Instruments, allows users to pump gas to their vehicle in any Exxon and Mobil gas stations or buy goods from the gas station stores with a Speedpass key tag. First, users must register online for free and link their credit or debit account information to the key tag. To complete a purchase, users only need to wave the device in front of the designated area. The user can set up on his or her account online whether or not he or she wants a receipt for each transaction.

More than 6 million Speedpass devices have been issued in the U.S. since it was launched. Speedpass is accepted at more than 8,800 Exxon and Mobil retail locations in the U.S. The contactless service allows customers to make macro and micro purchases through their key tag.

Exxon and Mobile are working together so in the future SpeedPass is accepted in several McDonalds, retailers, and restaurants nationwide.

WEBSITE: www.speedpass.com

- **Starbucks Card Mobile**

Launched in 2009, Starbucks offer a downloadable application for iPhones and iPods Touch, which allow users to make Remote Mobile Payments at selected Starbucks stores in Washington and California.

To make a purchase with the application, the user just follows the easy steps, and at the end the user will be provided with a 2D bar code which will be used to complete a single transaction.

The application was developed by mFoundry and it is free to download. Besides allowing the user to make micro payments, the application also allows them to reload their pre-paid card, which is linked to the application, and check their balance.

WEBSITE: http://www.starbucks.com/mobile-apps/StarbucksCardMobile/

- **Amazon - TextBuyIt**

Launched in 2008 by Amazon, the Mobile Remote Payment service allows users to find and buy products sold by Amazon.com using text messaging.

Certain items that are available as 'Deal of the Day' or have a 'Gold Box Discount' will not be discounted when purchased through Amazon TextBuyIt. Although using this service is free, standard text messaging rates may apply depending on the carrier used.

Just like the previously described services, the user must have an Amazon account, which must have a credit card/bank account registered, cell phone number does not need to be registered. Also, a shipping address must be registered so the item is directly shipped there.

The service works with the same U.S. phone carriers, and credit cards accepted are: American Express, Diners Club, Discover, MasterCard and Visa.

WEBSITE: https://payments.amazon.com/sdui/sdui/personal/mobile

- **Amazon - TextPayMe**

Founded in 2005, but acquired by Amazon in 2007, the Remote Mobile Payment service allows users to send money to people, request money from people, and check their registered account balance using text messaging. The service works with any mobile phone capable of sending text messages. While phone carriers may charge for the actual text message sent/received, sending and receiving money is free.

TextPayMe works with the following U.S. carriers: AT&T, Alltel, Boost, Midwest Wireless, Nextel Communications, Sprint PCS, T-Mobile, Verizon Wireless and Virgin Mobile

To use this service, the user must first create an account online at amazon.com where a cell phone number and a bank account or credit card will be registered. When registering the cell phone the user will get a user-created PIN that will later be used to confirm payments.

Although the account is linked to a bank account or credit card, the maximum amount that can be sent or received per month is us$500.

TextPayme allows P2P payments only within the U.S.

WEBSITE: https://payments.amazon.com/sdui/sdui/personal/mobile

- **Wells Fargo Mobile**

Launched in 2007 by the California based bank, Wells Fargo Mobile enable users to connect to their accounts via mobile web, TXT/SMS, or iPhone/iPod Touch App (Since 2009). Users can check their account balances, review recent activity, transfer funds, or pay bills with their mobile phone. The Wells Fargo Mobile service works on most mobile phones with internet access, and that supports WAP 2.0.

To start using the service, the user must first have a Wells Fargo account, and then the user can register for the Mobile Remote Payment service online from a computer or web-enabled phone. To pay bills and transfer money to other Wells Fargo customers, the user must register the desired accounts and people to transfer to when creating the Wells Fargo Account.

Through the Pay Bill option, the mobile service allows users to make micro or macro payments, depending on the bill amount. Regarding fees, the service is free of charge (iPhone/iPod Touch App is free too), but additional fees regarding internet and text usage may apply depending on the carrier.

As Wells Fargo was named Best Consumer Internet Bank in U.S by Global Finance in 2009, they keep working really hard to provide the best remote banking services to its 15.9 million active online customers.

Wells Fargo Mobile works with all of the U.S. carriers, some of the most important are AT&T, Alltel, Boost Mobile, Nextel, Sprint, T-Mobile, Verizon and Virgin Mobile.

WEBSITE: https://www.wellsfargo.com/mobile

- **Zenius MobilePay**

Launched as a demo in late 2009 by Zenius Solutions, the California based company developed a software to be used on NFC-enabled phones, which allow users to make contactless transactions with Mastercard PayPass, Visa payWave, American Express ExpressPay and Discover Network Zip. The software can interface with multiple mobile wallet applications, and can run on GSM NFC-enabled phones. Right now the software runs only on Nokia models 6131 and 6212 but can be ported to additional phone platforms upon request.

Right now the Demo of the software is offered free, but to upgrade it will cost. Prices have not been released yet. Once the software is fully available, it will allow users to make proximity micro and macro payments to merchants at any wave and pay terminal, but instead, they will be able to use their mobile phones.

Although the software was designed to make contactless purchases, other embedded applications, such as redeeming coupons or checking the registered account balance, can be used remotely.

WEBSITE: N/A

- **Zip Card – Discover**

Launched in 2007, the card allows discovery credit, debit, and pre-paid card holders to make purchases contactless. The Zip Card works in the same fashion that Master Card's PayPass, Visa's PayWave and American Express's ExpressPay. The card works at every wave-and-pay terminal, which supports the same standard radio frequency for all contactless cards mentioned above.

Because the card is linked to a specific account the user can make micro and macro payments. However, just like other contactless cards, for transactions over US$25 users may be required to sign or present a form of identification.

Some of the financial institutions issuing the Zip Card are: First Bank & Trust, GE Money (for Wal-mart and Sam's Club branded credit cards), Heartland Bank, HSBC Financial Corp., Palm Desert National Bank and West Suburban Bancorp Inc. Also, since 2006 Discover started issuing debit cards, thanks to the acquisition of Pulse Payment Systems, which expanded Discover services to more than 4,500 financial institutions and 289,000 ATM across the U.S.

Besides the card, Discover Zip offers a key chain fob and, a mini-adhesive card that can be attached to personal items, such as a mobile phone, PDA or MP3 player. Currently, the sticker is being tested but it is expected to be launched within a year.

Discover Zip is accepted at over 60,000 U.S. merchant locations. Regarding fees, they will depend on the issuing financial institution.

As of 2009, Discover Zip's newest partners include Hess and Home Depot.

WEBSITE: http://discovernetwork.com/paymentsolutions/features/zip.html

Other Upcoming Services

Although many services are already working in the U.S., there are quite a few that are being developed and sooner than later will available to the public. One of these services is AcCells, based off Israel. The company has a solution called AcCells mID which enables contactless payments with any mobile phone. The way it works is by identifying a mobile phone using only near field GSM signaling and authenticate it as unique to the billing servers. All the required information to complete a transaction is obtained from there.

Other solutions include OneTXT, with its product ORCA which provides payment processing services for social networks, online games, participation TV shows, and other social media. The platform enables social media and entertainment companies to accept payments, create loyalty programs, and send marketing messages without a third party owning the transaction, information or the relationship. OneTXT is based in New York City, with additional offices in San Francisco.

Money Gram has also partnered with Affinity International to allow consumers to use MoneyGram's agent network of over 180,000 locations around the world to send money to an account associated with a mobile device.

Not only services to customers are about the launched, but there are also service providers to digital merchants, which allow them to better channel their transactions through customers. Two of the big ones are PaymentOne and Netsize, which provide digital merchants with a Mobile Remote Payment service that allows users to make purchases of digital content with their mobile phones. These service providers are not new in providing payment services, but their mobile payment services have recently been launched, for which their expansion has been slow.

3.1.2 United Kingdom

This section will not include specific banks that issue PayPass or Paywave contactless card (under the assumption that they are the most popular contactless cards). However, BarclayCard One Pulse is included because, besides being a contactless credit card, it is a dedicated card to pay for U.K.'s transportation fares (Oyster).

- **BraclayCard OnePulse**

Launched in 2007 by Barclays Bank in U.K., the contactless card is the only card that combines the functionality of Transport for London's Oyster Card, with a Visa PayWave credit card. The proximity payment system allows users to pay for their public transportation by charging the card, or pay for other items using their credit balance.

The contactless card allow users to make micro payments of up to £10 in over 7,000 shops in London and other 3,000 in U.K.. Some of the merchants that accept this type of payment are: EAT, Yo Sushi!, Coffee Republic, Prêt a Manger and Krispy Kreme doughnuts.

Although there are no annual maintenance fees, Barclay's Bank may charge the user with extra fees for usage, recharge or issuance.

WEBSITE: http://www.barclaycard-onepulse.co.uk/cardDetail.html

- **MoBank**

Launched in 2009, the Remote Mobile Payment downloadable application allow iPhone, iPod Touch and Palm Pre users to buy cinema tickets, clothes, books, tickets, flowers, gifts and takeaways with their mobile phone. To use this service, users must first download the application, then, they have to register a credit or debit card, and finally, setup a PIN code to access their account. The application can be downloaded into any of the mobile devices mentioned above regardless of their carrier.

MoBank allow users to make micro or macro payments by registering an account from one of the following banks: Abbey, Bank of Ireland, Halifax, Bank of Scotland, Cahoot, Co-operative Bank, First Direct, HSBC, Intelligent Finance, Lloyds TSB (UK), Nationwide, NatWest (UK), RBS, and The Woolwich. Mobile purchases are accepted from the following merchants:

- Thetrainline.com (Train tickets)
- Waterstones.com (Books)
- Throntons.co.uk (Chocolates)
- Interflora (Flowers)
- MyVue.com, Cineworld.co.uk, Odeon.co.uk (Movie tickets)
- Justtheflight.co.uk and Ticketweb.co.uk (flights)
- Game.co.uk (gaming)
- Deliverance.co.uk (food delivery)

Besides allowing the user to make purchases, the mobile application allows the user to check the balance of the registered account and see mini statements.

The application is free to download, and it is free also to check the account balance and mini statements. However, for every purchase or transaction, a charge of 50p will be charged to registered account. The amount is billed every 3 months, so the users get charged £2.50 for making between 1-5 transactions every 3 months. The user has also the option to make a one-time payment of £15 and never be charged for any transaction. Cost of internet, airtime minutes, will depend on the carrier.

Only Maestro, MasterCard, Visa, and Visa Debit cards issued by UK financial institutions can be registered and used with MoBank.

The application's platform was developed by NTT Europe Online.

WEBSITE: http://www.mobank.co.uk/mobank/

- **Mobile Money – Monilink (UK)**

Formed in 2007, Mobile Money is currently working in the U.K. and the U.S. offering mobile remote banking services to customers 24/7 using their handsets. In the U.S. the service is under the name of Monitise while in UK is named MONILINK.

To get started the user must first register online to one of two services offered. The service can be easily access from your mobile phone through:

- *Mobile Money*: Text Services, which allow users to check their balance by text, get account balance alerts, weekly balance alert and oversea transaction alerts.

- *Mobile Money*: Manager App, which allow users to make transfers, get real-time mini statements and balance, check usage history, and make international payments.

The Mobile Money app works on most mobile phones. If the mobile phone has a camera or games installed it should support the application. However, iPhones and Windows Mobile devices do not currently support the application download. In 2008, Monilink launched an application for Blackberries which allow users from selected banks which allows them to perform basic banking operations

Current financial institutions that provide this service in the UK are: NatWest, Royal Bank of Scotland, Ulster Bank, Alliance and Leicester, Alliance and Leicester Commercial Bank, First Direct, HSBC and Lloyds TSB. Depending on the chosen bank, the services available vary.

Monilink's main partner is Carphone Warehouse, one of UK's main mobile phone retail chains.

Costs for using the service vary also depending on the financial institution and carrier. Vodaphone, Orange and Virgin Mobile users are charged by the financial institutions for

downloading the application. However, texting is not charged by the financial institutions but only by the carrier, depending on the plan and service.

Monilink works with every UK carrier: Vodafone, O2, Orange, T-Mobile, 3, Tesco Mobile, and Virgin Mobile.

In the near future, Monilink is expected to allow customers to move money between accounts, pay bills, and purchase travel tickets.

WEBSITE: http://www.monilink.co.uk/

- **Oyster**

Launched in 2003, the service, which is a card implanted with an RFID chip, allows users to pay for public transport in a contactless manner, within the Greater London area of the U.K. The proximity service works on the London Underground, buses, the Docklands Light Railway (DLR), London Overground, trams and some National Rail services.

Although the card is design to make micro payments, it can be charged for up to £90 at once. To recharge the card, users have the option to pay online, tfl.gov.uk/oyster, at Oyster Ticket Stops, at Tube and London Overground station ticket offices and touchscreen ticket machines, or at London Travel Information Centres.

In order to start using the Oyster card, users must first register the card in person at a London Underground Station. The cost of the card is £5 and comes with £2 of credit. If lost or stolen, the user must pay £5 and submit a new registration form with a photo.

Over 10 million cards have been issued of which around 5 million are in regular use. As of March 2007, more than 80 percent of all tube and bus journeys use Oyster. Around 22 percent of all Tube journeys are Oyster Pay as you go, around 4 percent cash.

The Transport For London and O2 partnered in 2007 to offer the Oyster ticket functionality through mobile phones (NFC equipped). Because phones with NFC functionality are extremely limited in UK and not widely expected to see mass take-up for some years, TFL concluded, after the trial, that this service will be launched before 2013.

The development of Oyster card came from a contract between Transport For London and TranSys and TranSys current partners include EDS and Cubic.

WEBSITE: https://oyster.tfl.gov.uk/oyster/entry.do

- **PayforIt**

Launched in 2006, but gone live in 2007, the UK based service developed by Vodafone, Orange, 3, T-Mobile and 02, allow users to buy mobile content from any mobile phone that can access to the internet. The Mobile Remote Payment costs nothing to the user. The user will only have to pay for the bought content and internet time, which depends on the carrier.

The user does not need to have an account or register for this service; neither has to register a credit card or bank account. Whenever the user sees the Payforit symbol on a mobile portal, he or she simply needs to follow the on screen instructions to pay for your content. The amount will be added to the monthly bill or pre-paid cell phone account.

The service allows users to make only micro payments for up to £10. However, the amounts are fixed, which means the user will be charged in fixed amounts, such as £25, £5, £1, £15. The user will not be charged £6.35 for example.

To make the payment go through, PayforIt counts with Accredited Payment Intermediaries, to ensure that transactions are managed and processed in accordance with the Payforit rules and conditions. These intermediaries are: 2Ergo, Bango.net, Dialogue Communications, Ericsson IPX, Hybyte Solutions & Services, mBlox, Mobile Interactive group, Sybase365, MX Telecom, Netsize, Tanla mobile, Oxygen8 Communications, Verisign and Win.

PayforIt aims at providing this service to over 52 million users in the UK and plan to extends its service online and allow macro payments as well.

WEBSITE: http://www.payforituk.com/

- **Zapa Tag**

Launched in 2009 by Zapa Technology, an Irish based company, the service allows users to attach a Tag to their phone and use it to participate in multiple retail loyalty and other programs such as prepaid payments, mobile gift cards and promotions. In UK, the mobile payment service platform will be provided through Postilion.

For now the pay-to-merchant proximity service only allow users to make micro transaction at 32 different location of Insomnia Coffee shop in Ireland. To get started, users need to pick up a tag at a participating location, register the tag online at zapatag.ie and then start using the service by -tapping at the cash register to receive bonuses and rewards.

Besides Insomnia, the service is expected in the near future to be functional in different types of outlets including restaurants and coffee shops, clothing and accessory stores, grocery, wine and delicatessen stores, entertainment venues and service stations.

The contactless payment initiative also provide features such as online and mobile alerts to advertise in-store promotions, mobile-based incentives to encourage foot traffic, and interactive customer loyalty programs tailored to individual consumer spending patterns.

3.1.3 U.S. and U.K.

- **BOKU**

Launched in 2009, BOKU currently operates in over 50 countries thanks to their acquisition of Paymo and Mobillcash businesses. Based in California, but with offices in Europe, Asia and Latin America, BOKU reaches over 1.6 billion consumers worldwide, and is funded by leading Silicon Valley entrepreneurs and venture capitalists Benchmark Capital, Index Ventures and Khosla Ventures.

BOKU allows users to pay for digital content, using their mobile phone device, inside games or social networks such as Hi5 or Facebook. The mobile remote payment takes place when users click on the ‘Pay by Mobile’ button on the merchant’s checkout page, enter their phone number and agree to payments by sending and receiving SMS text messages. The platform takes care of

financial conversion rates in all countries, and lets the publisher choose different prices for different countries.

The amount billed for purchases through Boku's mobile services will be charged on the customer's upcoming phone bill. Because the fees for using Boku's services on the user's Mobile phone are charged through each specific carrier, they can vary from 10 to 50 percent of the purchase price.

Boku allows mobile payments for micro-transactions for games in applications that are initially offered on services and games such as Hi5, Puzzle Pirates, Aeria Games, and multiple applications on Facebook and MySpace. Thanks to Boku's acquisitions of Paymo and U.K. based MobillCash, the company has secured partnerships with most of the main cell phone carriers in the world. More specifically, Boku can accept payments for 193 carriers to date. Main carriers include AT&T, T-Mobile, Virgin Mobile, Vodaphone, Verizon, Sprint, O2 and Orange.

Some the latest partnerships include Badoo, fatfoogoo, Gambit, Jambool, Meez, Offerpal, Playfish, Slide, Sometrics, Slide, Super Rewards, TrialPay, and WeeWorld,

WEBSITE: www.boku.com

- **Google Checkout Mobile**

Since 2007 the California based company allows users to quickly make purchases from their mobile device from any WAP enabled checkout merchant that accepts this mobile payment. Users need to have or set up a Google checkout account in which they will put all the relevant information to complete a purchase, such as credit or debit card information, billing and shipping address, email address and password. To be able to use Google Checkout Mobile, unlike regular Google Checkout used from a desktop, the user must first set up a PIN code which later will be the only piece of information needed to complete any transaction when navigating through the internet with their mobile devices.

The mobile remote payment alternative, offered by Google, needs to first be enabled by merchants before users can make purchases. Merchants need to have a mobile-friendly site and adhere to standard Google Checkout content policies.

Google Checkout Mobile allows Micro and Macro payments to registered merchants. Users can make purchases for up to US$70 per transaction and up to USD$1400 per month.

Regarding fees, for Merchants it depends on their monthly sales, the more they sell, the less percentage they pay. The percentages go from 2.9 to 1.9 percent plus a fixed US$0.30 per transaction. For users, the will be charged depending on the carrier for minute connected to the internet.

