Arthur D Little

Global M-Payment Report Update – 2009

M-payments surging ahead: distinct opportunities in developed and emerging markets

Dear readers,

in the last five years, m-payment markets have matured with a variety of players entering the industry value chain and new services being launched. Initially, it was a market entrance game and rivalry between different technological propositions that would facilitate mobile transaction channels. Today, we observe in many cases that only one or two dominant payment platforms have prevailed in national markets, and key issues being addressed are cross border interoperability and standardization. While, the prevailing financial crisis poses challenges to value chain players, we still believe that m-payment services will significantly grow over the coming years with the rise of mobile internet, the continuous improvement of mobile handsets and the younger generation's preference for mobile services. We believe that these prevailing trends will positively affect m-payment uptake in the coming years.

Similar to previous m-payment reports published in the years 2004, 2005 and 2006, this year's edition aims at providing insights into the current stages of the m-payment market development in different continents and countries. We conducted qualitative interviews through Arthur D. Little's global office network with selected experts from various industries: Mobile operators, banks, credit card companies, payment service providers, mobile equipment suppliers and regulators. The feedback gathered through these interviews, as well as numerous industry reports and case studies present the basis for our analysis and identification of major trends for the future market development.

Our team would like to thank all those who contributed to the Arthur D. Little Global M-Payment Report Update 2009. We are convinced that by reading this report leaders in many industries will be able to leverage the potential of m-payment services and identify ways to strengthen the value of their business.

Yours sincerely,

Karim Taga

April 2009

Gregory Oswald

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Executive summary

As in our previous m-payment reports, Arthur D. Little's M-Payment Update 2009 is based on qualitative and quantitative interviews conducted through Arthur D. Little's global office network and on numerous industry reports and case studies. We rely on feedback from more than 70 industry experts from diverse industries, including inputs from mobile operators, banks, credit card companies, payment service providers, suppliers and regulators of 35 countries worldwide.

In this report, Arthur D. Little set out to address four primary questions:

1. How is the global m-payment market characterized concerning the services offered and factors influencing its development?
2. Which geographical regions and offered services show the highest growth rates and where is the highest transaction volumes generated?
3. What are the current trends in developed markets?
4. What are the current trends in emerging markets?

The global m-payment market and dynamics

- **The m-payment value chain consists of six main players; the market driver and the distribution of power along the value chain vary by market.** The m-payment value chain is made up of mobile operators, financial institutions (e.g. banks and credit card companies), independent service providers, merchants, equipment suppliers and industry associations. Market players take on a variety of roles from facilitation to authorization, and access provision to service promotion.
- **Arthur D. Little expects total m-payment transaction volume to reach almost USD 250 billion in 2012 growing at 68% p.a., starting at USD 29 billion in 2008.** Overall, we expect the total transaction volume to grow 68% p.a. from 2008 to 2012 and to reach almost USD 250 billion by 2012. Proximity payments will represent by then 51% of the total m-payment transaction volume. Furthermore, we believe those figures to materialize in the future despite the prevailing financial crisis, as telecommunication companies have an incentive to launch m-payment services in order to take advantage of the current window of opportunity. Additionally, we believe that transaction volume will keep rising as m-payments will take over market share from banking transactions due to lower service prices and from online-payment services due to increased mobility.

- **The majority of m-payment services are still focused on a business to person environment, and are equally balanced between remote and proximity services.** Concerning the transaction volume development, remittances will globally be the strongest growth contributor with 25% p.a. over the next two years, before retail purchases will take the lead with 77% p.a. growth until 2012.
- **The developments in individual markets in both developed and emerging countries are influenced by economic, technological, social and cultural factors.** A key factor influencing the potential for m-payments in any market is the banking infrastructure; m-payments have a greater opportunity in markets with relatively less developed the banking network, which acts as a competitive service channel.
- **We expect m-payment transaction volume in developed markets to grow at 56% p.a. representing 35% of the total transaction volume in 2012, compared to emerging markets with a 76% p.a. growth, and accounting for 65% total volume in the same year.**
- **The biggest transaction volume share in 2008 comes from the developed country cluster Japan, South Korea and Australia with 24%.** Western Europe is in the 2nd position with a share of 13%, but will become the biggest transaction volume contributor with a share of 17% by 2012. It will be closely followed by South America with 12% and North America with 11%.

Trends in developed markets

- **M-payments are unlikely to substitute existing payment systems, as massive adoption is limited to convenience enhancing applications and niche segments, but will put pressure on existing transaction channel margins.** In the next two years, m-payments will remain a complementary transaction channel in developed markets. In order for an m-payment solution to be adopted on a mass scale, it must fulfill the key success factors, offering unmatched mobility, user-friendly interface, a high number of contacts with banks and operators and especially a new level of convenience. Most of the m-payment applications supply niche segments.
- **Despite the current hype, we do not expect to see a massive Near Field Communication (NFC) adoption in a majority of developed countries until 2011, at the earliest.** We believe a broad adoption of NFC-based m-payments is still two years away, due to a delay in hardware standardization, the limited availability of NFC-enabled handsets and issues in the development of a viable business case for all stakeholders.

- **It is critical for market players to leverage their existing customer relationships and motivate retailers, in order to encourage market adoption.** Key success factors for market players to enable a massive m-payment adoption will be the capability to leverage their existing customer relationships, including reducing the barriers for service adoption, and to motivate retailers to deploy POS (point of sale) readers.
- **Improved regulations and movements towards a liberal ecosystem will push market developments into going "cross-border".** As seen in the EU, m-payment market development depends on the creation of a liberal regulatory framework, enabling increased competition and aiming at streamlining cross-border m-payment transactions.

Trends in emerging markets

- **M-payment services will become the first widespread cashless payment system in many emerging countries, enabling cost-effective and secure transactions.** As already seen from several successful service launches, emerging markets are a fertile ground for the development of m-payment solutions due to their limited banking infrastructure and growing mobile penetration.
- **End-users' benefits will mainly be created through low-value but high-frequency transaction services.** Service providers will continue to focus on simple, low-value, but high-frequency transactions while leveraging their customer relationships. Regulators and governments are establishing a legal environment which encourages a further development of m-payment services.
- **New Know-Your-Customer (KYC) norms will be developed, forcing market players to find the balance between convenience of use and security concerns.** The development and implementation of KYC norms will remain a complicated matter in m-payments, particularly in emerging markets. Regulators, operators, banks and other players have to find the right balance between making the service very convenient and lowering barriers to adoption on one side, and appropriate security and anti-fraud controls on the other side. Hence, value chain players should take an active role in defining the KYC norms in order to secure their influence on **the development.**
- **Remittance will be the strong growth driver for m-payment transaction volume and cross border cooperation.** Globally growing mobile remittances with 146% p.a. growth will be the target area for m-payment services, and will lead to the establishment of international strategic partnerships. Thereby, it will positively influence the m-payment transaction volume.