Google Checkout Mobile tries to target the millions of people who search for items on Google from their mobile device on a daily basis.

WEBSITE: http://checkout.google.com

- **mPark**

Launched by Payzone in the U.K. in 2001, mParks allow customers to pay for parking remotely with their mobile phones in the U.S., Ireland, Germany, Australia and off course, the U.K. The way it works is:

- Find an available parking space
- Dial the mPark number shown on the ticketing machine
- Enter the 4 digit parking location number as instructed by IVR
- End call
- The meter is now activated, displaying a personal greeting
- Press a button to select parking duration required
- Press a button to confirm payment
- Parking ticket will be printed automatically
- Display ticket on your windscreen

Afterwards, the customer gets a confirmation message (SMS) and is billed through the registered debit or credit card. However, recently mPark partnered with O2 in the U.K., so customers can also get billed through their regular mobile phone bill only if they have a contract with the MNO (no pre-paid).

Because the payment depends on the parking time and certain restrictions, the customer can pay either micro or macro payments.

WEBSITE: www.mpark.com

- **PayPass – MasterCard**

Launched officially in 2005 after a nine month successful trial in 2003, PayPass offers a Mobile Remote Payment alternative that allows users to make person to merchant transactions via contactless RFID technology. Users can use a Card, a Mobile Phone, a Key Chain Fob, or a Wrist Watch to make contactless payments. The different options will depend on the chosen financial institution. Current financial institutions that offer this technology in the U.S. are Citibank, HSBC, Key Bank, Union Bank of California, and Washington Mutual. In the U.K. HSBC, the Royal Bank of Scotland and Natwest, among others. Each transaction is debited, or credited, from the users account at one of the above mentioned financial institutions.

Regarding the mobile phones, they are required to be NFC enabled and be able to perform Over the Air Personalization (OTA), this last one is used to configure the users Mobile Phone so it works with PayPass. As for their carriers, during their first trial in 2003 MasterCard partnered with AT&T and Nokia, however, nowadays PayPass and Nokia still work together but there's no specific carrier working with them. The mobile option it is still not widely used in the U.S. and in the U.K. is not even an option.

In the U.S., although the application was designed for micro payments, PayPass can be used for Macro payments as well. If the user's purchase is less than US$25, then it is only necessary to tap de device onto the RFID reader. However, if the transaction is over US$25, the user will be required to either enter a PIN code number or sign the receipt. In the U.K. it is only accepted for micro payments (transactions of £10 or less)

PayPass can also be used in 17,500 vending machines equipped with ePort across the U.S., thanks to the positive feedback from consumers, vending operators and soft drink bottlers, as well as increased sales at machines that accept contactless payments. In the U.K. PayPass is accepted in over 7,000 shops in London and other 3,000 in UK. Some of the merchants that accept this type of payment are: EAT, Yo Sushi!, Coffee Republic, Prêt a Manger and Krispy Kreme doughnuts.

As of second quarter of 2009, MasterCard had issued nearly 61 million MasterCard PayPass cards or devices, which can be used at over 153,000 merchant locations globally. Regarding fees for using PayPass, they will depend on the chosen financial institution and type of account.

PayPass have partnered with numerous U.S. merchants, such as Best Buy, Office Depot, McDonalds, Walgreens, 7 Eleven and Arbys.

During 2009, PayPass have also partnered with Blaze Mobile to introduce the same service,PayPass, but as a sticker that can go into any cell phone so the user can pay with their mobile phone. The NFC technology is currently being offered in Metabank, a bank that serves Iowa and South Dakota. Payments through this modality are offered at the same retailers that offer PayPass cards.

WEBSITES:
http://www.mastercard.com/us/personal/en/aboutourcards/PayPass/index.html
http://www.mastercard.com/uk/merchant/en/solutions_resources/PayPass/index.html

PayPal Mobile

Launched in 2006, the California based company allows people, with this new service, to pay for goods from any mobile phone that is enabled to text and/or access to the internet. However, the user must first set up an account with PayPal, then when the user must activate his phone for PayPal Mobile and create a 4 digit PIN code number, which later will be asked for, instead of username and password, to proceed with each transaction. Once the PIN is entered the user will receive either a call or a text to confirm the transaction.

The Mobile Remote Payment alternative allows users to do Micro and Macro payments in different ways:

- *Send Money:* Users can send money to anyone by text, voice, or logging into their account online using their mobile phones.
- *Pay for goods*: Any time users see "Text to Buy" on an item displayed on an advertisement, newspaper, street, or magazine, they will be able to buy the item by texting the code displayed on the "Text to Buy" item. Users can also buy stuff online from their mobile phones by logging into their PayPal account or straight from eBay.
- *Give to Charity:* Just like paying for goods, but the advertised charity will say "Text to Donate"
- *Check their balance and change currencies*: By using TXT/SMS

During 2009, PayPal have implemented an application for Android and iPhone mobile devices, which provide the same options indicated above but with much better and efficient accessibility.

In 2008 another application was launched for Blackberries. However, this application only allowed users to make purchases through PayPal offering the same options and entry data requirements than using PayPal through the internet from a regular desktop.

Allowing P2P and Person to Merchant payments, PayPal Mobile targets its 73 million active accounts in over 190 markets around the world.

Using PayPal Mobile the maximum amount allowed for a single transaction, for PayPal members, is US$10,000 and, for non-PayPal members, US$4,000 for a one-time, single transaction. The amount to be sent or spent depends on whether the account is verified by PayPal and the funds available to the account linked. The cost of using PayPal Mobile is zero but phone carriers may charge users for text messages, data usage, or airtime minutes. In the U.S. the main phone carriers that support this system are T-Mobile, Verizon, Virgin Mobile, Alltel and AT&T. In the U.K. the there are over 10 million accounts and all of the carriers are supported to use this service.

Some of PayPal's main partners includes Blackberry, GPShopper, and Transaction Wireless, with whom they powered the company wCharge by Transaction Wireless.

WEBSITE: https://www.paypal.com/mobile

- **Verrus**

Founded in 2000, the Vancouver based company offers Mobile Remote Payment of car parking in over 100 different cities along North America, Europe and Australia. In the U.S. it is now operating in cities like Aspen, Chicago, Coral Gables, Dallas, Hawaii, Madison, Miami, Milwaukee, Minneapolis, New Haven, New Orleans, Oakland, Redwood City, Santa Ana and Seattle. Verrus also will allow users to pay for their Taxi's fare through their Mobile phone in the near future. In just two years of operation in the U.K. market, Verrus has positioned itself as the leading supplier of mobile phone payment services for parking and is now supplying ten local authorities including the City of Westminster, the first UK authority to implement phone parking as the only form of on street payment. Verrus also supplies its service to NCP and to Euro Car Parks, two of the UK's largest private parking operators.

The way it works is, first he customer must create a profile/account at Verrus main website, verrus.com, and insert their credit card information and license plate information.Credit cards accepted by Verrus in the U.S. are Mastercard, Visa, and American Express, on specific locations. The maximum number of license plates to be registered per profile is four. Once the account is created the user can go parking wherever the Verrus service is provided, without coins. Right after parking the user must call or text to the posted number, enter the location and time, then the user is reminded when the time is almost up. To extend the parking time the user can call or text the same number again and enter the new amount of minutes. Through the profile/account created, the user is able to see past and recent transactions and print receipts. Users can call or text from any phone, regardless of the phone carrier.

The Remote Mobile Service provider allows mainly micro payments, unless the parking time is extremely long and allowed by the parking space provider.

Signing up for Verrus is free but there is a US$.35 cents charge on each transaction, even when adding more parking minutes. In the U.K. in addition to paying for the parking, the user is

charged a Service Charge of 20p where the parking fee is more than £2, and a Service Charge of 10p where the parking fee is less than £2.

Regarding partnerships, In 2006 Verrus partnered with Payment Processing, Inc. to offer its payment platform through clients such as the City of Vancouver, Douglas Parking and Impark. This last one owns, manage or lease over 300,000 parking spaces among Canada and the U.S. Along with Impark, in 2008 Verrus have also partnered with Republic Parking Northwest, United Parking, and Diamond parking to offer the city of Seattle approximately 300 parking spots that offer this type of Remote Mobile Payment alternative.

During 2007 Verrus have also included on his U.S. client portfolio Metro Transit Chicago, Redwood City in California, and St. Paul Minneapolis Airport. In 2008 Verrus started to serve the city of Miami in Florida, where now offers more than 8,000 street parking spots. Lastly, the most innovative Verrus application was launched when partnering with Seattle's baseball team, The Mariners, and Verizon Wireless. Since 2005 any user at Safeco Field (Mariners Baseball Field) can order food, win prizes, get game updates, and help selecting the music to be played during the game, by calling or texting with their Verizon mobile phone.

WEBSITES:
http://www.mparkusa.com/mpark/index.jspx
https://www.verrus.com/default.asp?ctState=prFAQ

- **Visa Paywave**

Introduced in September 2007, Visa payWave, a contact-less technology feature that uses RFID which allows cardholders to wave their card in front of contact-less payment terminals to make purchases without the need to physically swipe or insert the card into a point-of-sale device. In order for the transaction to be completed, the card needs to be in close proximity (1-2 inches) from the reader, and it must be correctly oriented to be processed. After waving the card in front of it, the reader will light up and beep to inform you that your information has been received and processed.

The Mobile Proximity Payment service offers three different ways to pay to merchants: Visa Card, Visa Mini Card, and Visa Micro Tag. The main difference between these options is the size.

In the U.S., seven of the top ten Visa issuers are offering Visa credit, debit and prepaid cards with Visa payWave technology. First Citizen Bank and Barclays started to issue Visa payWave cards in August 2007. National merchants already accepting Visa payWave in the U.S. include BP, 7 Eleven, CVS Pharmacy, McDonalds, Taco Bell, Jack in the Box and more. A number of national merchants are in the process of upgrading point of sale terminals and have announced plans to accept Visa payWave, including Einstein Noah Restaurant Group, BJ's Wholesale Club, Circle K, Office Depot, and PETCO. In the U.K. Paywave can only be obtained through Barclays. Some of the U.K. merchants accepting contactless paywave are Ikea, EAT, Caffe Nero, Subway, Krispy Cream, Pret, the National Trust and Yo! Sushi.

The checkout process is speedier for most transactions under $25. If the transaction is above US$25, then the process becomes slower, because the customer will have asked to sign a receipt, enter their PIN, or hand their card to the cashier. IN the U.K the maximum purchase amount is £10.

Regarding fees, any fees, such as enrollment fees, transaction fees, and annual fees, that may apply to Visa payWave will be set by the issuing financial institution. Some institutions may issue the card free of charge but others may charge depending on the card program. These numbers are to be disclosed during the application process.

Regarding other services, Visa payWave and USA Technologies, Inc. have recently agreed on extending the number of vending machines terminals to 4,000. These new vending machine terminals will include G8 ePorts so users can purchase using Visa payWave.

WEBSITES:
http://consumer.visaeurope.com/paywave/default.aspx
http://usa.visa.com/personal/cards/paywave/index.html

- **Zong**

Founded in 2000, the California based company allows users to pay for digital content throughout social networks and online games with their mobile phones. Zong is currently live in 23 countries across 110+ carriers and has over 10 million users worldwide. In the U.S. Zong operates with 9 carriers: AT&T, Verizon Wireless, Sprint, T-Mobile, Alltel, US Cellular, Boost Mobile, Cellular One and Virgin mobile. In the U.K it operates with Vodafone, Orange, O2, T-Mobile, Hutchison 3G and Virgin Mobile.

The Mobile Remote Payment application is featured in social networks such as Facebook and MySpace as well as online gaming sites, such as Gaia Online, IMVU and Outspark. In 2009 Zong processed mobile payments for over 10 million unique users worldwide.

What makes Zong unique is the fact that it does not require end-user registration and a mobile phone is the only thing needed. To perform a transaction the user first needs to enter his or her phone number. Seconds later the user receives a TXT/SMS with a PIN code number, which needs to be entered in order to complete the transaction. Zong allows users to make micro payments and charge them through its short codes with Premium SMS, or event based billing on each month's phone bill. Prices will vary depending on the carrier.

Although their transaction costs are higher than other electronic payments, 25 to 50 percent of the sales price, their conversion rate (according to Zong, the payment conversion rate is the rate at which a user gets to the "payment completed" page after clicking the "pay now" button) is significantly higher, about 10 times higher than electronic payments.

Zong is a division of Echovox, a mobile monetization company with Headquarters in Switzerland and California, which is backed by Advent Partners and Newbury Ventures.

WEBSITE: www.zong.com

3.2 Database

Because of the extent of the database, it is not possible to include it in this report. However it is available electronically on the accompanying CD of the thesis.

4. RESULTS

The total list of services analyzed was 55. 38 were from the U.S., 11 from the U.K., and 6 were services operating in both, the U.S. and the U.K. Because of the difference in the number of services collected, the results are based on the assumption that they are significant and proportional to the reality of each country. It is important to mention that the services were divided into: U.S., U.K, and US & U.K. The services are mutually exclusive, they do not repeat among groups. The services from the U.S. are only present in the U.S. and so it is for the U.K.

Based on the criteria of the database used, described on the Analysis Framework section, the following are the results of the empirical analysis.

4.1 Type of Payment Service Analyzed

The following section aims at comparing the RMP and PMP services that are currently being offered in the U.S., the U.K., and in both, the U.S. and U.K. at the same time. The results will be delivered throughout different sections. The analysis will come from the following distribution of services.

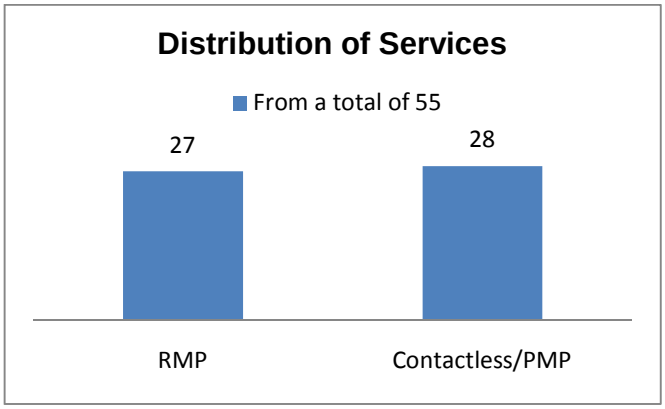

Figure 55: Distribution of Services

Within the list of PMP services, there are a number of banks that provide either Visa's Paywave or MasterCard's PayPass. Because of this, some graphs will include each bank as a unique entity (will stay "including bank"), while other graphs (that will say "without banks") will include the single technology and not each bank as a unique entity. The importance of including banks lays in its offering of an alternative to the consumer.

An exception as been made with PMP services that provides a unique contactless card by a single institution. For example, Zip from Discover network, Blink from Chase Bank, and OnePulse from UK's Barclay's bank.

Based on the amount of services analyzed, the majority of contactless services analyzed from the U.S. and the U.K. were provided by banks.

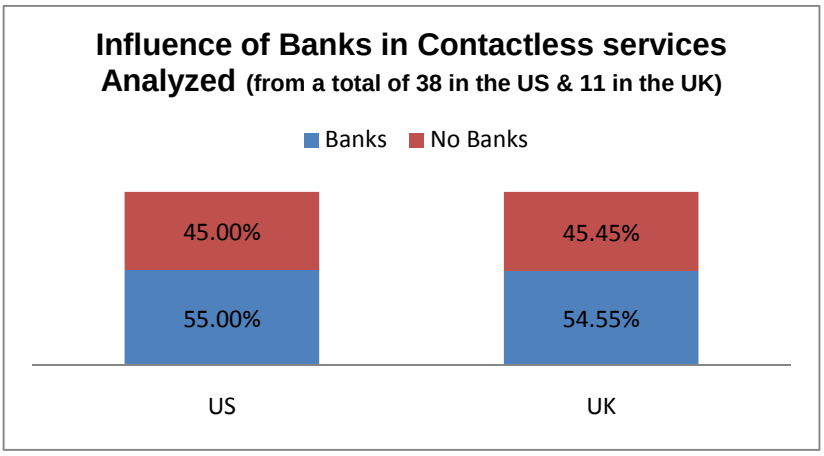

Figure 56: Influence of Banks in Contactless services Analyzed

4.1.1 Mobile Payment Distribution

For purposes of the results, "mobile" explicitly refers to the use of a mobile phone, while contactless refers to the use of any other mobile device. When using a mobile phone, the customer can make RMP or PMP. Because of this, the first graph shows the distribution of remote and proximity payments within the "mobile" section. For the rest of the analysis, the term "mobile" is equivalent to "remote". The following graphs show the mobile payment distribution in the U.S., UK, and both countries.