Conclusion

- **While m-payments are growing globally at 68% p.a. and are expected to reach approximately USD 250 billion in total transaction volume by 2012, m-payments are developing differently in emerging and developed markets.** In developed markets, m-payment services tend not to substitute existing payment systems, and massive adoption will be limited to niche segments. In emerging markets, m-payment services will become the first widespread cashless transaction system.
- **Mobile network operators should focus on low-value, high-frequency transaction services in emerging markets, and especially on remittances.** Playing an active role in shaping the regulatory environment is crucial to preserve the long-term market development potential and ensuring inter-country operability will ensure the success of remittance services.
- **In developed markets, mobile network operators need especially to focus on reaching the required critical mass in terms of retailing partners, as we expect a shift from predominant low-value services to Near Field Communication (NFC)-enabled high-value services.** Partnerships with independent payment service providers are one way to speed up the value chain network build-up.
- **For financial institutions, m-banking and related m-payment services can be a differentiating factor and a chance to tap into the trillion US$ market of micro cash payments.**
- **For merchants, it is best to evaluate the m-payment channel as a means to increase consumer convenience, mobility and accessibility of their services and goods.**
- **We recommend independent payment service providers to increase their partnerships in order to become well-integrated and hence to increase their bargaining power concerning value chain margin distributions.**
- **Suppliers should participate in Near Field Communication (NFC) trials in order to improve their readiness for market growth.**

Introduction

Arthur D. Little's Global M-Payment Report provides an overview of the global m-payment market and dynamics, strategic and operational issues, as well as major challenges and opportunities for the future.

The purpose of this year's Arthur D. Little M-Payment Report Update is to provide an overview of developments in m-payment services globally, as well as in individual markets, since our last report in 2006.

In this report, Arthur D. Little set out to address four primary questions:

1. How is the global m-payment market characterized concerning the services offered and factors influencing its development?
2. Which geographical regions and offered services show the highest growth rates and where is the highest transaction volumes generated?
3. What are the current trends in developed markets?
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This year's Report Update is structured into three main parts:

In the first part of our report, we focus on the global m-payment market and its dynamics. First, we will examine which roles the relevant market players take within the m-payment market value chain, and define and categorize the current m-payment services on offer. The report will then focus on the potential of the different services concerning their future growth and volume development. We will also assess the economic, technological, social and cultural factors that have a direct influence on m-payment markets. Finally, we will detail growth and volume forecasts for different geographical regions.

The second part focuses on trends in developed markets. We address the potential for the m-payment channel to substitute for existing transaction channels, when we expect NFC to be adopted on a mass scale and what value chain players have to do to speed up market adoption.

In the third part, we focus on trends in emerging markets, assessing the potential for m-payments to be the first widely used transaction channel, which services have the greatest potential and which factors will influence the future development.

In the appendix, we will provide an updated view on our ranking of the national m-payment leader countries and present overviews of the current m-payment related activities in some of the most interesting m-payment markets.

1. The global m-payment market and dynamics

Over the last few years, the m-payment market development has led industry players to position themselves differently along the value chain. A range of factors, such as the level of development of the banking sector, has led to very distinct developments of m-payments in developed and emerging markets. Globally, m-payment transaction volume is expected to grow at 68% p.a., reaching almost USD 250 billion by 2012.

1.1 Players within the m-payment value chain

The m-payment value chain consists of six main players; which player acts as market driver and the distribution of power among the key players often varies by market.

The m-payment value chain consists of six main players: mobile operators, financial institutions, merchants, independent payment service providers, suppliers and professional organizations and forums.

Mobile operators

The role of mobile operators in any particular market depends on the m-payment solution provided and the technology involved. Typically, MNOs provide either authorization or access to m-payment solutions. In some cases, they may act as full service providers. There are some rare examples, such as in Japan and Austria, where mobile operators captured a dominant role in the m-payment value chain by acquiring existing or establishing their own financial clearing institutions.

Financial institutions

While often not the driving force for the development of m-payments, banks generally link their existing clients' personal accounts with m-payment services and enable primarily macro payments, as well as the handling of clearing services.

Belgium's Banksys is one rare example where banks have joined forces to take the lead in shaping the market development and move beyond a mere facilitating role. Similarly, in Portugal, the main market force is SIBS, an inter-banking association, which has worked together with the mobile operators to establish a common framework for mobile payments, evolving from its mature card-payment infrastructure.

Major credit card companies, like MasterCard or Visa, have aggressively been testing new smart card-based contactless payment solutions in several countries and are hence trying to occupy a more central role in the m-payment value chain. This is a clear indication that they have a keen interest in capturing a share of small payments (less than USD 5 equivalent), which amount to a current market value of USD 1.7 trillion annually.

Merchants

Merchants have a key role in the m-payment value chain due to their direct contact with consumers and, in this regard, they normally act as service promoters. In the transportation sector in Germany, merchants, such as the regional transport network Rhein-Main-Verkehrsverbund (RMV), are taking the initiative to push the development of Near Field Communication (NFC)-based m-ticketing solutions. Moreover, Deutsche Bahn has been focusing with its partners on the development of contactless m-payment solutions on trains.

Independent payment service providers

Independent Payment Service Providers are often called third-party solution providers and are usually start-ups with a service platform designed for the processing of payments between banks and end-users. Often they are also active in the development of front-end applications. In China, for example, the main m-payment development push has so far been coming from independent service providers, which have established partnerships on a regional basis with one of the two mobile carriers, China Unicom or China Mobile, and retail banks. This lack of a national solution has lead to a fragmented market, hindering the coordinated m-payment development in China.

In some cases, rather than fragmenting a market, independent service providers can unite competing mobile carriers by offering them an open service platform. In 2007, the German company, paybox, focused on the development of mobile payment enterprise solutions by initiating the m-payment alliance "mpass", encompassing Vodafone Germany and o2. The initiative aims to set up a nationally interoperable mobile payment system for remote and proximity payments.

Independent service providers can play a greater role in the m-payment value chain than just processing payments. Especially concerning the discussions around NFC, an independent payment services provider in the form of a "Trusted Services Manager" (TSM), might be beneficial for all as a hosted service to issuers of contactless applications. Paybox, however, was recently acquired by Sybase 365, a subsidiary of Sybase, Inc., the global leader in mobile messaging interoperability and data roaming. This merger creates a potential global leader in providing end-to-end mobile commerce services to mobile operators, financial institutions and merchants with a focus on m-banking, m-payments and m-remittances in both emerging and developed markets around the world.

Suppliers

There are a wide variety of suppliers contributing to the m-payment value chain, including handset vendors, chip vendors, SIM card vendors and POS terminal vendors. From a technological point view, these companies primarily occupy a facilitation role in mobile-based transactions. Nevertheless, the involvement of these players in the industry standardization process is important for the speed of market development.

A shorter adoption process was the main reason why the independent service provider Obopay (US) partnered with one of the major POS terminal vendors ViVOtech. The partnership ensured Obopay's users the access to 160,000 retail outlets across the US, all of them equipped with ViVOtech POS devices, and subsequently led to higher service adoption rates. Obopay has closed an important additional industry partnership trough a significant direct investment of Nokia into the company's product and market expansion.

The role of suppliers in the m-payment ecosystem may evolve from pure technical facilitation to process mediation, characteristic for a TSM; a recent example is the case of Gemalto within the French NFC Payez Mobile initiative.

Professional organizations and forums

Independent bodies often play a facilitation role when it comes to inter-industry negotiations and the development of industry standards. As we predicted in our last M-Payment report, no successor of Simpay has emerged so far. Simpay was launched as a joint initiative of Vodafone, T-Mobile, Telefonica and Orange with the goal of developing an interoperable m-payment platform for transaction routing, clearing and settling. As this initiative has failed on its promise to develop a standardized m-payment solution for its stakeholders, the operators have been focusing meanwhile on the development of national m-payment systems (remote, SMS-based m-payments) adapted to local needs and payment specifics.

In the area of proximity m-payments (RFID based), the GSM Association and ETSI (European Telecoms Standardisation Institute) have contributed very much to the development of mobile NFC standards. GSMA launched an initiative in 2007 and ETSI achieved an agreement on hardware standardization in 2008. GSMA's initiative and ETSI's standards, supported by main industry representatives and other professional organizations (e.g. NFC Forum and Global Platform), are expected to lead to an agreement on a single global approach for enabling proximity m-payments within the near future.

1.2 M-payment services offered and volume development

Arthur D. Little forecasts that remittance will be the strongest contributor to transaction volume growth globally in the next two years. After 2010 when proximity payments are rolled-out commercially, we expect retail transactions to be the major growth driver.

Arthur D. Little's previous M-Payment Reports have been focused primarily on m-payment applications encompassing services from m-parking to m-banking. However, in order to better assess future market developments, we believe it is necessary to distinguish m-payment from m-banking services.

Within **m-banking** services, we consider services such as account balance reports, post transaction SMS notification, money transfer (larger funds) and other information services related to a bank account. M-banking services are typically bank-centric, implying that banks are the key drivers for innovation, while other value chain players in the transaction rather play a facilitating role. Banks have not identified mobile transaction

channels as a key growth business with the exception of their activities in emerging markets. Instead, they are investing in m-banking services as a means to an end for preserving their competitive position and enhancing customer relations. Therefore, our report will be mainly focusing on m-payment services, where we expect more innovation compared to the m-banking area.

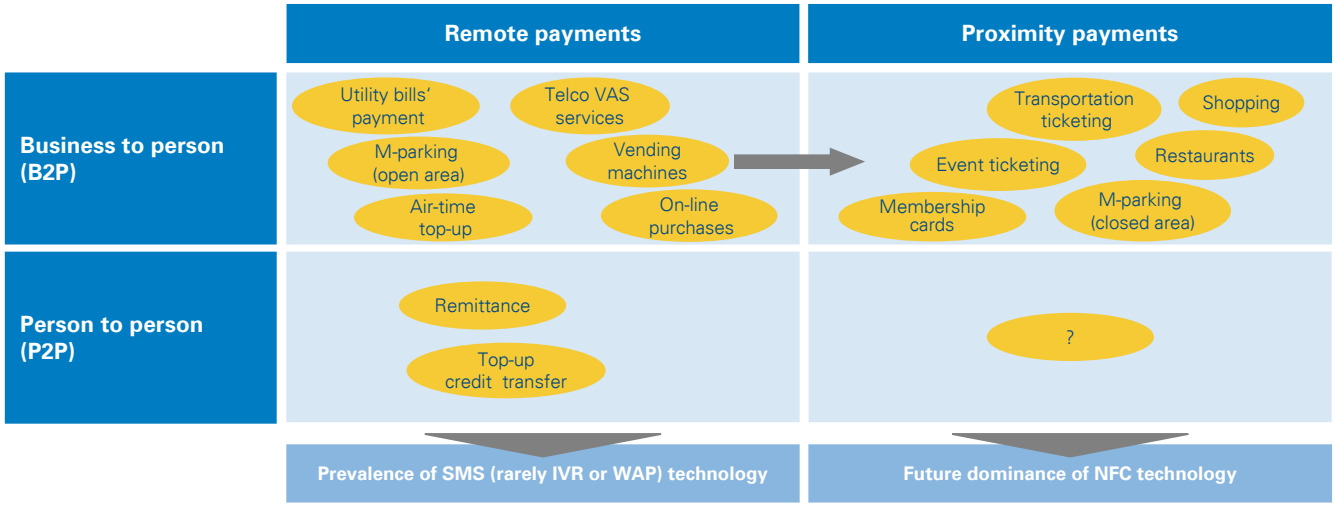
In terms of **m-payment** services, we make the distinction between applications for remote payments, characterized by a prevalence of SMS technology, and proximity payments, which will in the future be dominated by NFC technology. Each service in both of these groups can further be categorized as either P2P (person to person) or B2P (business to person) services.

So far, the focus in m-payments has been put on B2P-transactions. Nevertheless, P2P applications and, especially, remittance services will have an increasing significance for the future growth of m-payment services. In summary, one can group the offered services into one of four clusters, defined by the distinction in B2P vs. P2P and remote vs. proximity payments as shown in *Exhibit 1*.

This service categorization takes into account changes that NFC (Near Field Communication) is expected to bring in developed markets worldwide in the near future. For example, purchases at vending machines is expected to migrate from remote (mainly SMS-based) to proximity payments (mainly NFC-based). NFC is a RFID-based technology, and provides short-range wireless contact and communication between electronic devices in proximity (<20cm).

NFC is a combination of the Smartcard technology, often used in the US, and contactless connection technologies (e.g. GSM). NFC devices can, in contrast to Smartcards, change their roles and be used as both reader and transmitter (active-active and active-passive situations) whereas the Smartcard technology is active-passive based and no mobile phone is required. Additionally, NFC supports other network protocols. The initiation of an activity itself requires no launch of another application, but in order to avoid unwanted transactions, a transaction is only executed after the user has confirmed the action (e.g. by pushing a button on his mobile phone).

Exhibit 1: M-payment product matrix with a majority of services applied in the B2P environment



Source: Arthur D. Little analysis

Hence, NFC allows users to initiate an activity, such as a payment or information request, by placing their electronic device or payment card next to a reader device, which is embedded with an NFC tag. The system establishes the connection between the initiating and reading device within milliseconds without complex security procedures, such as identification verification. After confirmation by the user via SMS or WAP-page, the transaction is executed.

In our M-Payment Report Update 2005 and 2006, we stated that a growing interest in RFID will lead to the development of new applications and will eventually result in the substitution of certain SMS services by NFC technology. One example is the expected replacement of SMS-based purchases at vending machines by a NFC-based purchase process.

Remote payments

Business to person (B2P)

The majority of B2P services are currently based on SMS; some applications may require java-enabled phones. Examples of current SMS-based services that we expect to be offered also in the future are: payment of utilities, typical telco value added services (e.g. ring tones), airtime top-up, m-parking in open areas, online purchases and purchases at vending machines.

In Austria, one of the leading m-payment markets, the dominant service provider, mobilkom, has enabled its users to purchase snacks and drinks through NFC touch points at 415 Selecta vending machines across the country. Although NFC technology is in this case only used for service initiation (waving a NFC phone next to the vending machine's NFC tag) and the rest of the transaction process still relies on SMS technology (sending an order message to a vending platform), we believe that the SMS technology will be completely substituted by NFC solutions in the future. Hence, payments at vending machines will move from remote to proximity m-payment applications as shown in *Exhibit 1*.