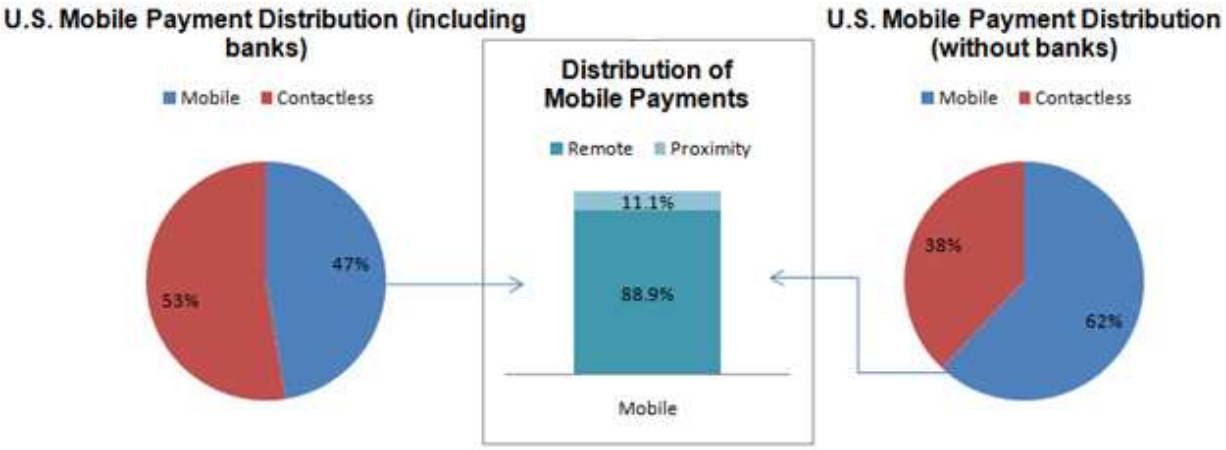

Figure 57: U.S. Mobile Payment Distribution

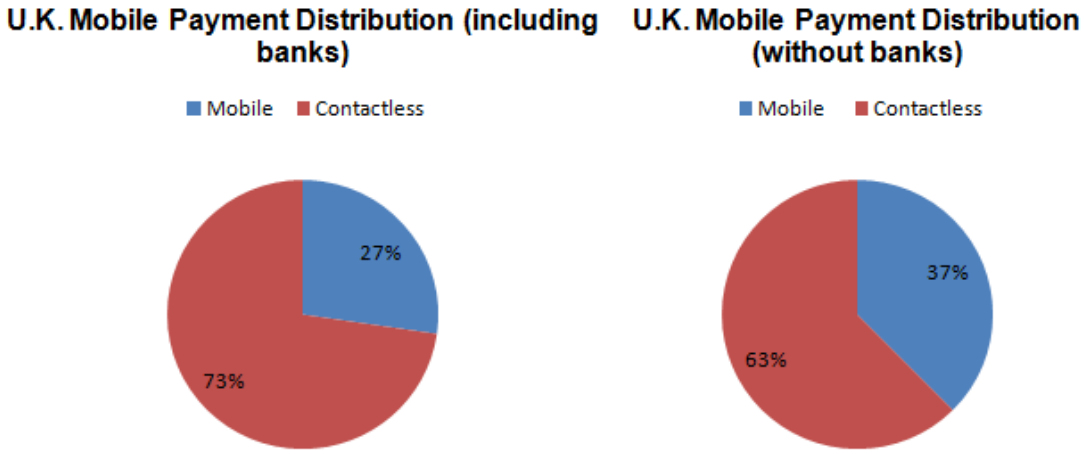

Figure 58: U.K. Mobile Payment Distribution

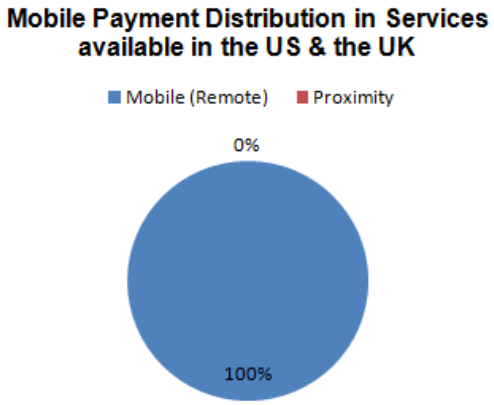

Figure 59: Mobile Payment Distribution on Services Available in the US and the UK

Based on the graphs it is possible to see that in the U.S. there is an even number of RMP and PMP services. If we count each bank that provides a contactless service, then there is definitely an impact towards a greater number of contactless services. On the other hand in the U.K. the number of PMP services surpasses the number of RMP services. The few services that are available in the U.S. and the U.K. are all RMP services. Although Visa Paywave and MasterCard are available in both countries, each has its own unique rules and regulations, and because of that, they do not count as PMP service for both countries.

4.1.2 Service Distribution

Service distribution refers to the different purposes of each mobile payment.

- **RMP**

While in the U.S. 16 services were collected for this thesis, the U.K. is represented by only 3 RMP services. On the other hand the 11 services present in both countries are all RMP.

When analyzing at the different purposes for using RMP, it is possible to see that in the U.S. most of the RMP offer P2P services. While a big portion also provides more than one other service, the rest of the categories are very fragmented. The “Other” category refers to fundraising and/or bill payment services. In the U.K., the services offered are equally distributed. Although the “Other” category has the majority (bill payment), the array of services in the U.K. is very fragmented.

There’s no difference among the RMP services offered in the U.S. and U.K., as they offer a very diverse set with no dominance. Because of the low number of services collected from the U.K. and services that operate in both countries, the fragmentation implies that the different services are used for more than one purpose.

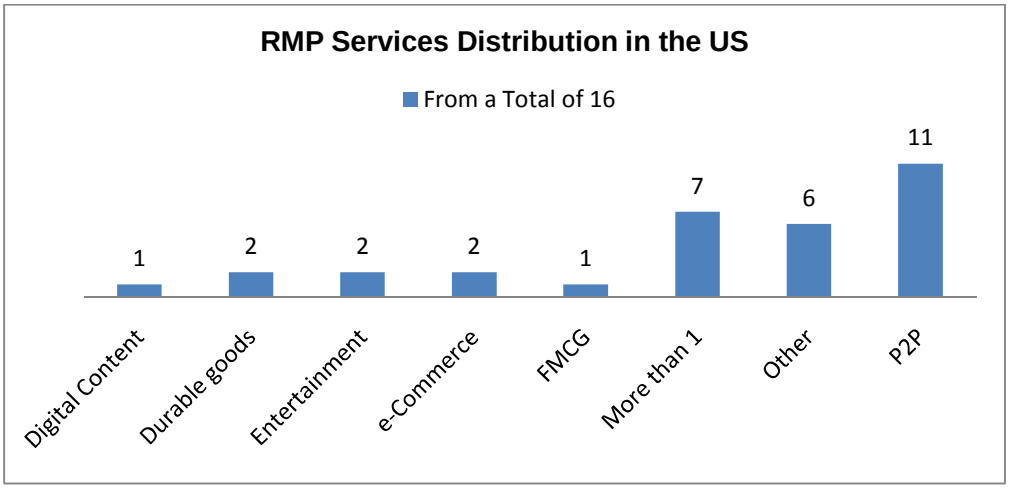

Figure 60: RMP Services Distribution in the US

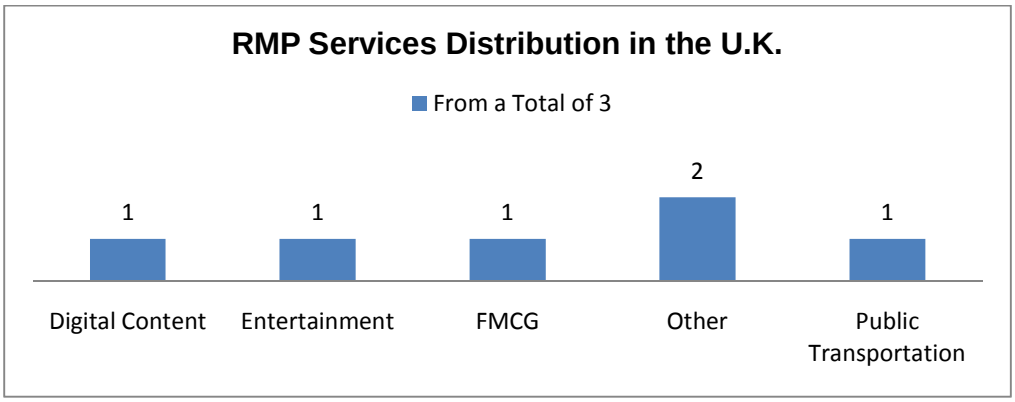

Figure 61: RMP Services Distribution in the UK

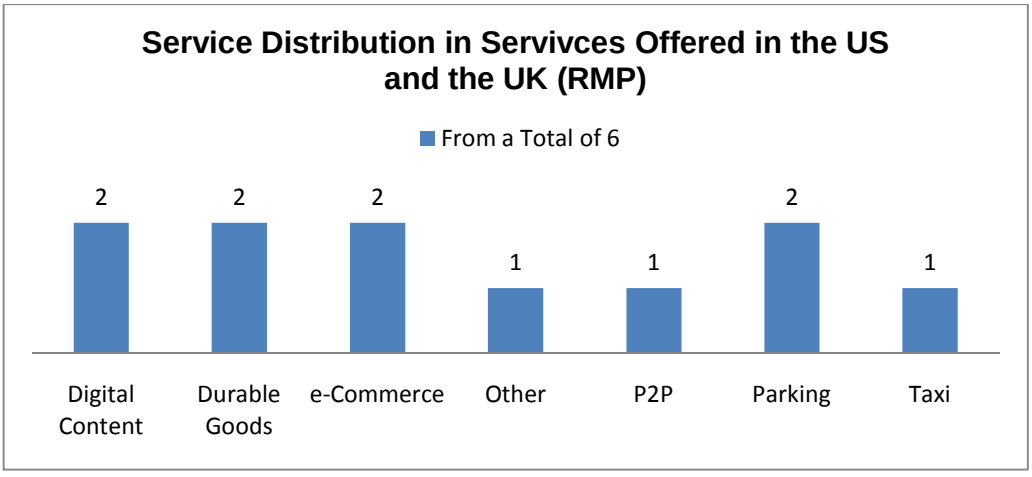

Figure 62: Distribution of Services that are offered in the US and the UK

- **PMP**

Including banks, in the U.S. the majority of PMP services are to purchase durable goods (81%) and FCMG (86%). The percentage of services that allow these purchases is not too far from the rest. 77.27% of the services allow consumers making purchases in bars or restaurants and for entertainment.

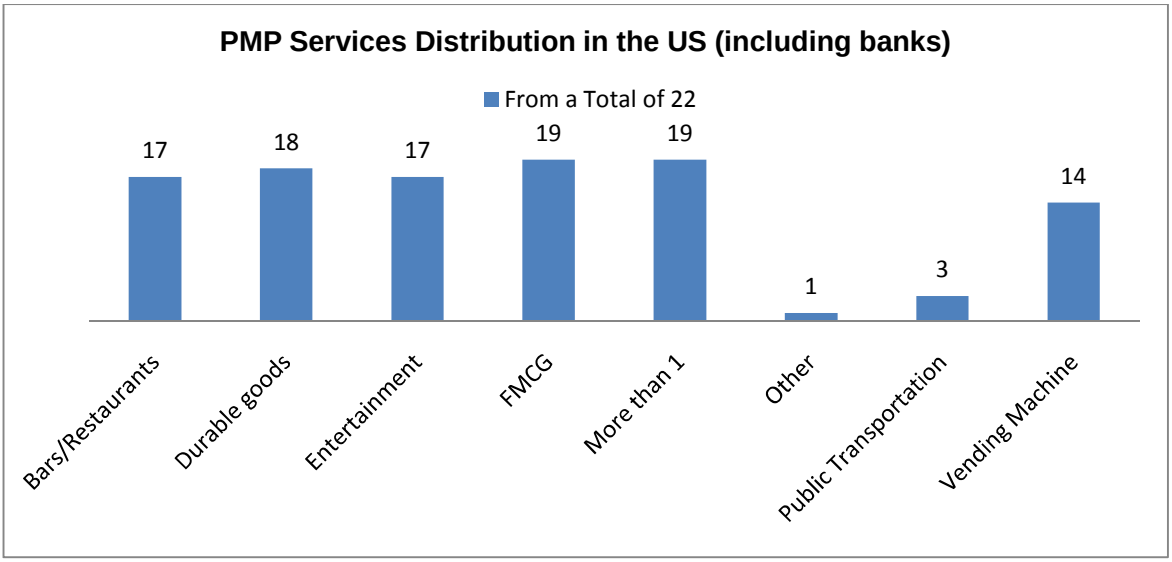

Figure 63: PMP Services Distribution in the US (Including Banks)

Although the percentages are lower, the trend is the same when excluding banks from the analysis.

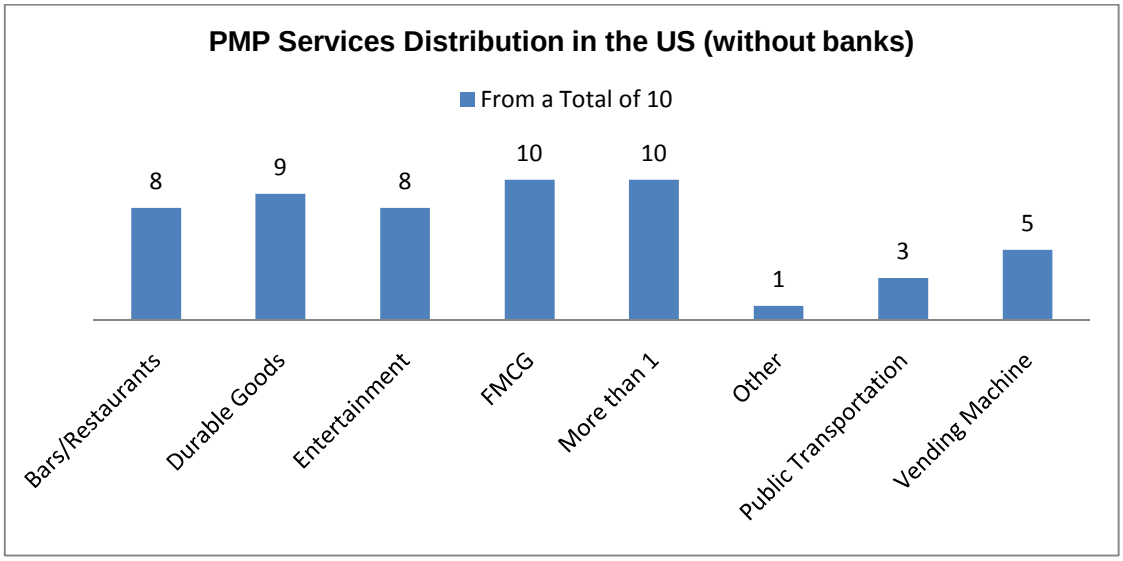

Figure 64: PMP Services Distribution in the US (without banks)

In the case of the U.K. the trend is very similar when including in the analysis banks that offer the same contactless technology. Consumer are more likely to buy FMCG, or make purchases at a bar or restaurant when making a PMP. Now, if we exclude the banks from the analysis, the story changes. Public transportation becomes a high use of PMP. Buying FMCG remains high.

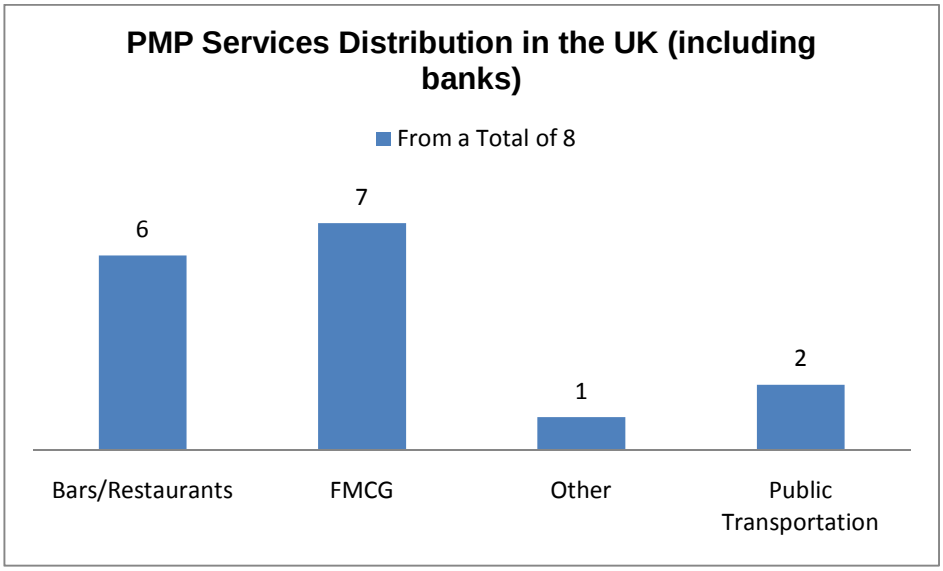

Figure 65: PMP Services Distribution in the UK (including banks)

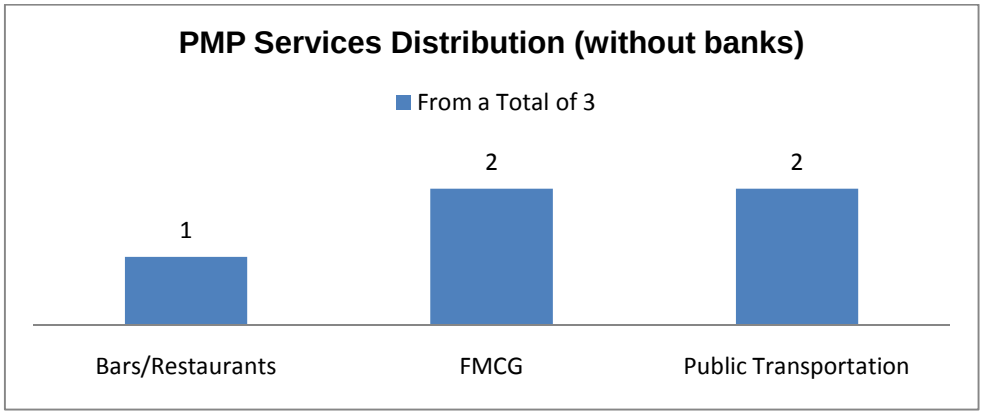

Figure 66: PMP Services Distribution in the UK (without banks)

There are no PMP services to analyze that operate in the U.S. and U.K.

4.1.3 Activation Distribution

Activation distribution refers to the different mechanisms to activate a mobile payment service, whether is remote or proximity.

- **RMP**

The results are the same for all RMP services analyzed. Most of the mobile payment services in the U.S., U.K, and those who are present in both countries, are activated via Web. This could be consequence of the high internet penetration on both countries (US = 89% and UK=87% of their populations respectively).

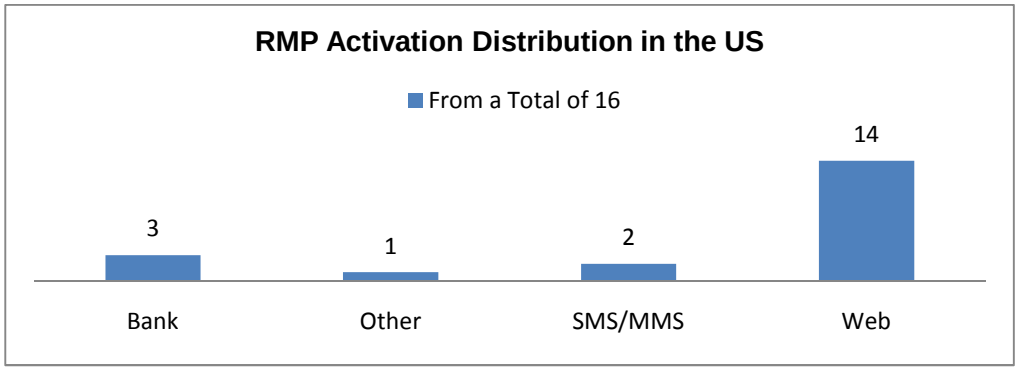

Figure 67: RMP Activation Distribution in the US

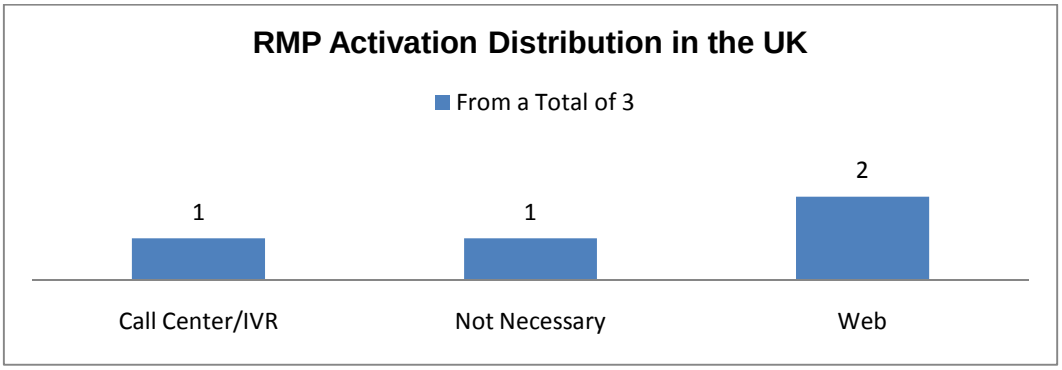

Figure 68: RMP Activation Distribution in the UK

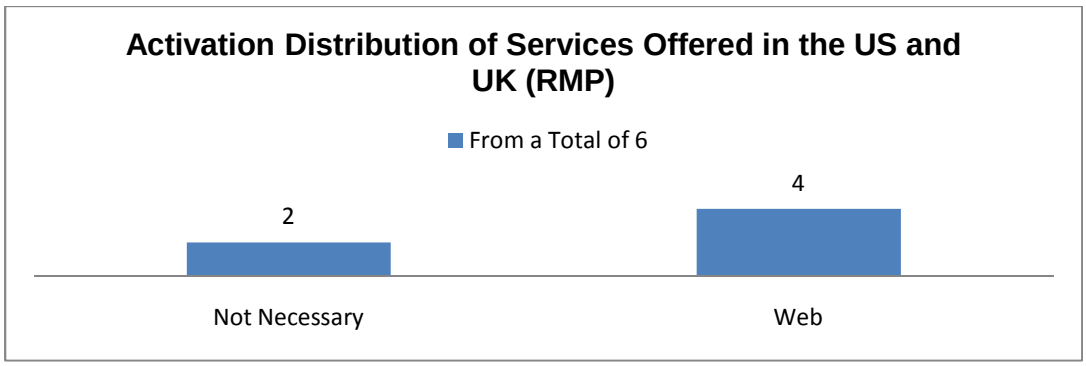

Figure 69: Activation Distribution of Services Offered in the US and UK (RMP)

- **PMP**

The case is different for PMP. Most of the PMP services are activated through a Bank in the U.S. and the U.K. There are no PMP services to analyze that operate in both countries.

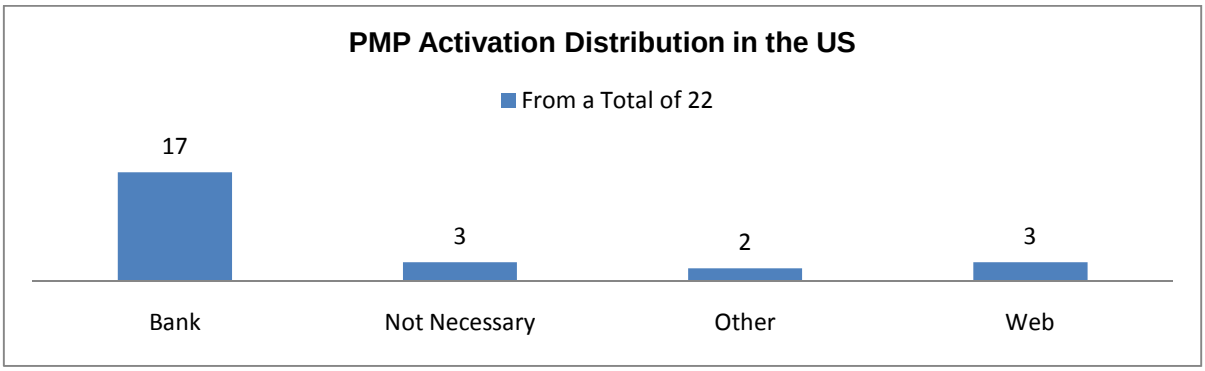

Figure 70: PMP Activation Distribution in the US

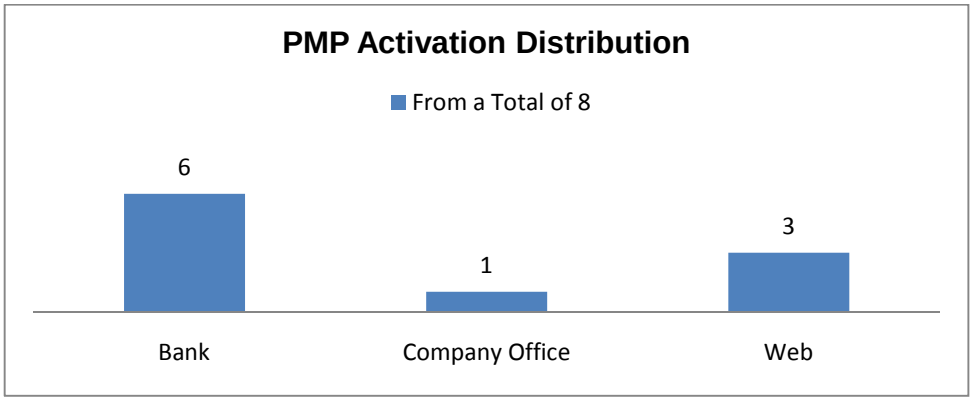

Figure 71: PMP Activation Distribution in the UK

4.1.4 Source of Payment Distribution

Source of payment refers to where the money comes from at the moment of paying for a good or service.

- **RMP**

The pattern seems to be the same for the U.S. and the U.K. The most popular source of payment is the bank account, followed by the credit card. Although a small percentage of services allow pre-paid payments in the U.S., in the U.K. there are not any services that offer this payment modality.

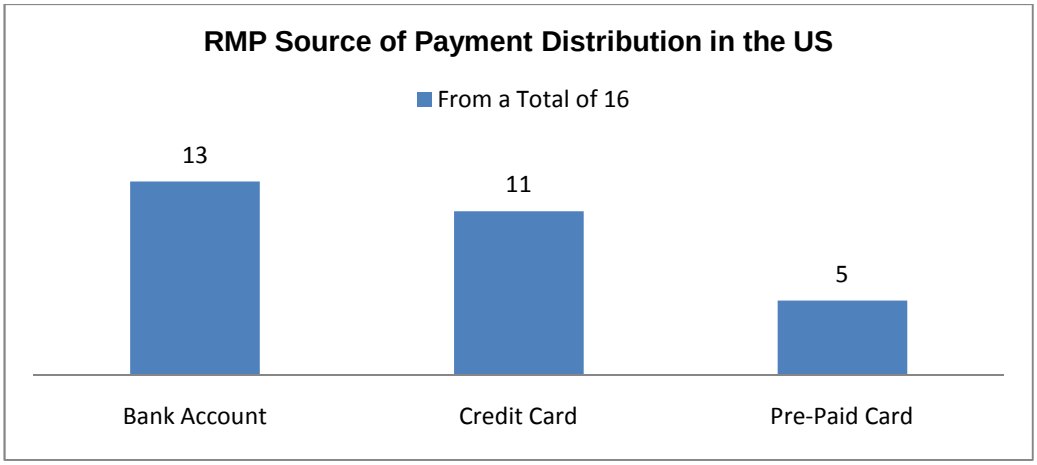

Figure 72: RMP Source of Payment Distribution in the US

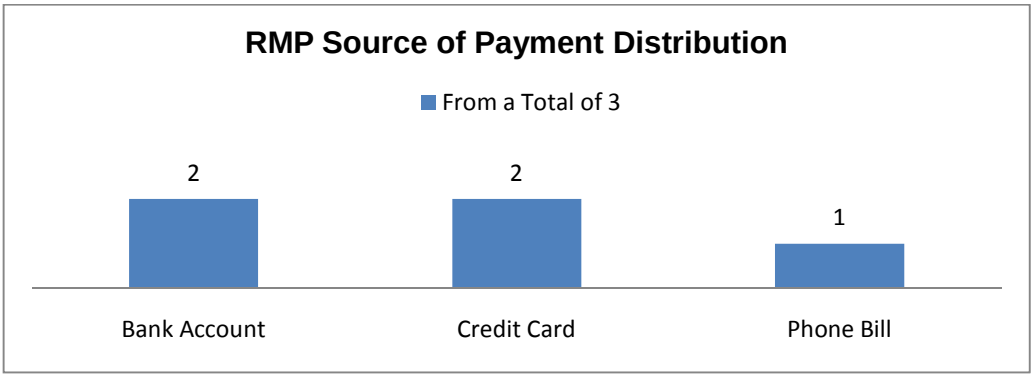

Figure 73: RMP Source of Payment Distribution in the UK

In the case of services that are being offered in both countries, bank accounts and credit cards are also the most popular source of a mobile payment. However, very closely follows paying through a debit-card and mobile phone bill.

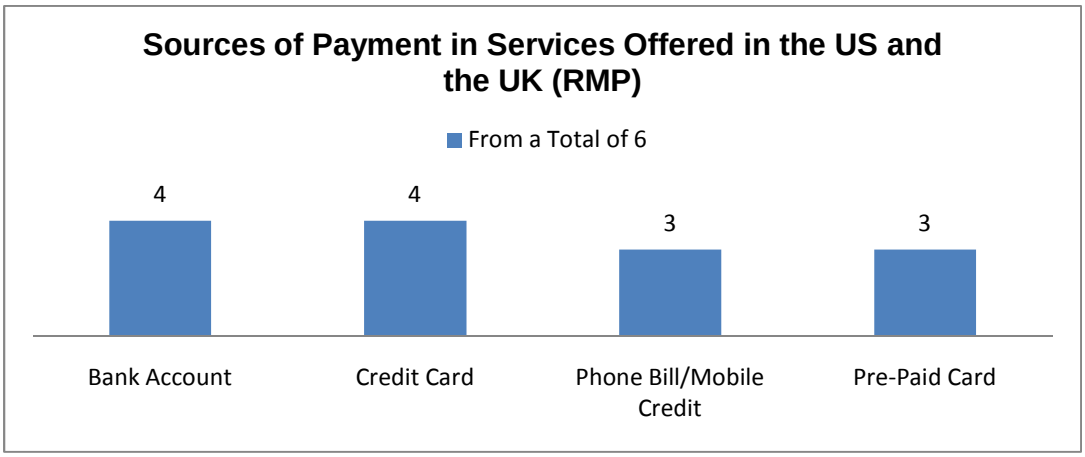

Figure 74: Sources of Payment in Services Offered in the US and the UK (RMP)

- **PMP**

For this type of mobile payments, still the bank account and credit card are the most popular source of payments. However in the U.K. it is a lot more popular the credit card than the bank account.

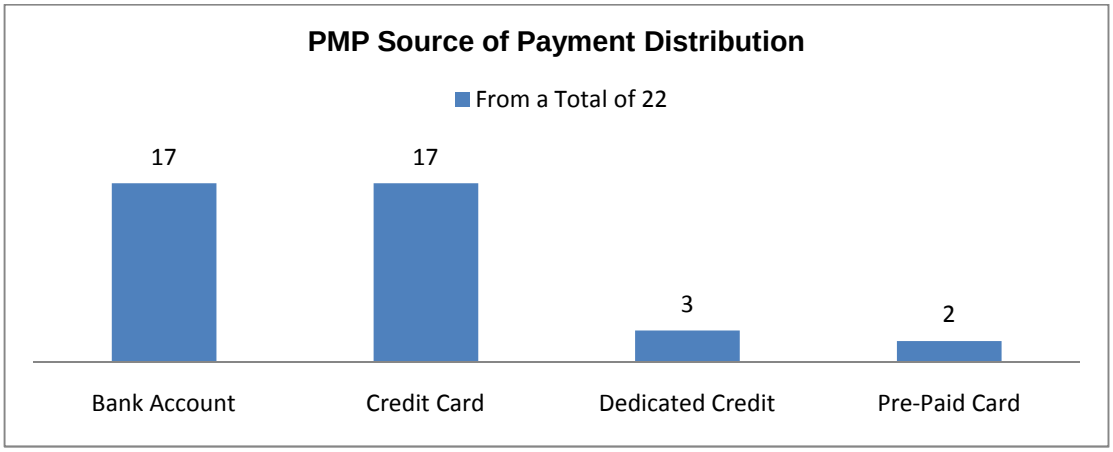

Figure 75: PMP Source of Payment Distribution in the US

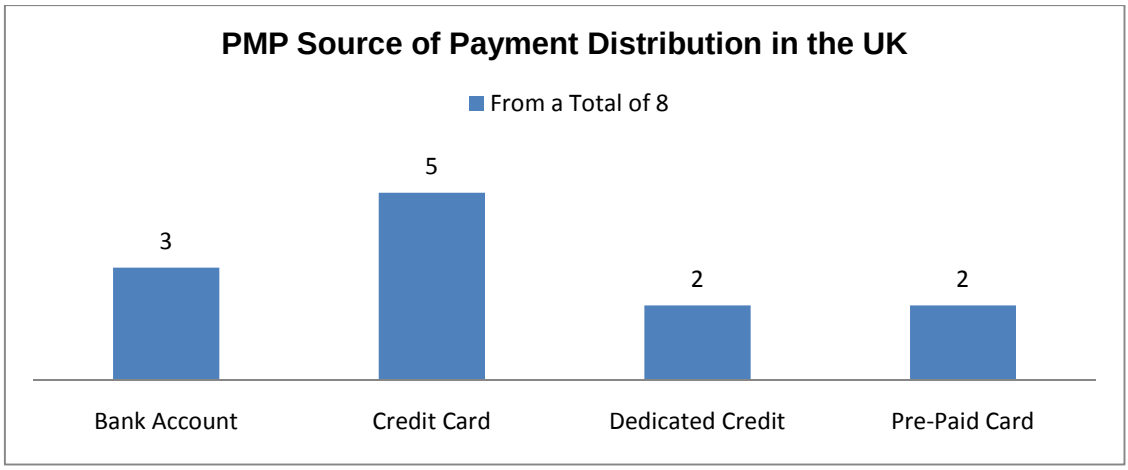

Figure 76: PMP Source of Payment Distribution in the UK

4.1.5 Promoting Players Distribution

Promoting players refers to those entities, or players, that played an important role to launch a mobile payment service into the public.

- **RMP**

According to the analysis performed, Technology & Service Providers represent majority of the promoting players of those services being offered in the U.S., U.K, and both countries. This is expected, because RMP requires a wider spectrum of technologies.

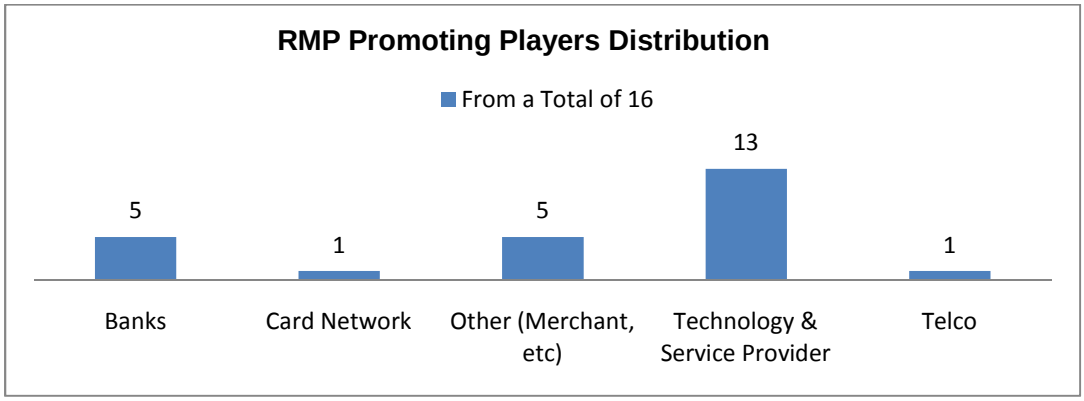

Figure 77: RMP Promoting Players Distribution in the US

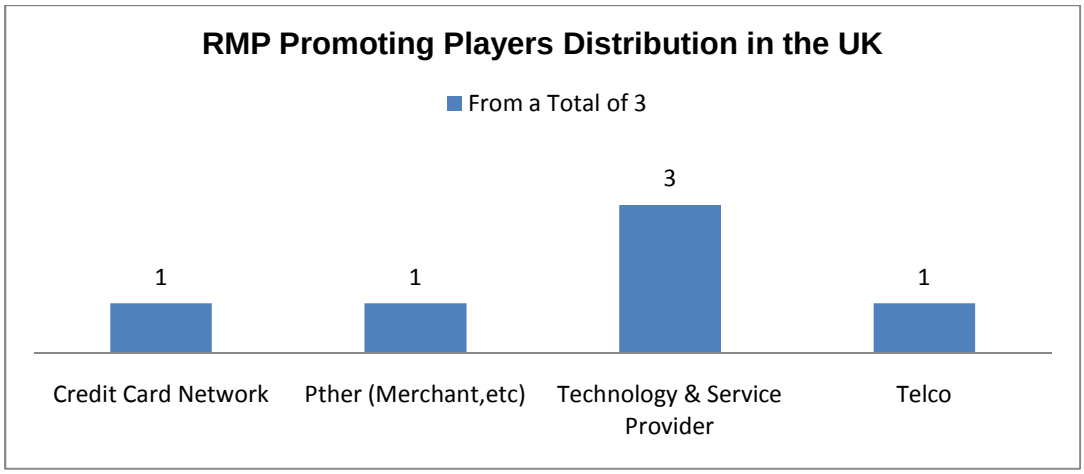

Figure 78: RMP Promoting Players Distribution in the UK

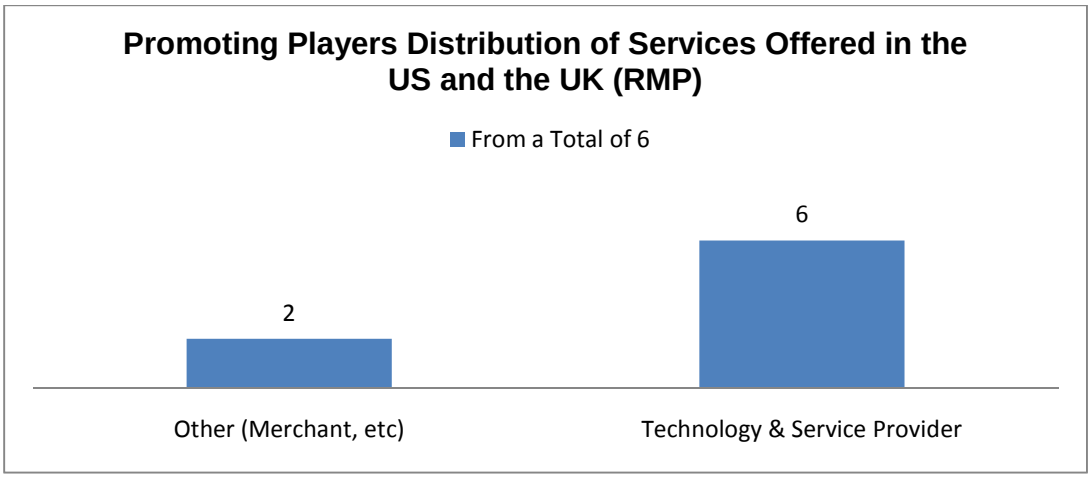

Figure 79: Promoting Players Distribution of Services Offered in the US and the UK (RMP)

- **PMP**

For this type of mobile payment, the majority of the promoting players in the U.S. and U.K. are credit networks and banks, followed by merchants. This trend makes sense, because under the assumption that the most popular way to make PMP is contactless cards, its success relies on the team work of financial entities and merchants to create awareness and the necessary critical mass for success.