Person to person (P2P)

In the P2P area, remittance (strictly P2P transactions) is currently the dominating service and is expected to remain so. In the Philippines, the providers GCASH and SMART managed through their m-payment channel roughly USD 3 billion in P2P transactions, which accounted for almost 20% of the country's total remittance volume for 2007. Furthermore, the Philippine remittance transaction volume is growing at approximately 10% p.a. Besides remittance services, we see airtime top-up credit transfers between persons as an additional service, which will in the future also rely on SMS technology.

Proximity payments

Business to person (B2P)

There exist vast potential for new applications for proximity payments within the B2P environment. As predicted in our last M-Payment Report Update, low value payments, such as for parking or public transportation, have dominated the growth in m-payments. From a global perspective, most of these services are currently based on SMS or on IVR or WAP technology. However, in the next two years, we expect that low value payments will be increasingly relying on NFC technology.

In advanced markets, such as Japan, over 18 million transactions per month were made in 2007 using the Suica, a public NFC-based transit payment system operated by JR Railway. Similar services are also planned to roll out in Western European countries. T-Mobile, in Germany, for example has supported RMV for the development of a NFC-based public transportation solution "Handy Ticket", while Vodafone partnered with Deutsche Bahn for the development of its NFC-based "Touch&Travel" ticketing solution. Other services that will be paid by NFC-enabled phones in the future are taxis, retail-shopping purchases (also over the internet), event tickets, services in restaurants and bars, m-parking in closed areas and the usage of membership cards embedded on a NFC chip.

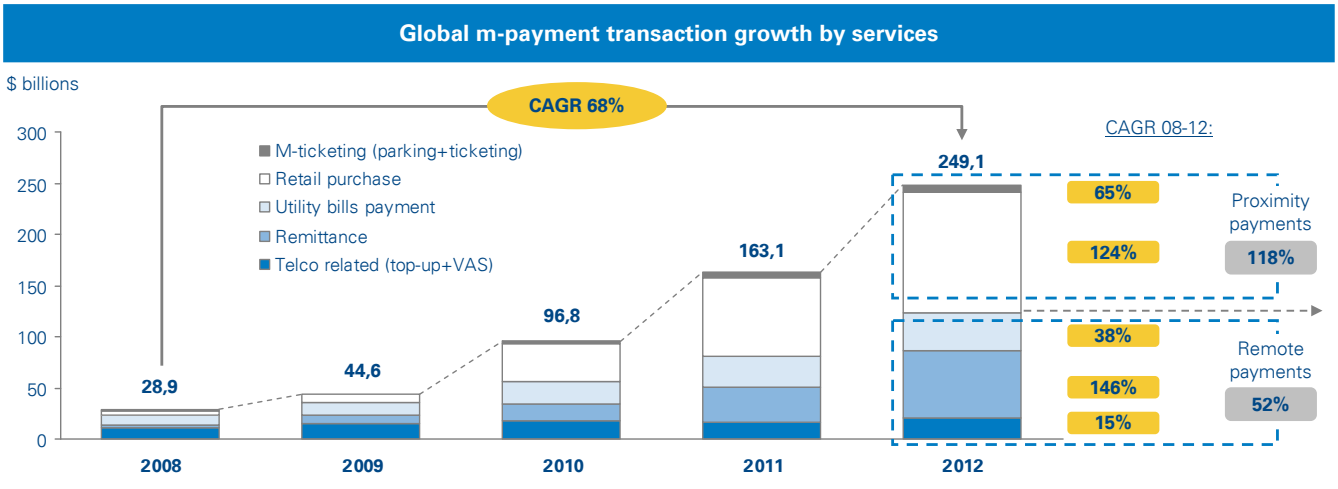
At present, NFC-based m-payment solutions have only been targeting retailers (B2P), and no P2P applications have emerged so far. While NFC will likely dominate, we do not expect it to be the only technology utilized in the proximity / P2P area. We anticipate that some sort of proximity-based, P2P-related remittance services to be developed, which may be based on technology other than NFC.

In terms of proximity payments, suppliers have been so far mostly following a "Wait-and-See" strategy. However, as major milestones are achieved in the development of NFC-technology and related services in the coming years, we are likely to witness major handset suppliers launching different NFC-enabled mobile phones by the beginning of 2010. In this first phase of new technology introduction, those vendors who actively participated in numerous globally on-going NFC trials will be better positioned than their rivals in terms of market insights, experience and required time-to-market, once the NFC technology is ready for broad market introduction.

In 2008, we estimate that the share of proximity payments in overall transaction volume share has reached 23%, which is much lower than previous forecasts. This is primarily due to the significant increase in the remote service "Payment of utility bills". Utility bills m-payments have seen a much higher than expected take up among the population without a banking account in developed markets. Payment of utility bills over the mobile phone encompassed roughly 35% of the overall m-payment transaction volume in 2008.

Based on our market analysis, we forecast that remittance will be the strongest contributor to transaction volume growth globally in the next two years, with a CAGR of 25%. After 2010, when proximity-based payments will have been massively rolled out on a commercial basis, we expect retail purchases (e.g. shopping, restaurant payments) will become the major growth driver for transaction volume with a CAGR of 77%. By 2012, we expect the global m-payment transaction volume to reach almost USD 250 billion, increasing from 2008 to 2012 by 68% p.a. *(see Exhibit 2)*. Proximity payments are then expected to account for 51% and remote payments for 49% of the total transaction volume.

Exhibit 2: Remittance as the fastest growing m-payment service according to the global transaction volume growth split into different services



Source: Arthur D. Little analysis

Arthur D. Little believes that the m-payment market growth will materialize despite the current global financial crisis. As m-payment services require a new, often complex and expensive organizational and process setup, telecommunication companies will be tempted to postpone the introduction of m-payment services in order to cut costs. Operators nevertheless have an incentive to launch m-payment services, as the window of opportunity for market entry and expansion is now. In emerging markets, the underlying business case is defined and there is limited competition in regard to competing transaction channels. In developed markets, some mobile carriers may apply a "Wait-and-See" strategy, but with the launch of NFC solutions, the perspectives for launching m-payment services in developed markets will also become highly attractive. Therefore, we believe that investments in m-payments will continue to be part of telecommunication companies' strategy in the near future.