Please notice that for purposes of this specific section PMP services include banks because of its impact in promoting a service, whether is the same or not as other banks.

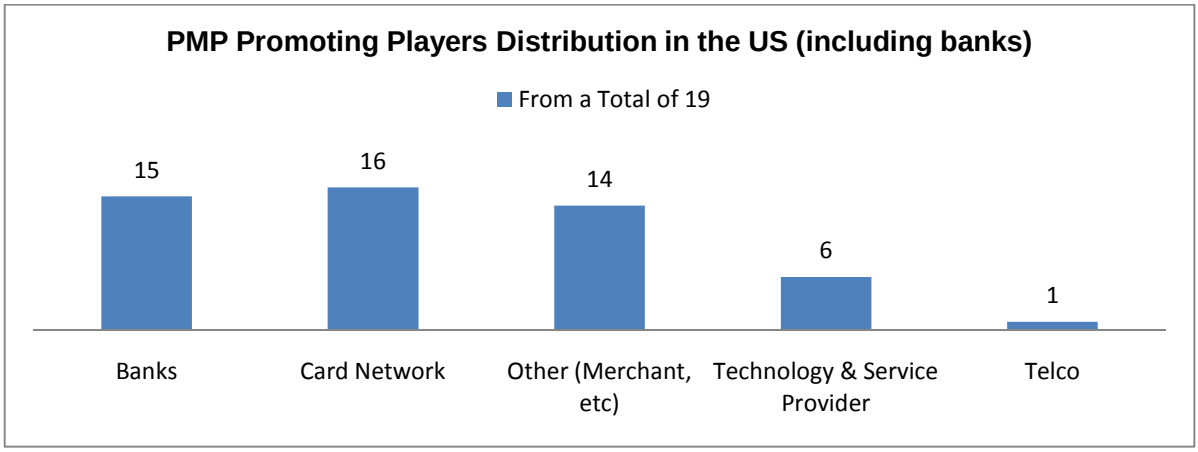

Figure 80: PMP Promoting Players Distribution in the US (including banks)

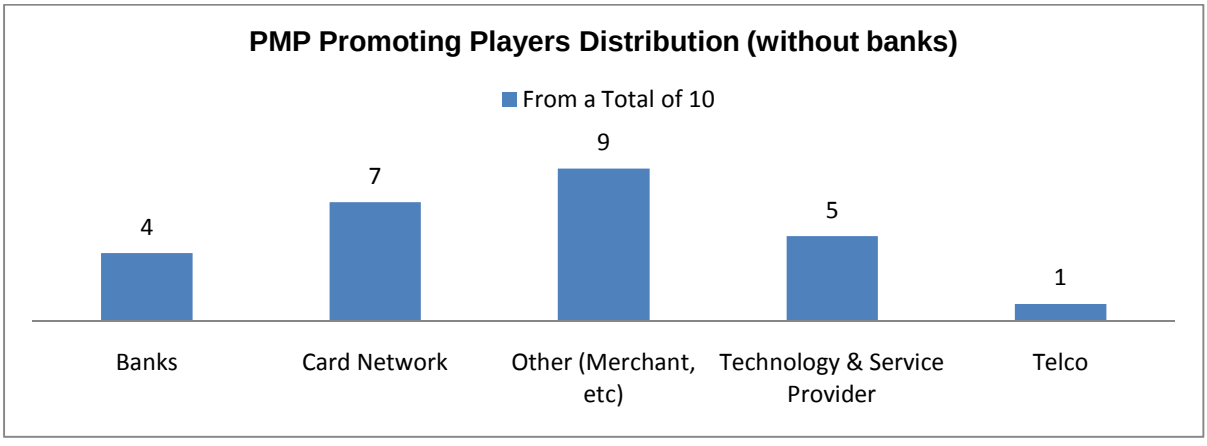

Figure 81: PMP Promoting Players Distribution in the US (without banks)

The U.K. seem to have the same pattern of bank and /or financial institution involvement.

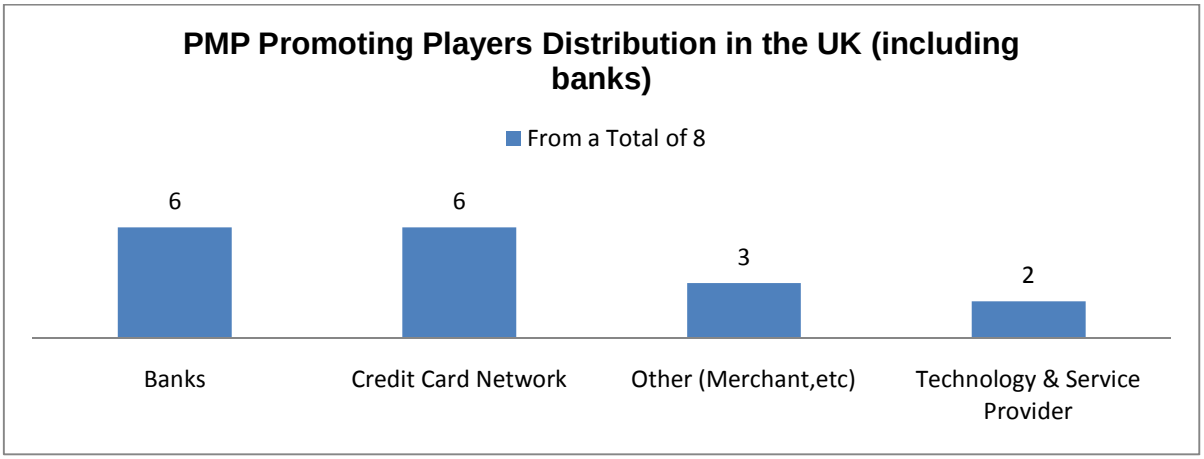

Figure 82: PMP Promoting Players Distribution in the UK (including banks)

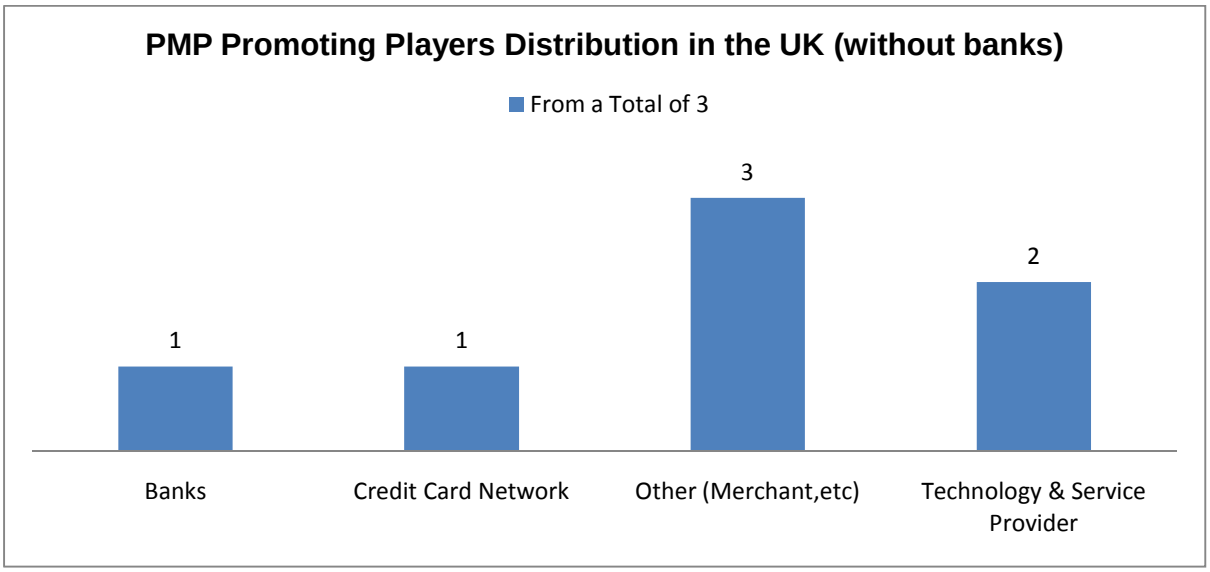

Figure 83: PMP Promoting Players Distribution in the UK (without banks)

4.1.6 Service vs. Payment Source

The following section matches the different services with a specific payment source to find what people spend on the most when making a mobile payment, and where most of the money comes from.

- **RMP**

Based on this comparison, in the U.S., the most noticeable pattern is making P2P RMP payments with a bank account or credit card.

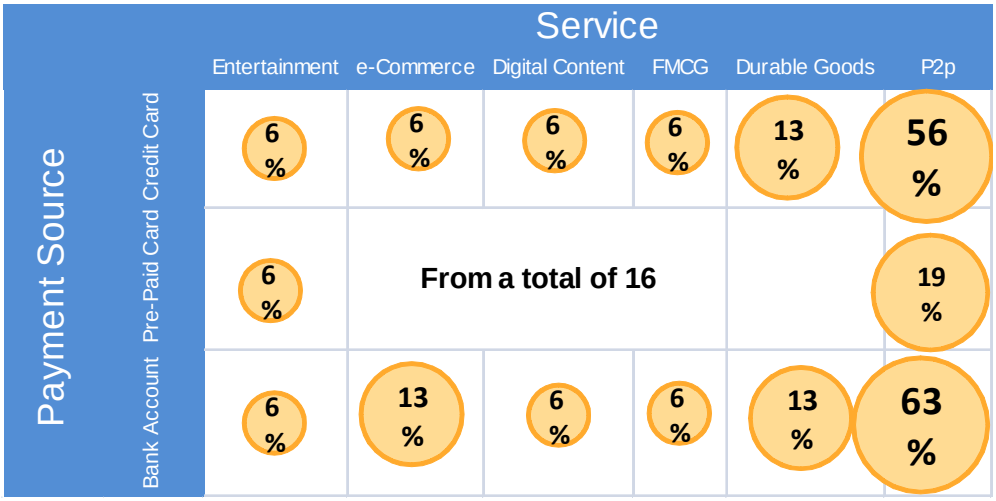

Figure 84: Service vs. Payment Source in the US (RMP)

On the other hand, in the U.K., the main payment source is still a bank account or credit card, but instead of P2P payments, the highest use is “Other”, which can represent bill payments or other applications.

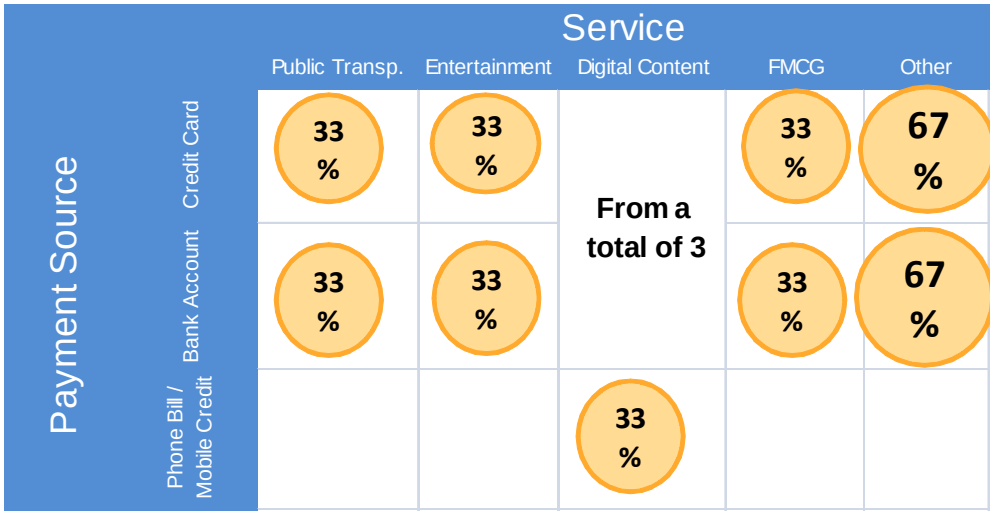

Figure 85: Service vs. Payment Source in the UK (RMP)

When looking at services that are being offered in both countries, the fragmentation is high. The majority is using RMP for parking paying with a credit card or bank account. Another trend is paying for digital content via mobile phone bill. The lack of dominance could be because of the low number of services analyzed (6). However, under the assumption made at the beginning, the results are significant for the purpose of this thesis.

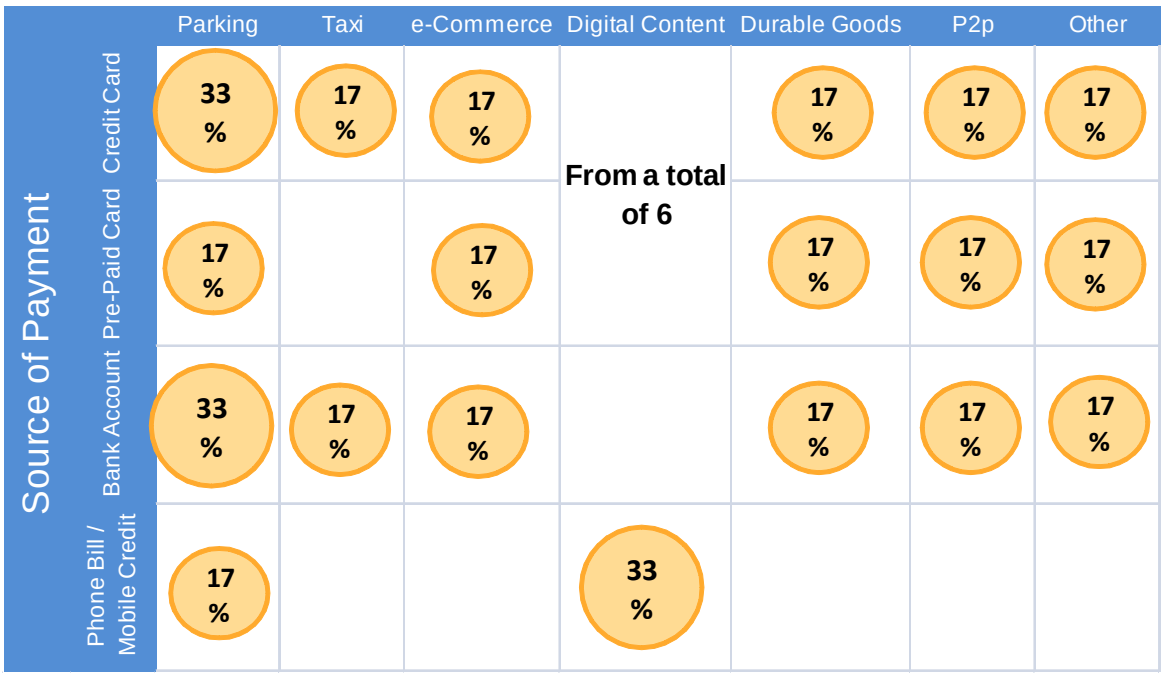

Figure 86: Service vs. Source of Payment for Services being offered in the US and the UK

- **PMP**

The use of credit card and bank account it is still a pattern when making PMP. In the U.S. these payment sources are mostly used to pay for entertainment, FMCG, durable goods, or at a vending machine or bars or restaurants.

The high fragmentation can be caused by the high amount of contactless services (cards) that allow the payment of multiple goods or services under one single technology. Banks are included in this analysis.

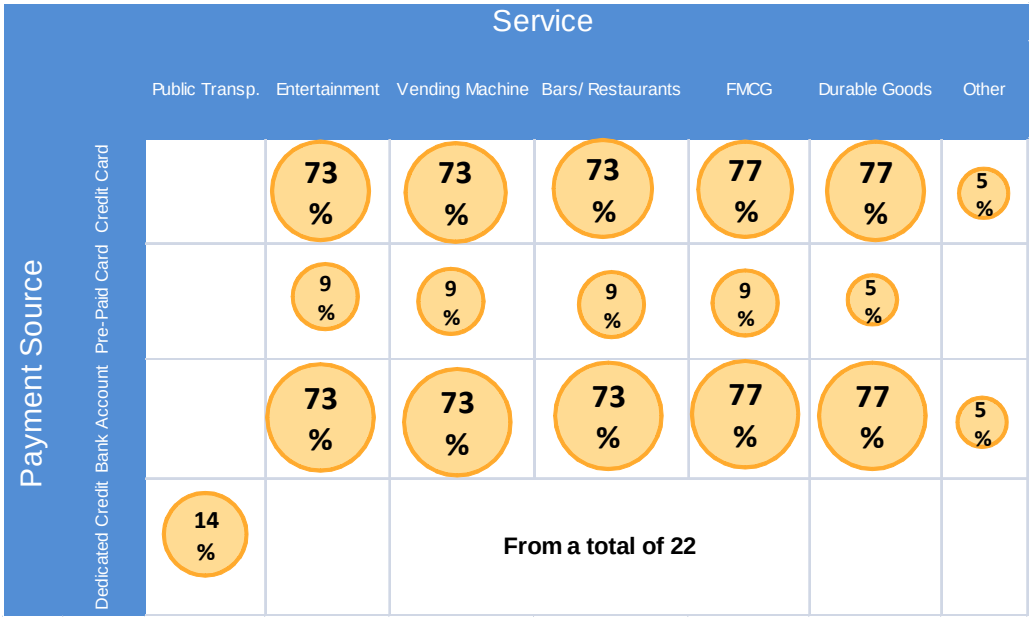

Figure 87: Service vs. Payment Source in the US (PMP)

The trend is exactly the same. The small variations can be caused by the low number of services analyzed from the U.K. People in the U.K. tend to use more a credit or bank account to pay for their daily needs and going out to eat or drink. This could be because of their high trust to financial institutions.