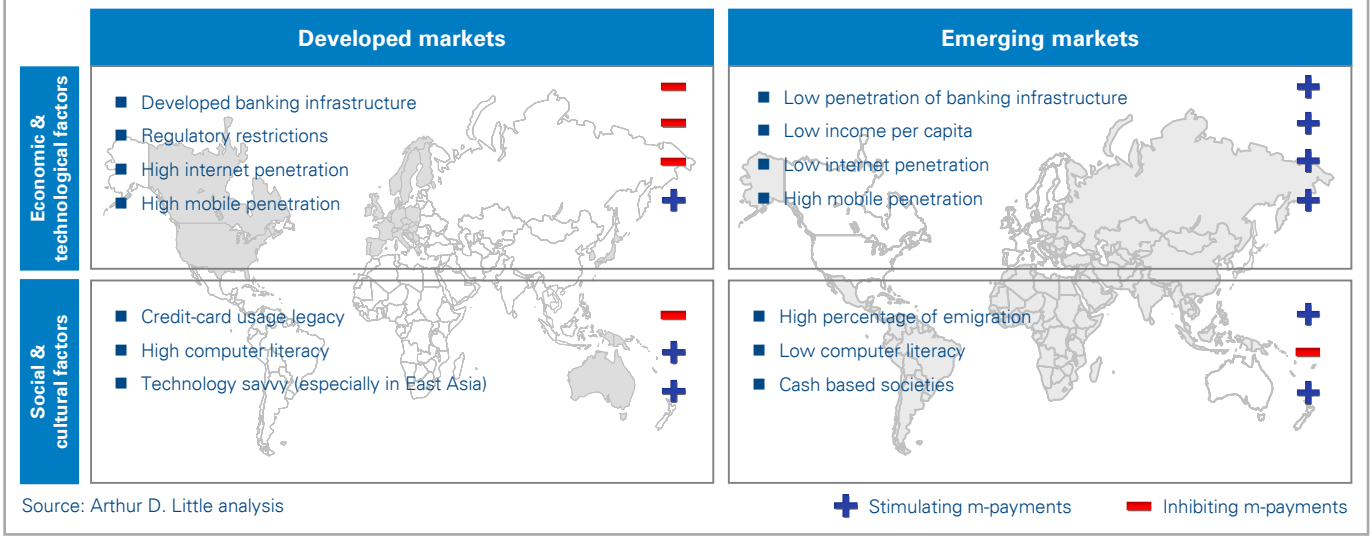
Although the financial crisis will have a negative impact on consumer consumption, which will affect financial transactions in general, m-payment services will still have potential for growth. Due to their cheaper transaction costs, they will be able to grab market share from traditional banking services and due to their better mobility, they will grow faster than less mobile payment channels such as on-line payments. Additionally, on the supply side telecommunication companies have an incentive to push m-payment services as a promising new revenue source, as they face often stagnating revenues in their core business segments of fixed and mobile telephony.

1.3 Factors influencing the regional market development

A range of factors, such as development of the banking sector, mobile penetration, and rate of emigration, affect the potential for m-payments in any individual market.

Regional m-payment markets are expected to continue to develop differently due to a variety of underlying economic, technological and social-cultural factors. These factors have a broad influence on the economic environment: influencing market demand, impacting the range of services offered and affecting the near and long-term potential for m-payment development. We have grouped key factors affecting the m-payment sector into economic & technological and social & cultural factors, and illustrate their impact on developed and emerging markets in *Exhibit 3*.

Exhibit 3: Different economic & technological and social & cultural factors behind the m-payment market in emerging and developed countries



Source: Arthur D. Little analysis

Economic & technological factors:

Economic and technological factors which effect the development and growth of m-payments include:

- The level of banking sector development
- GDP per capita
- Regulatory environment
- Level of technology

Level of banking sector development

The most important factor influencing the development of m-payment services is the underlying banking infrastructure of a country. Developed markets are characterized by a relatively strong national economy, which is based on a mature banking industry with a fully established infrastructure, such as ATM terminals widely available countrywide. Such an existing banking infrastructure enabled an easy adoption of cashless transaction systems based on credit and debit cards. Regions with a well-developed banking system include the US, most of Europe, countries in Far-East Asia, such as Japan and South Korea, and Australia.

In contrast, a majority of African countries is economically and financially weak, without an effective, cost-efficient banking system and integrated infrastructure. In China and India, for example, there are 96 and 28 installed ATMs, respectively, for every million inhabitants. In comparison, the ratio in the US is much higher, 1,300 ATMs per million inhabitants, and in South Korea, the number of ATMs increases to almost 1,960 per million.

The degree of development of banking infrastructure has a direct, inverse impact on the development of m-payment services. A strong banking infrastructure represents a competitive product to m-payment services and hence hinders its development. For this reason, m-payments have much greater potential in emerging markets. However, there are countries in emerging markets, such as Latin America, Eastern Europe, China and India, with relatively developed banking systems, which possess the potential for a parallel development of two alternative payment systems.

GDP per capita

A similar logic applies to the difference in GDP per capita. The GDP per capita is lower in emerging countries and hence end-users have normally a higher price sensitivity concerning their spending including financial transaction services. Traditional banking services generate higher costs for end-users than m-payment services. For example, m-payment transactions trough African WIZZIT service is 50% cheaper monthly than through traditional bank accounts. Lower GDP per capita and related higher price-sensitivity are reasons why m-payment services tend to develop faster in emerging countries compared to developed nations.

Regulatory environment

The regulatory environment plays an important role in the development of m-payment services in both emerging and developed markets. In emerging markets the existing regulatory environment is not as strictly defined as in developed markets, and hence offers greater market opportunities for innovative services such as m-payment. Although there has been considerable effort to liberalize regulation in the financial and telecommunication markets over the last few years, the regulatory structure in developed markets are generally more restrictive than in emerging markets. Therefore, regulatory policy in emerging markets is increasingly allowing new competitive services like m-payments to emerge and compete with existing payment channels.

Level of technology

The level of technological development, specifically internet and mobile penetration, also plays an important role influencing the development of m-payment services. *Internet penetration* correlates positively to the level of economic development, which means that developed countries have normally a higher internet penetration. Because high internet penetration facilitates internet banking services, m-payment services are more likely to develop in countries with a lower internet penetration. In Slovenia, where the internet penetration is 37%, the Moneta m-payment platform was able to increase its penetration 26 times within one year. Vodafone's M-Pesa initiative in Kenya, where internet penetration is only 8%, managed to increase its penetration 42 times.

Mobile phone penetration is the basis for any m-payment services, as mobile phones are the core carrier devices for any m-payment service. Hence, a high mobile phone penetration is critical in order to provide the basis for successful growth of m-payment services.

Social & cultural factors:

Social and cultural factors which effect the development and growth of m-payments include:

- Early adopters
- Use of credit and debit cards
- Degree of emigration

Early adopters

Countries like Japan, South Korea and Singapore are considered to have a very tech-savvy population with high proportion of early adopters among the addressable customers. This makes an early acceptance of m-payment services more likely in these countries. Developed countries often have a higher percentage of tech-savvy people and higher level of computer literacy, which makes a quick market acceptance more likely than in emerging markets.

Use of debit and credit cards

In the US and Scandinavia, debit and credit cards are the leading day-to-day payment instruments. People have been using them for such a long time that it became a part of their spending culture and tends to hinder the development of an alternative transaction channel, such as m-payment services. The situation in emerging markets differs however, as traditional payment channels such as debit and credit cards have often not yet reached a significant market penetration.

Many African countries tend to be cash-based societies, because people tend to handle their daily transactions in cash and prefer to keep their savings literally at home. The are some cases, most notably in South Africa and Kenya, when m-payment and m-banking services have successfully positioned themselves in these markets as the dominant channel for financial transactions, significantly replacing cash in financial transactions.

Degree of emigration

Due to the frequent social and political instability in emerging countries, they are often witnessing a high level of emigration; In 2007, the average net migration on average in Africa was at -0.27/1,000 people, compared to 1.6/1,000 people in the EU. Emigration is an opportunity for the development of m-payment services in emerging countries. Many expatriates in developed countries send remittances back to their families. In 2007, 79% of the USD 318 billion in global remittances was set to emerging countries. High emigration can hence positively influence the development of m-payment services as an effective means of sending remittances back home.

As we have seen, the economic, technological, social and cultural factors influencing m-payments differ in developed and emerging countries. This leads to different initial market conditions and future challenges for development of m-payment services. Therefore, in the subsequent chapters, we will first assess the development of m-payment services in developed countries, and second at the advancement in emerging countries.

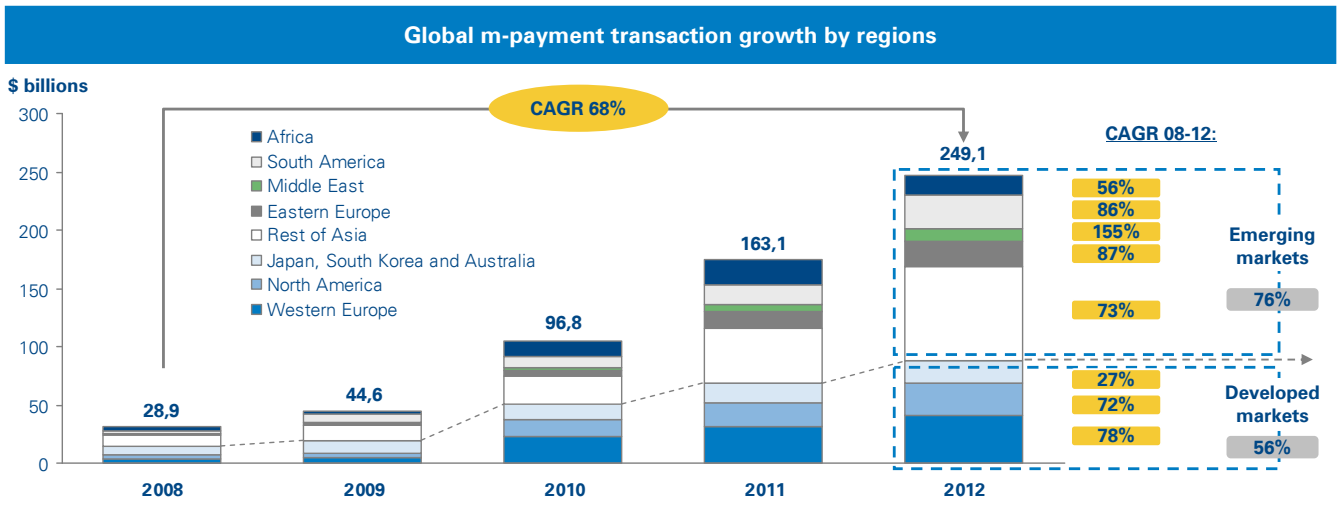
1.4 M-payment volume development by regions

Arthur D. Little estimates that global m-payment transaction volume reached USD 29 billion in 2008, less than the USD 37.1 billion that we had forecast in our previous reports. The difference stems mainly from an underperformance in developed markets, especially in Western Europe. The ongoing fragmentation of national markets, without a critical mass of retailers that could support a massive service up-take, resulted in a 40% lower transaction volume than previously forecast.

We have recently, however, witnessed stronger than expected m-payment growth in emerging markets. The vastly-populated countries of China and India, together with other booming national markets, such as the Philippines, Malaysia and Taiwan, are expected to contribute 20% more than initially expected to the overall transaction volume.

By the end of 2012, we expect to see a further acceleration in the growth of m-payments in emerging markets, which will result in emerging markets accounting for a global total transaction volume share of 65% in 2012. Overall, we forecast the global m-payment transaction volume to reach USD 249 billion in 2012, growing at an annual growth rate of 68% from 2008 until 2012. *Exhibit 4*

Exhibit 4: Emerging markets as the main growth drivers of the global m-payment transaction volume



Source: Arthur D. Little analysis

2. Trends in developed markets

The take-up of m-payment services in developed countries has been limited by the availability of other transactions channels, as m-payments have had difficulty competing with already established payment channels. A massive NFC adoption, which could further promote m-payment services, is still likely two years away.

In developed markets, we have identified four trends that will shape the development of m-payments in near-term:

- M-payments will not substitute existing transaction channels, as adoption is limited to convenience-enhancing applications and niche segments, but will rather put pressure on existing transaction channel margins;
- Despite the current hype, we will not see a massive NFC adoption in the majority of developed countries until 2011 at the earliest;
- In order to promote market adoption, market players need to leverage their existing customer relationships and motivate retailers;
- Improved regulations and movements towards a more liberal ecosystem will encourage the development of "cross-border" m-payment solutions.

2.1 M-payments will not substitute existing transaction channels, as adoption is limited to convenience-enhancing applications and niche segments, but will rather put pressure on existing transaction channel margins

In the next two years, m-payments will remain a complementary transaction channel in developed markets, because only those applications that fulfill the key success factors will be massively adopted, and most of the m-payment applications will remain focused on niche segments.

Market developments have so far shown that both proximity services, such as m-parking, and remote services, such as m-remittance, could only prevail over traditional transaction channels if end-users recognized and valued the service's new, unrivaled convenience.

Key success factors for a massive uptake of m-payment services are an enhanced convenience and unmatched mobility, a user-friendly interface and a high number of contacts with banks and operators. In this regard, we distinguish between m-payment applications that contribute to a massive mobile market uptake and those will be only applicable to niche segments. The following *Exhibit 5* gives a general overview of m-payment services specifically offered in developed countries.

Whether merchants will be willing to widely deploy POS readers does depend on the underlying margin squeeze; merchants will base their decision of offering a new payment possibility on the channel's transaction margin compared to other means of payment. Of course, POS manufacturers also influence the attractiveness of m-payments, by offering operationally- and financially-appealing POS readers, but they can only position themselves within a certain margin breadth. Hence, a viable business case for all value chain players is mandatory for a successful development of m-payment services. In our opinion, m-payment will not substitute for existing payment channels, such as credit cards, but will lower ARPU over time due to increased channel competition.

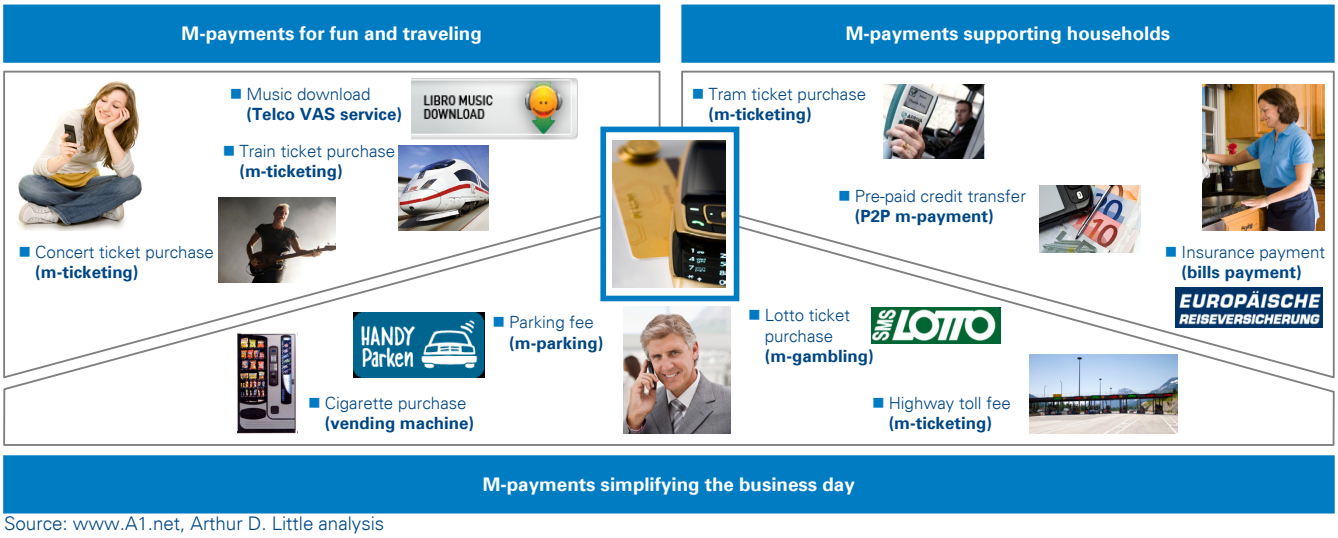
Applications driving a broad up-take of m-payments