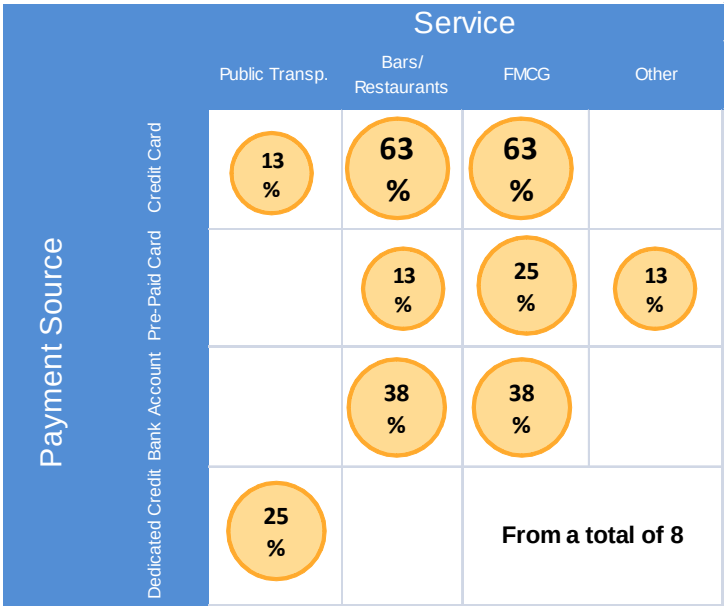

Figure 88: Service vs. Payment Source in the UK (PMP)

4.1.7 Micro vs. Macro payments

Let's remember that micro payments are payments of US$10/£10 or lower. Macro payments represent payments greater than US$10/£10.

- **RMP**

While in the U.S. 100% of the services analyzed allow micro and macro payments, in the U.K., all of the services allow micro, but not all of them allow macro payments.

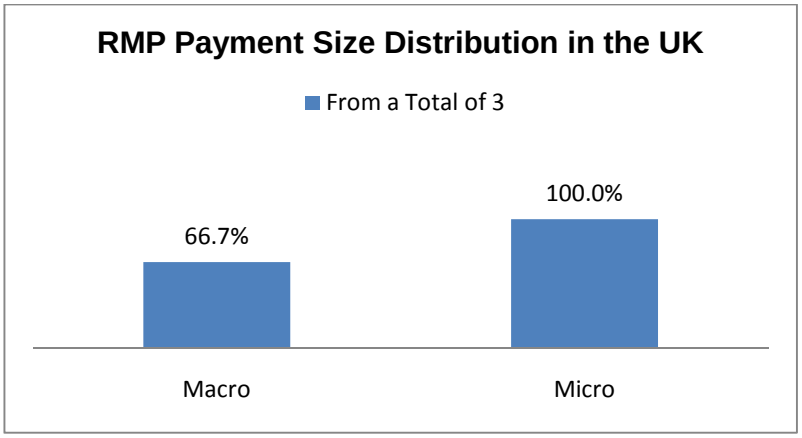

Figure 89: RMP Payment Size Distribution in the UK

The same occurs with services that are present in both countries. All of them allow micro payments but not all of them allow macro payments.

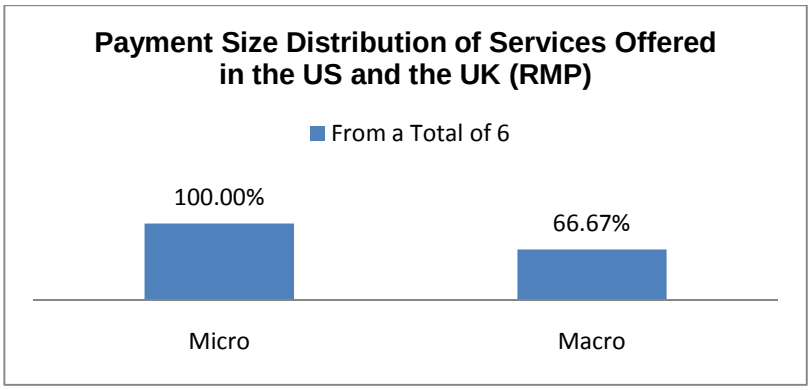

Figure 90: Payment Size Distribution of Services Offered in the US and the UK (RMP)

- **PMP**

In the case of the U.S., 100% of the PMP services analyzed allow micro and macro payments. In the U.K., although 100% of the PMP services analyzed allow micro payments, none allow macro payments.

4.1.8 Current Status

Current status refers to whether a service is a "pilot", "started" or "running".

- Pilot –Services that are not available to all consumers, but a small population running on a pilot mode to test results.
- Started – Services that have started but are not widely used or known of by the general population. Lacks of full awareness and implementation.
- Running – Services that are running 100%, with established rules and entities in the value chain.

- **RMP**

In the U.S. most of the services are "started" but have not yet been able to run 100%. The same situation is happening in the U.K with RMP. Based on the results, the U.S. have multiple "pilots" going, but the U.K. does not have "pilots", instead just have a few services running but most of them are just "started".

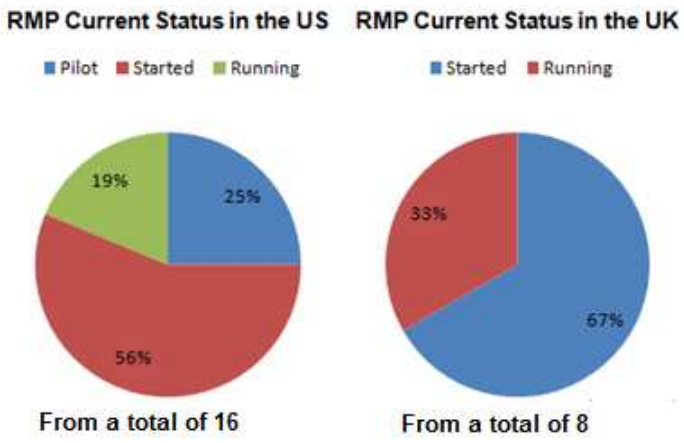

Figure 91: Current Status of RMP Services in the US and the UK

For services that run in both countries the situation is different. Most of them are running 100%.

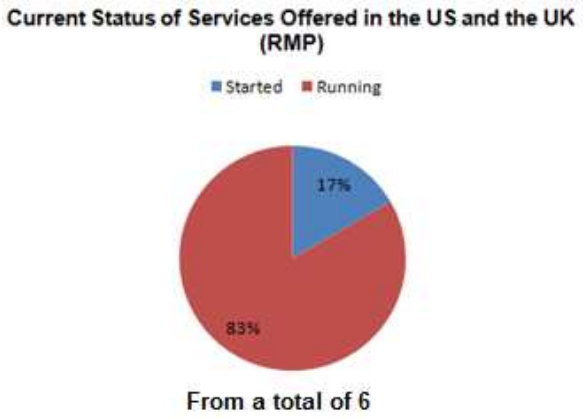

Figure 92: Current Status of RMP Services offered in the US and the UK

- **PMP**

Counting banks, in the U.S. most of the PMP services are either "started" or "running". If we do not include banks in the analysis, then most of the PMP services are running 100%. This is because in the U.S. there are constantly new banks offering contactless cards, but that are not running 100%, because each institution must first see the response of its clients.

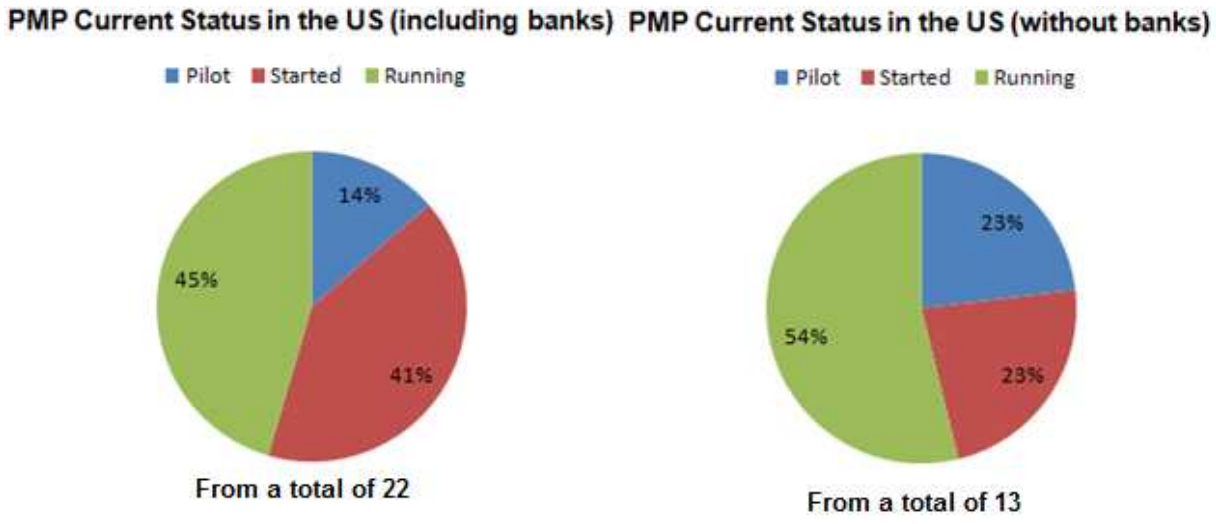

Figure 93: PMP Current Situation in the US

In the U.K. the majority of the PMP services are running, regardless of whether banks are included in the analysis.

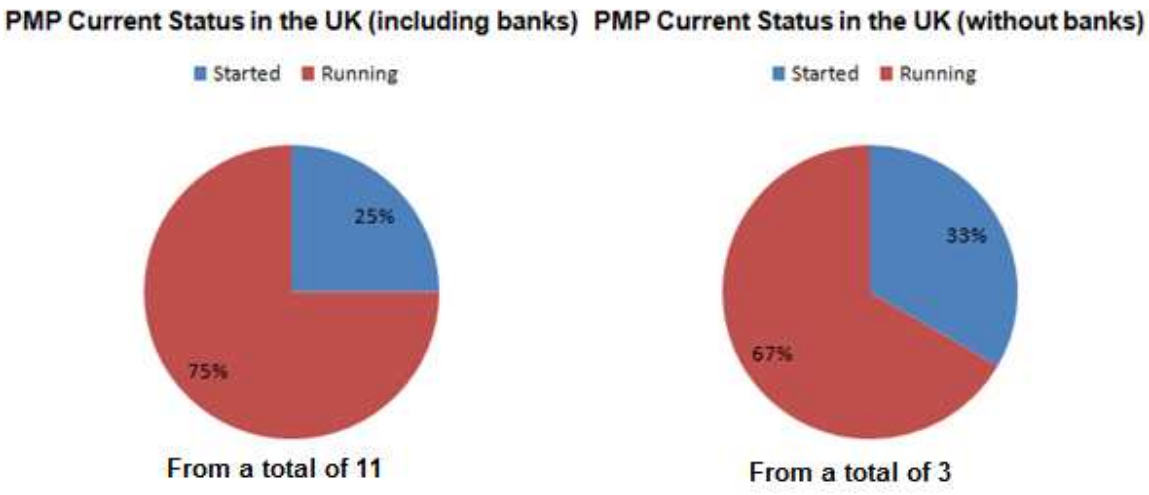

Figure 94: PMP Current Status in the UK

4.2 U.S. and the U.K General Comparison of Services

It is equally important to take a look at the differences between the U.S. and U.K. regardless of whether they are RMP or PMP. The following section aims at showing the results of the analysis that compares the services offered in the U.S., U.K., and both countries without distinction of the type of mobile payment.

Please notice that for this part of the analysis the different banks that provide contactless cards are not included. Because this part of the analysis provides a general view, the results can be skewed if too many banks outnumber the rest of mobile payment services.

4.2.1 Technology

Technology used for PMP is mostly based on NFC (RFID) through contactless cards, mobile devices and stickers. On the other hand, RMP technology is a bit more diverse.

In the U.S., when using RMP, clients mostly use Short Numbers while Network responds via SMS. Also, when communicate via Apps and Mobile Browser, the Network responds via Data Transfer.

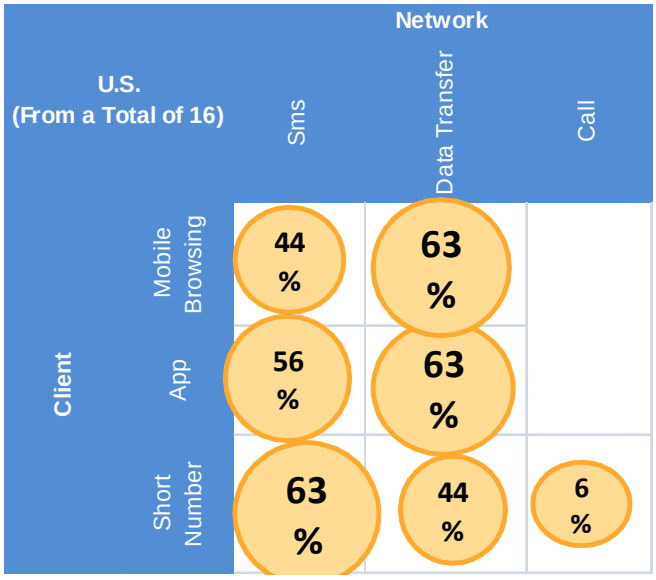

Figure 95: Network vs. Client in the US

In the U.K., the communication for RMP takes place, mostly, via App (on the client side) and Data transfer (on the Network side).

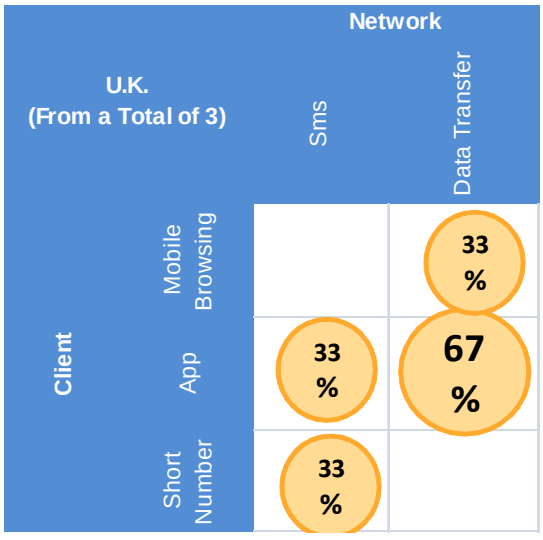

Figure 96: Network vs. Client in the UK

When using services that are offered in the U.S. and the U.K, then the communication takes place mostly via Short Number (on the client side) and SMS (on the network side). The second highest use is Mobile Browsing (on the client side) and Data Transfer (on the Network side).

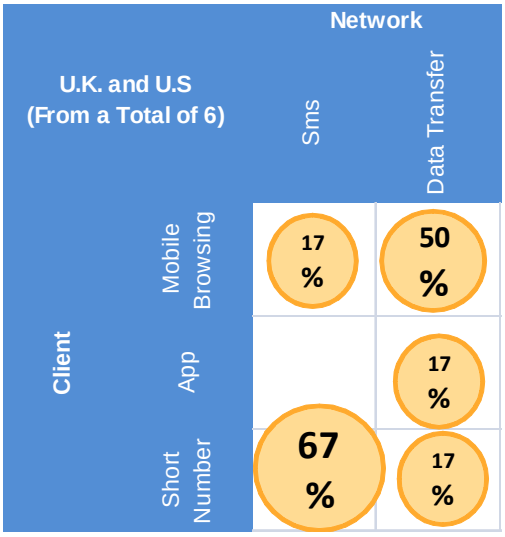

Figure 97: Network vs. Client in Services tha are offered in the US and UK

4.2.2 Service Pattern

Regardless of the type of payment (RMP or PMP), most mobile payments in the U.S. offer P2P payments. Not too far is the purchase of FMCG and durable goods. This is probably influenced by the strong presence of contactless cards provided by banks in the U.S.

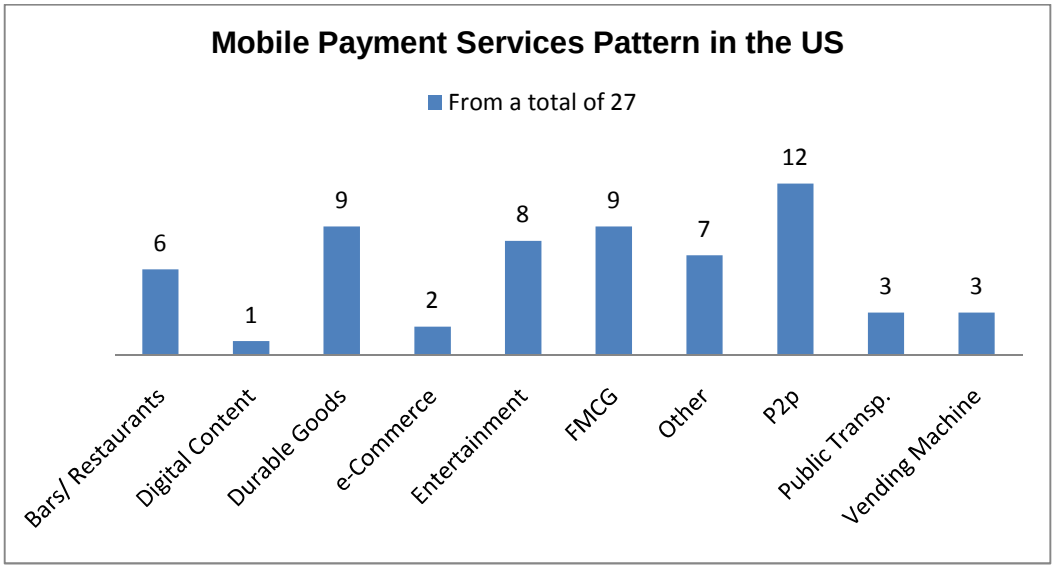

Figure 98: Mobile Payment Services Pattern in the US

In the U.K., mobile payments are mostly used to pay for public transportation. It follows the use of mobile payments to buy FMCG. This can also be influenced by the presence of contactless cards through banks.

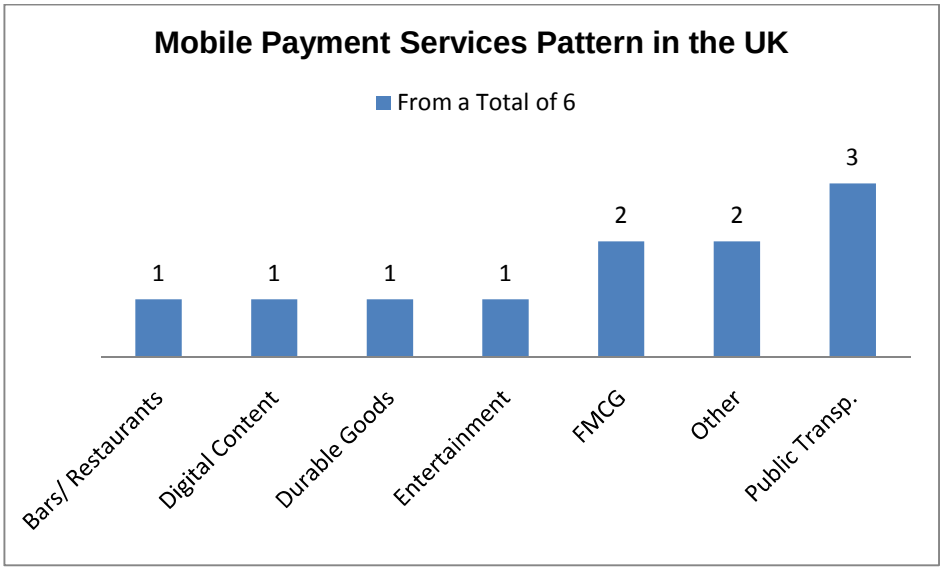

Figure 99: Mobile Payment Services Pattern in the UK

On the other hand, services that currently operate in the U.S. and the U.K. offer an array of options of purchase. Services that operate in both countries do not have a specific dominance as

to what specific type of good or service the customer can access to. Instead, these services allow customers pay for different things using a single system.

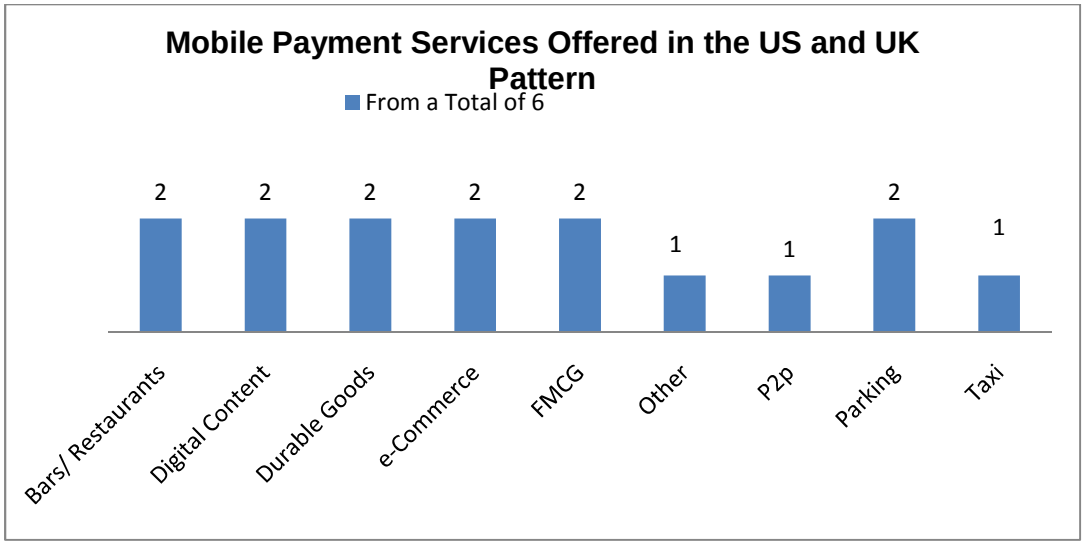

Figure 100: Mobile Payment Services Offered in the US and UK Pattern

4.2.3 Activation Distribution

There are different ways to look at how a mobile payment service is activated for use. Based on the services analyzed, the following is the distribution of activation by mechanism. Out of all the services analyzed, out of all the services that are activated via SMS/MMS, 100% are from the U.S.

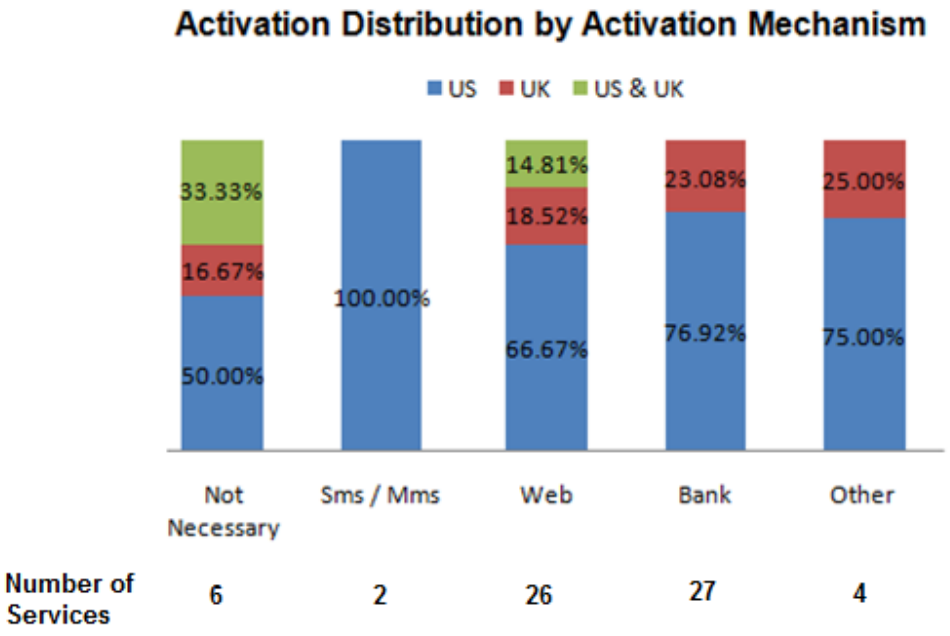

Figure 101: Activation Distribution by Mechanism

If we look at the same information by country it is possible to see, for example, out of all the services analyzed, the services that operate in the U.K. and U.S. can only be activated via Web or through a bank. Please notice that activation mechanisms are not mutually exclusive.

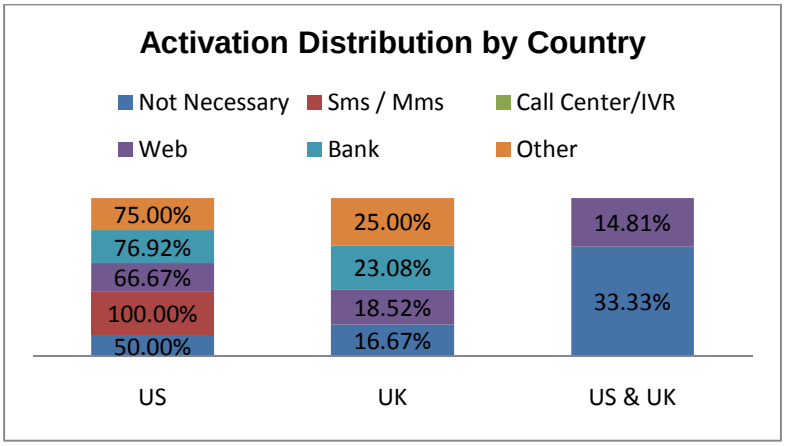

Figure 102: Activation Distribution by Country

Regardless of the type of mobile payment, in the U.S., in general, they are activated via Web or through a bank. The same pattern can be seen in the U.K.

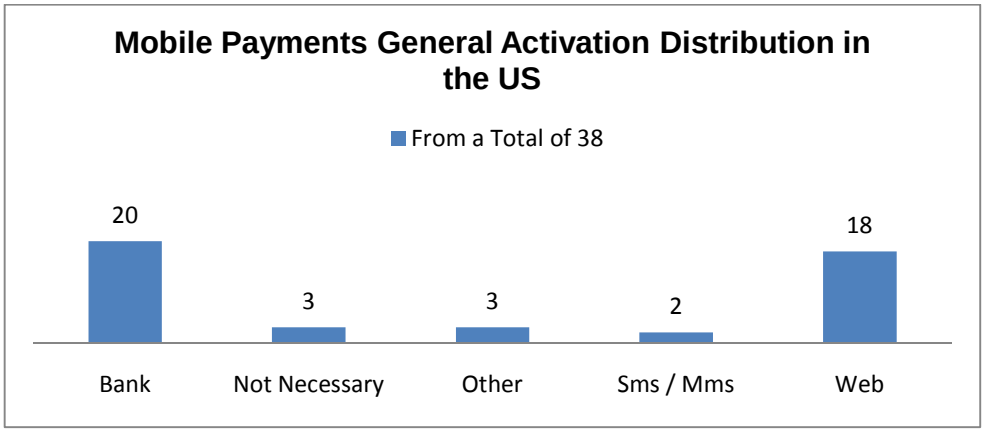

Figure 103: Mobile Payments General Activation Distribution in the US

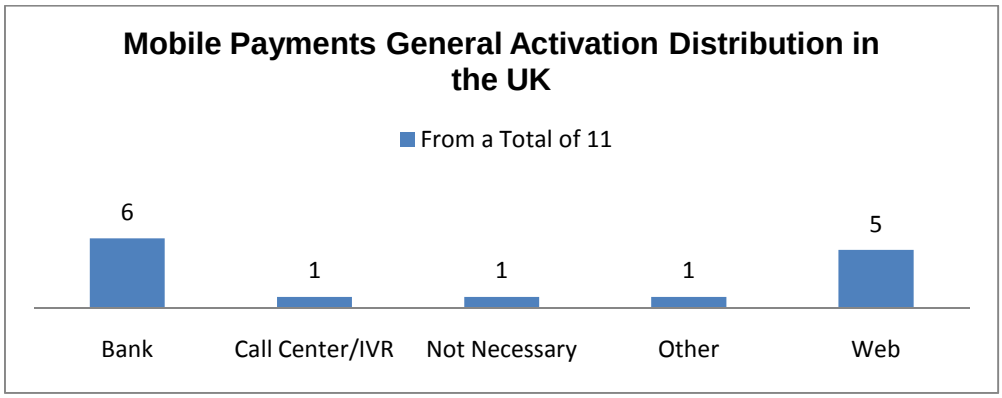

Figure 104: Mobile Payments General Activation Distribution in the UK

On the other hand, services that are operating in both countries are mostly operated via Web. If they are not activated via Web, based in this analysis, then they do not need activation.

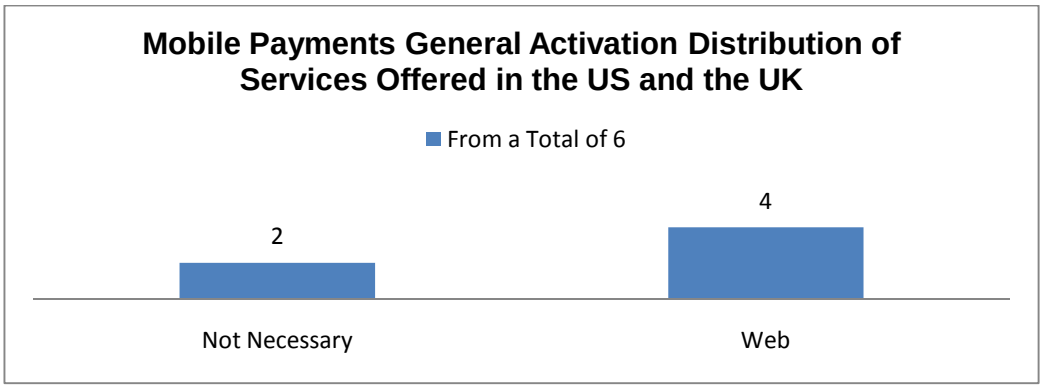

Figure 105: Mobile Payments General Activation Distribution of Services Offered in the US and the UK

4.2.4 Payment Source Distribution

Based on this analysis, the most common payment source for services in the U.S., U.K., and both countries, is the credit card and bank account.

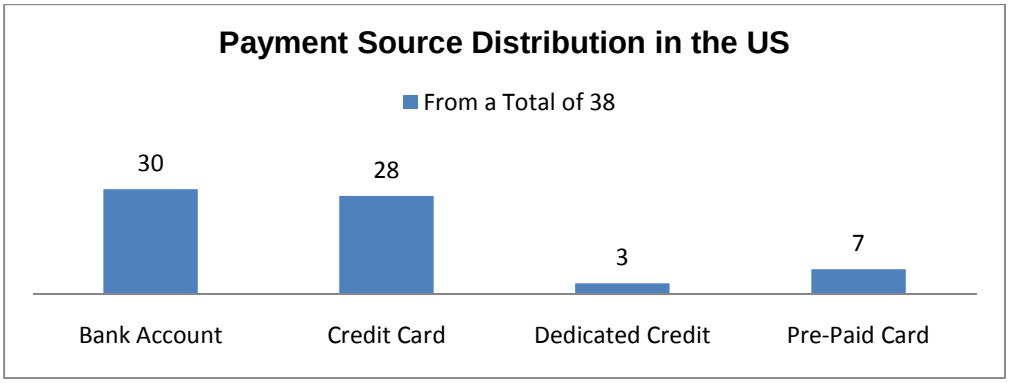

Figure 106: Payment Source Distribution in the US

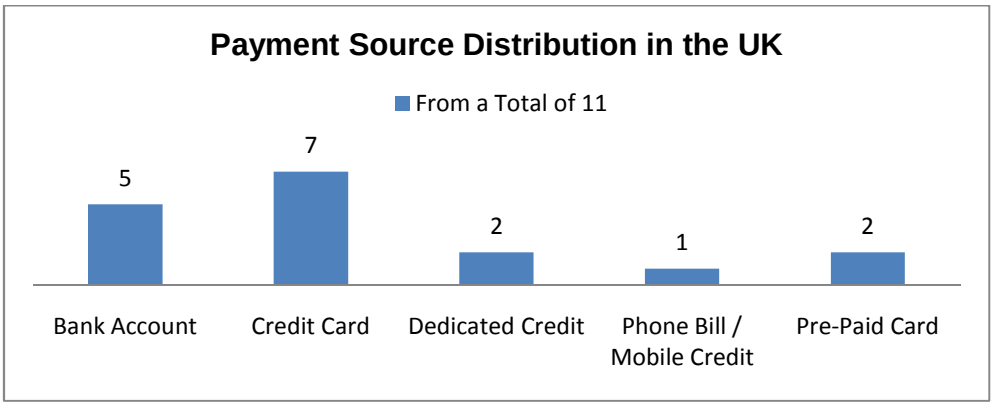

Figure 107: Payment Source Distribution in the UK

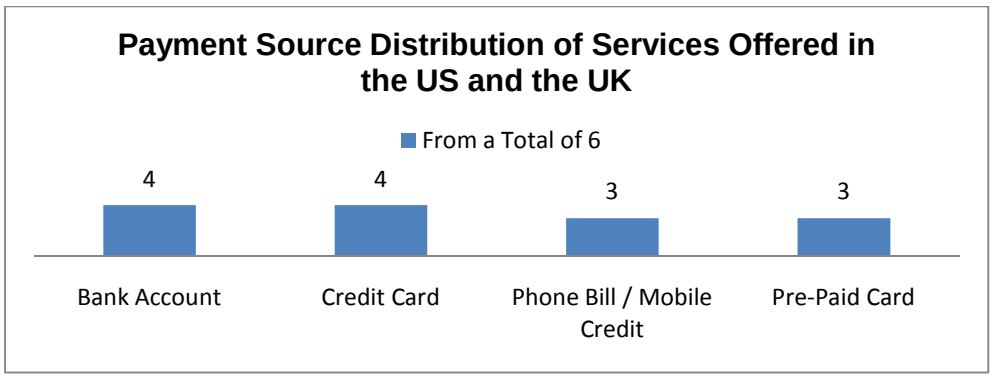

Figure 108: Payment Source Distribution of Services Offered in the US and the UK

If we look at the services analyzed and each payment source and relate that information to each country, then we can see that, for example, out of all the services that have mobile phone bill as a payment source, 75% operate in the U.S. and U.K., while 25% represent services in the U.K. In the same manner, the majority of services that have credit card, pre-paid, bank account, and dedicated credit as payment source, are from the U.S.

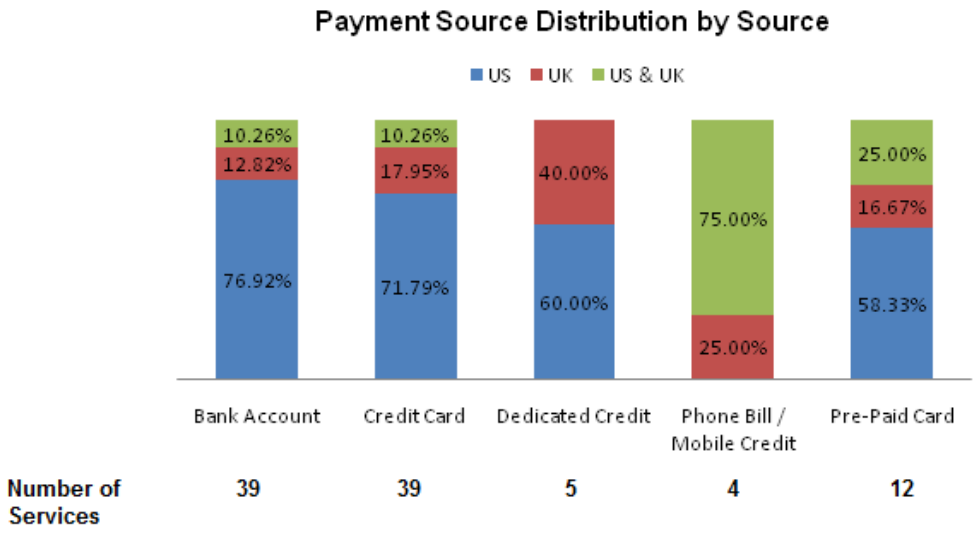

Figure 109: Payment Source Distribution by Source

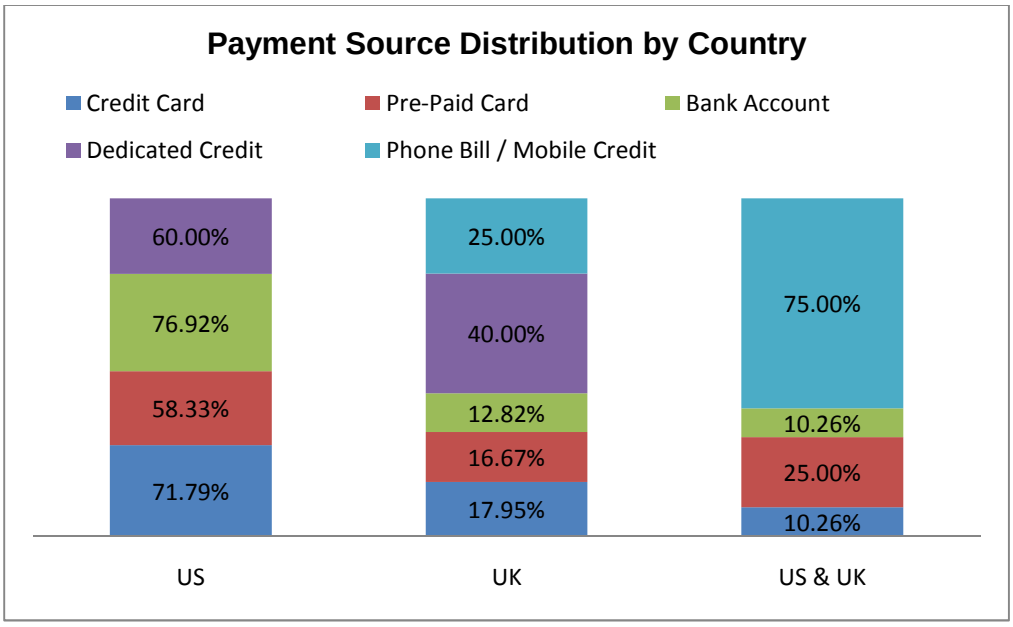

Figure 110: Payment Source Distribution by Country

4.2.5 Promoting Players

In the U.S. there is an important collaboration from different promoting players. There is no dominance. This may be caused by the participation of different players of the value chain to launch a mobile payment service.