The m-payments which have seen most success in developed countries have offered enhanced convenience through unmatched mobility, user-friendly interfaces and contracts with numerous operators and banks. The applications that have been driving a broad up-take of m-payments in developed markets are: M-parking, M-ticketing and remittance. Our interviews with executives of leading global MNOs confirmed that airtime top-up and value-added services (VAS) offered by mobile operators have also been major uptake-drivers of m-payment services in developed markets.

M-parking

M-parking solutions are one of the applications driving uptake and, as already mentioned in our previous editions of the M-Payment Report series, these applications have already been

Exhibit 5: Main m-payment services offered in developed countries (e.g. Austria)



Source: www.A1.net, Arthur D. Little analysis

implemented across US, Australia and in many European countries. M-parking has fueled the growth of m-payments with their value proposition of being both more convenient for consumers, and able to substantially reduce costs for parking service providers. Companies specialized in parking service management revealed that cost reductions of 30-40% are achievable in comparison to traditional offers that are based on cash payments.

In countries like Austria and Croatia, where m-parking services were first introduced, traditional payment systems were bypassed, and m-parking is now the most frequently used service. In Zagreb, the capital of Croatia, m-parking services have massively gained in market penetration; from 20% in 2002 to 71% in 2007. This represents a CAGR from 2002 to 2007 of 28.8%. At the same time, the sale of parking tickets through kiosks almost disappeared as a distribution/payment channel (-22.9% p.a.). *Exhibit 6 overleaf*

M-ticketing

M-ticketing has been successfully implemented largely because it can lead to a significant reduction in operating costs for transportation companies, as well as making the use of the services more convenient for consumers (e.g. eliminating queues).

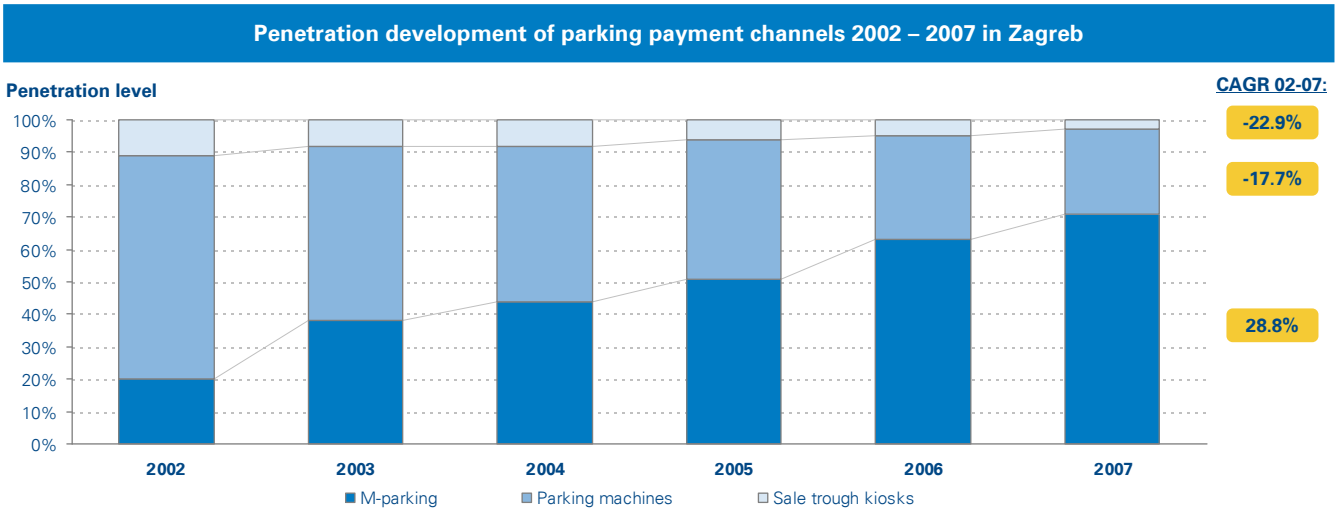
In the airline industry, for example, which has been under tremendous cost pressure, the International Air Transport Association (IATA) estimated that savings from a shift from paper tickets to an alternative ticketing system could lead to cost reductions of USD 3 billion globally. Many airline companies in the EU, Japan, China and India have already recognized this opportunity and introduced m-ticketing solutions in parallel to e-ticketing.

Besides m-parking and m-ticketing services, our interviews with executives of leading global MNOs confirmed that airtime top-up and value added services (VAS) offered by mobile operators have also been major uptake-drivers of m-payment services in developed markets up to now.

Remittance

Remittance is playing an important role in boosting m-payment usage in emerging countries, but has also been implemented to a lesser extent in developed countries. Obopay for example, an independent American service provider, is primarily focusing on

Exhibit 6: Strong m-parking penetration growth has led to dominance over other parking payment channels in Zagreb



Source: Infoart, Arthur D. Little analysis

remitting services. In Europe, companies like Crandy and LUUP offer remitting services as well. But unlike their peers in the US, they have problems reaching a critical market size, since their service applicability is limited to countries where they have partnership agreements with national carriers and banks.

With the implementation of the European Commission's Payment Service Directive (PSD) in the EU member states, which is expected by the end of 2009, the current hurdle for cross-border market expansions will largely be overcome. Hence, remittance can and will be an important m-payment market uptake driver.

Applications in niche segments

Mobile-based solutions, such as event ticketing or product ordering, have not been as successful in replacing traditional payment channels, and often only remain successful in niche segments. Mobile phones as payment instruments have only managed to effectively substitute existing channels if the current level of convenience is unsatisfactory to the consumer. The purchase of cinema tickets by call-in booking is one example when m-payments were able to offer more convenience and satisfaction to the consumer.

The ordering of food via landline phones is so widely accepted, used and convenient that it is very unlikely that any user will migrate to a text based (e.g. SMS, WAP) ordering/payment channel. E-purchase of books, DVDs, CDs, as well as the commonly used online ticketing, show also limited potential for an m-payment market uptake, mainly due to the existing high internet penetration in developed markets.

SMS-based proximity m-payment services, such as for the purchase of snacks and soft drinks from vending machines, have not been as widely used across Europe, and remained so far a niche segment as compared with Far-East Asian markets. Rare examples among EU countries are Austria and Slovenia where a solid base of POS readers for proximity m-payments has been installed across the country. In many other countries, though, only trials with NFC solutions, as an alternative to SMS-based payments, have been conducted. However, in these countries a commercial service roll out is still ahead of us, at least until a viable NFC business case has been developed and a wide range of NFC capable phones become available.