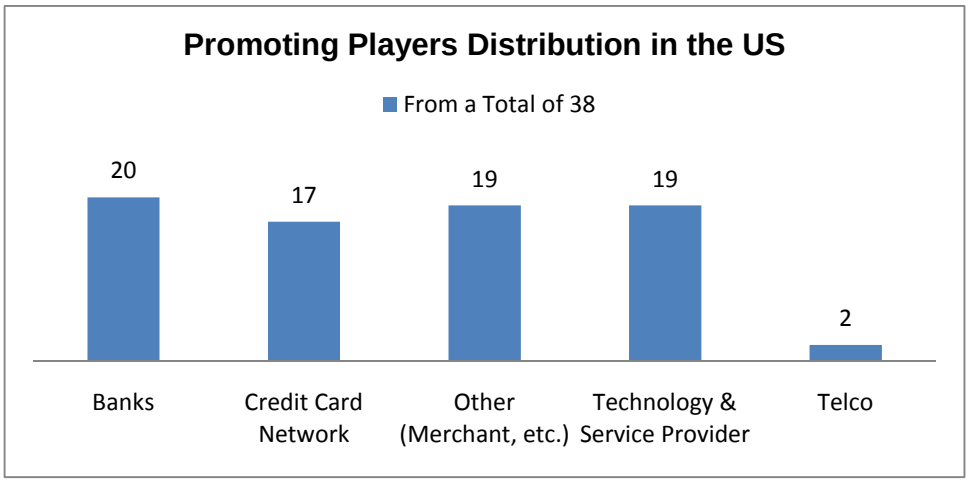

Figure 111: Promoting Players Distribution in the US

In the U.K. credit card networks, technology & service providers, and banks are the main promoting players. The limited participation of other players can be caused by regulatory norms and dominance of financial institutions.

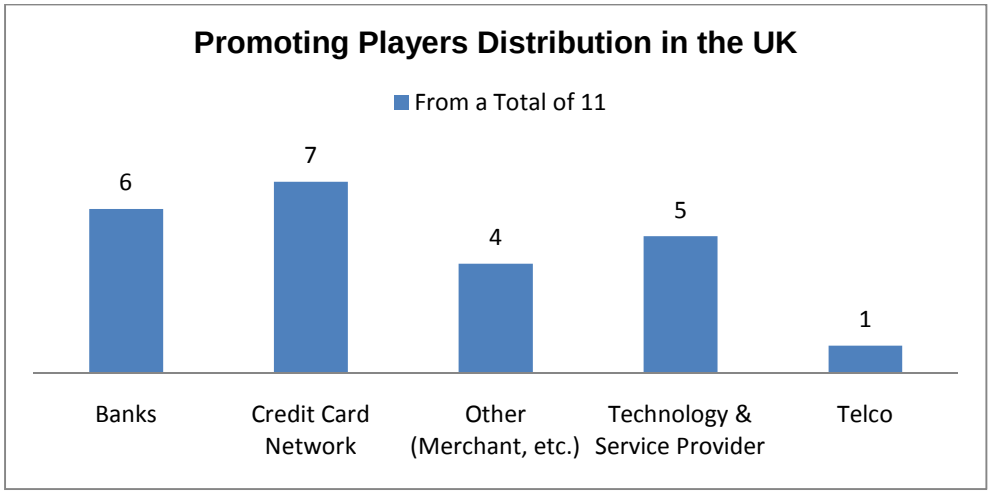

Figure 112: Promoting Players Distribution in the UK

When looking at services that operate in both countries it is possible to see that main promoting player is technology & service provider.

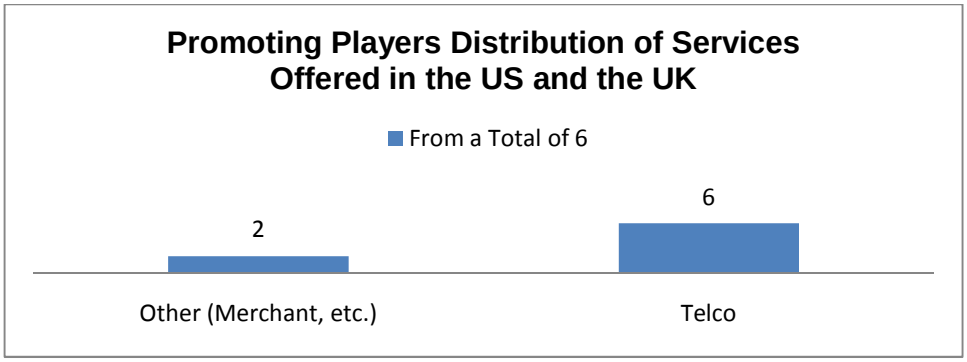

Figure 113: Promoting Players Distribution of Services Offered in the US and the UK

4.2.6 Payment Size

The following graph shows the distribution of services that allow micro and macro payments from the list of services analyzed in this thesis.

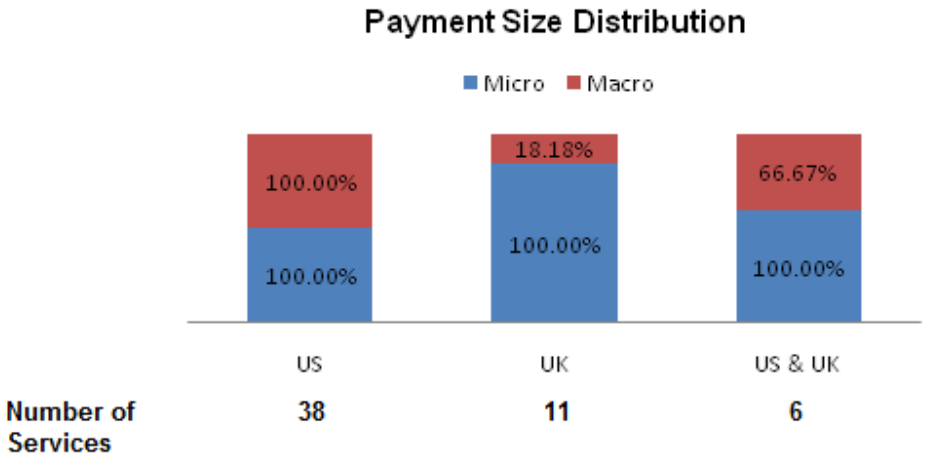

Figure 114: Payment Size Distribution

While all of the services accept micro payments, only in the U.S. all of the services accept macro payments as well. Not many services in the U.K. accept macro payments, only 18%.

4.2.7 Current Status

The majority of the services analyzed that operate in the U.S. are "started", which means that they have not yet fully developed as a service. They are offered in specific locations and they are not widely available to the general public. On the other hand, from the services analyzed, most of them who operate in the U.K., or both countries, are "running", which means they are operating at 100% expecting to reach a critical mass. As it is possible to see on the next graphs, in the U.S., unlike the U.K., they still have pilots running. This can imply that they have still a lot of work to do to feel comfortable with a system, or they just want to keep getting better and lead the mobile payment industry. It seems that another reason for having many pilots going is that there are too many players involved in the mobile payments in the U.S. and each wants to try to launch a new mobile payment service.

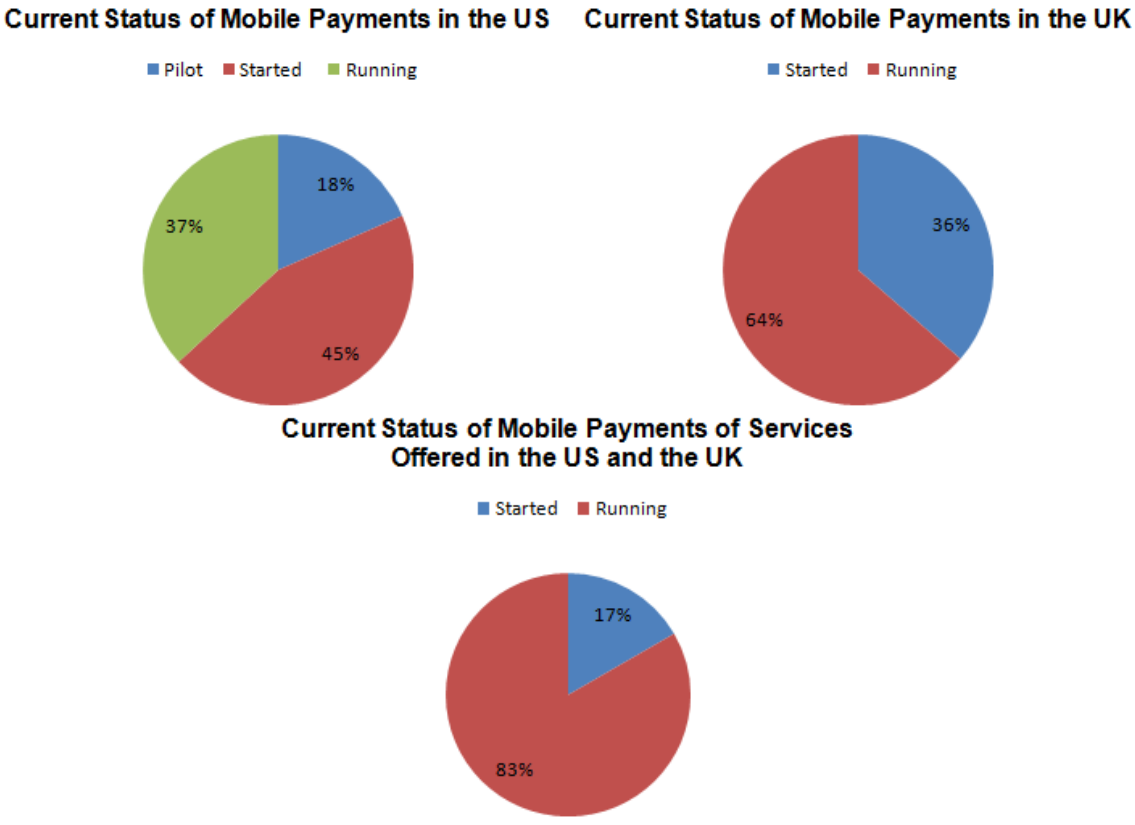

Figure 115: Current Status of Mobile Payments

Based on the results of the empirical analysis it seems that, although there are fewer services available in the U.K., they are more efficient, in terms of reaching a critical mass and be able to deploy a full service to customers.

The U.S. has too many players involved in the value chain, which translates into fewer standards, fewer services "running" 100%, and more customers overwhelmed by the amount of services, without knowing which one to trust. One thing for sure, is that most of the current successful mobile payment systems are dominated by financial institutions. This is not coincidence as people rather trust their money to entities that are experts in this matter.

5. CONCLUSIONS AND FUTURE RECOMMENDATIONS

The purpose of this paper was, first, to identify and analyze mobile payment services that are currently active in the U.S., U.K., and in both countries at the same time. Second, to use a structured database to classify the different components of each service to be able to compare those services offered in the U.S., with those offered in the U.K., and with those offered in both countries. The comparison was built based on two criteria, first, to compare remote with proximity services, and second, to make a general comparison of services by country. The findings are summarized in Table 16, which lists the different criteria upon which each service was compared.

In general terms, the results of the empirical analysis suggest that there are strong similarities between those mobile payment services offered in the U.S. and those offered in the U.K. These similarities are caused because by the larger number of PMP services analyzed from each country, which are mostly influenced by banks or credit networks. In both countries banks and credit networks provide the main source of payment and represent the main promoting player of mobile payments when they initially launched. Banks also play an important role in the activation of such services on each country. The majority of mobile payment services require to be activated through a bank or via web.

In terms of payment size, the U.K. seems to be more organized and reserved, as they mostly accept only micro payments. Very few services accept macro payments. On the other hand, the U.S. does not have restrictions when using mobile payments. They allow micro and macro payments on all of their services.

Based on the differences between RMP and PMP on each country, in the U.S. most of the RMP services allow P2P services, while in the U.K. they mostly allow bill payments, or other applications. Although bank accounts and credit cards are the main source for RMP, in the U.S. the use of pre-paid cards is catching up. In the U.K. the use of mobile credit or mobile phone bill to pay is doing the same, which could be justified by the exponential grow of alternative technologies and partnerships among players of the value chain on each country.

Table 19: Summary of Results

	MAJORITY OF THE SERVICES		
	U.S.	U.K.	U.S. & U.K. (only RMP)
Mobile Payment Distribution	Contactless and Remote (PMP and RMP)	Contactless = PMP	Remote=RMP
Service	-*RMP:* P2P -*PMP:* Durable goods, FMCG, and entertainment	-*RMP:* Other -*PMP:* FMCG, bars and/or restaurants and public transportation	Durable goods, digital content, e-Commerce, and parking
Activation	-*RMP:* Web -*PMP:* Banks	-*RMP:* Web -*PMP:* Banks	Web
Source of Payment	-*RMP:* Bank Account and Credit card -*PMP:* Bank Account	-*RMP:* Bank account and Credit Card -*PMP:* Bank account and Credit Card	Bank Account and Credit Card (very close follows Pre-Paid card and Phone Bill)
Promoting Players	-*RMP:* Technology and service providers -*PMP:* Banks and card networks	-*RMP:* Technology and service providers -*PMP:* Banks and card networks	Technology and service providers
Service vs. Payment Source	-*RMP:* P2P with credit card or bank account -*PMP:* Banks	-*RMP:* Other with credit card or bank account -*PMP:* Banks	-Digital content paid with phone bill. -Parking paid with credit card or bank account
Micro vs. Macro Payments	-*RMP:* Micro & Macro -*PMP:* Micro & Macro	-*RMP:* Micro -*PMP:* Micro	Micro payments
Current Status (Pilot, Started or Running)	Started	Running	Running

The results of the analysis for those services that are present in both countries suggest that, because they are internationally present, they avoid the strong influence of banks and/or credit networks, since they tend to have their own set of rules and/or policies. Instead, they are strongly influenced by technology and service providers. In fact 100% of the services analyzed (offered in the U.S. & U.K) were RMP. These services allow payments in a wide array of merchants, such as digital content providers, parking, durable goods and e-commerce. Because of the same reason these services are more easy to use, as they either don't need to be activated, or if it needs to be activated, it can be done via Web. Also, they seem more reliable as they are fully operational and running in multiple countries, besides the U.S. and the U.K.

Based on the overall results it is possible to see a strong influence of banks and credit networks on PMP on both countries. Moreover, the results suggest that, because of such influence, the most successful and common form of mobile payment is PMP through NFC enabled contactless devices. On the other hand, RMP services are strongly influenced by technology and service providers. The main differences between the U.S. and the U.K. seem to be number of services offered, the type of usage, and the efficiency of the services offered.

Although there were less mobile payment services in the U.K. than in the U.S., those offered in the U.K. prove to be more efficient because most of them are running, are fully operational, and have gained, at some level, the customer's trust. The reason for this can be the existence of a larger number of regulatory entities and competition present among European countries, which creates a certain pressure to respond effectively to the consumer's needs.

On the other hand, based on the results, it is suggested that the U.S. lack of efficiency is caused by the low number of mobile payment services that are fully operational. This is caused mainly by the large amount of services, which slows the standardization process and confuses the customer. Also different services involve different entities, which can translate into conflicts of interest.

Future recommendations include:

- A more detailed analysis to the different technologies used on each service
- A greater number of mobile payment services (if available) that operate in the U.K.
- Use more updated information. Because the growth of this technology is exponential, the amount of services and technologies available grow every month, if not, everyday. The collection of information for this thesis lasted 4 months. A collection of information on services for a longer period could help providing a better insight to more complex differences in mobile payment services in the U.S. and the U.K.
- Compare these technologies to technologies of other countries in Europe to check whether or not there is a difference between technologies in the U.S.-U.K vs. other Countries in Europe.

6. TABLE OF TERMS AND ABBREVIATIONS

ARPU : Average Revenue Per User

B2B : Business to Business

B2C : Business to Consumer

CAGR : Compound Annual Growth Rate

C2C : Consumer to Consumer

CDMA : Code Division Multiple Access

CSF : Critical Success Factors

FMCG : Fast Moving Consumer Goods

GSM : Global System for Mobile Communications, originally from Groupe Spécial Mobile

HSCSD : High Speed Circuit Switched Data

IVR : Interactive Voice Response

LTE : Long Term Evolution

m-Commerce : Mobile Commerce

MLS : Mobile Location Service

MMS : Multimedia Messaging Service

MNO : Mobile Network Operator

MO : Mobile Originate

m-Payments : Mobile Payments

MPSP : Mobile Payment Service Provider

MT : Mobile Terminated

NFC : Near Field Communication

P2B : Person to Business

P2P : Person to Person

PDA : Personal Digital Assistant

PMP : Mobile Proximity Payment

PSP : Payment Service Provider

RF : Radio Frequency

RFID : Radio Frequency Identification

RMP : Mobile Remote Payment

SMS : Short Message Service

TTP : Third Party Provider

UMTS : Universal Mobile Telephone Standard

USSD : Unstructured Supplementary Services Data

WAP : Wireless Application Protocol

WiMAX : Worldwide Interoperability for Microwave Access

WML : Wireless Markup Language

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