In the case of proximity m-payment services in retail areas, as for example shops, restaurants or bars, solutions based on the

contactless smart card technology (with RFID tags integrated in the identification card) dominate in developed Asian countries, in contrast to countries in Europe and North America. In the latter markets, we have seen a rather limited offer and adoption of foremost SMS-based proximity m-payment services. In Japan, however, NTT DoCoMo has offered the 'iD' credit payment service for low value purchases since the end of 2005. Only in the first quarter of 2008, the company managed to increase the number of iD-enabled payment terminals at retailers by more than 40%, which amounts now in total to 300,000 units. In parallel, the number of subscribers has grown by more than 30% to reach 5.64 million users in Q1 2008.

The main reason for the limited global services uptake of proximity m-payments so far is the lack of a global standard. Such a standard would boost the motivation of retailers to invest in new equipment, as it would ensure a ubiquitous software solution for all end users' mobile phones and POS. As a result, the achievement of the required critical mass in order to become accepted and profitable would be easier. The European Telecommunications Standard Institute (ETSI) has significantly contributed towards resolving hardware standardization issues through the development of their SWP (single-wire protocol) standard. However, an unclear division of roles and ownership of costs between the different value chain players (especially for marketing activities) have so far made the new business case too complex for a successful realization.

In the next two years, mobile banking is also not expected to become a massively adopted service in the EU, US and in the majority of other developed markets. The existing banking infrastructure already offers an easy service access and the high internet penetration has enabled e-banking to become a widely accepted, inexpensive and convenient way of conducting transactions. This is true for home- as well as for work-related applications. Although estimations showed that mobile banking costs can be as much as 10% lower than the comparable transactions in a normal bank branch, European retail banks have introduced m-banking services mainly for the purpose of enhancing customer satisfaction and mobilizing existing customer relationships, complementing the existing e-banking channel and improving their competitive position.

An example of new customer acquisitions through m-payment channels, which was identified in our survey, is the offer of banking services to children, who are not legally eligible for a regular credit card, but often have a mobile. By offering m-credit-card services to children, banks are widening their product portfolio, but not jeopardizing their existing services and sales channels.

A recent survey has shown that out of 92 leading banking institutions in the world, only one-third plans to introduce m-banking services in 2008 to 2010. Therefore, we consider the introduction of m-banking services by major players rather as a tactical and reactive move to changes in the competitive environment. We can already witness this move in the US where, for example, Bank of America, Wells Fargo and Citibank have launched their m-banking services to maintain and improve their competitive position.

2.2 Despite the current hype, we do not expect to see a massive NFC adoption in the majority of developed countries until 2011 at the earliest

We believe a massive adoption of NFC-based m-payments to be still two years away due to delayed hardware standardization, the current limited availability of NFC-enabled handsets and issues in the development of a viable business case for stakeholders.

Credit card companies are globally driving NFC-based payment solutions, the only exception among developed markets being Far-East Asia, where MNOs have taken the lead in the past. The path to fast market adoption and growth, however, is rocky; delayed hardware standardization has hindered commercial deployment, lack of cross-border interoperability leads to limited service applicability and there are no NFC-enabled handsets widely available yet in the market. In addition, the financial crisis has negatively affected consumer behavior globally, which has resulted in a prolongation of the normal handset replacement cycle which will impact NFC-based m-payment service uptake.

The initiative "Pay-Buy-Mobile" lead by GSMA gives hope for a successful business case, while the European Telecommunications Standards Institution (ETSI) significantly

contributed towards resolving hardware standardization issues through the development of their SWP (single-wire protocol) standard. The protocol enables the NFC chip to communicate directly via the mobile phone's antenna with the reader device without using the phone's own software. Hence, mobile phones will communicate based on the same standard as they are circumventing the diverging mobile phone software versions. Although ETSI's achieved hardware standardization in 2008 and globally conducted NFC trials within GSMA's "Pay-Buy-Mobile" initiative are very important achievements for the future positioning of mobile phones as the main NFC technology carriers, we see a massive adoption of NFC phones still two years away.

Credit card companies or mobile operators in the driving seat?

In the past, credit card schemes have played a major role in the US and to certain extent in Europe in pushing NFC payment cards into the markets. MasterCard, for example, commercially rolled out and tested different PayPass-related programs in more than 20 countries worldwide. On a global level, MasterCard managed to distribute over 20 million contactless cards by the end of 2007, which represents almost a 100% growth from 11 million cards distributed in 2006. The trials of NFC payment models, supported by credit card companies, made it unclear whether mobile operators as part of the value chain will only have a facilitating role or if they will be able to capture an adequate portion of the revenue share.

In this new payment channel, the mobile network operators (MNOs) will enter the market as additional value chain players. Traditionally, there are only four main players involved: the credit card company as issuer, the consumer, the merchant and banks as intermediaries. Increasing the number of involved players leads to two possible scenarios concerning the revenue distribution; either the original value chain players will face lower revenues as the MNOs claim their share or end-users will face higher service costs (by transferring the costs onto the end-user). At present, it is not entirely clear how the revenue will be shared. The only additional revenue sources for MNOs would be issuing fees to users, over-the-air (OTA) services, process fees to card issuers (as real benefits that can be offered on a mobile phone in comparison to a plastic payment card) and finally subscription- based monthly fees for value added services to end-users. We expect credit card companies to remain as the dominant market player in the US and Europe.

In contrast to cases in the US and Europe, the Far-East Asian countries have successfully implemented NFC business models that have been developed by MNOs, while the benefits were reaped jointly by mobile operators and banks. In the case of Japan, one success factor was the proprietary nature of the "Felica" contactless smart card solution. It consists of only one unique TSM (trusted service manager) owned by the contactless provider, one MNO and one transit network. This enabled DoCoMo as the dominant Japanese player to cover 95% of the total service market. It is unlikely that this ecosystem can be successfully replicated in other countries as it evolved at a time where little attention was paid to m-payments, and the already dominant player DoCoMo did not have to make compromises.

Main obstacles for massive adoption of NFC-based m-payment services

Two main hurdles have been negatively influencing the development of NFC solutions: a delayed hardware standardization and related limited interoperability, and the unavailability of a wide range of NFC-enabled hardware. Besides those two main hurdles, there are also issues in the development of a viable business case.

Recently conducted field trials concerning NFC m-payment options, which were part of the strategic initiative "Pay-Buy-Mobile", led by GSMA and 46 global mobile carriers, as well as major handset vendors and credit card companies, have proven that interoperability and standardization have been two key obstacles. Cross-border usage is another important driver of m-payment uptake, but in order to enable such usage, POS terminals need to be standardized to avoid different interfaces and limited interoperability.

In comparison with previous attempts to create a uniform service platform, such as Simpay in Europe, the "Pay-Buy-Mobile" initiative gathered the critical mass in terms of the number of involved future stakeholders and has introduced the role of a Trusted Service Manager (TSM). A TSM occupies

the role of a trusted third party and serves as a single touch point between mobile operators and service providers, such as banks, transportation companies, etc., which will launch their applications on NFC-enabled phones. The role of a TSM smoothes the relationships within the m-payment ecosystem, and hence contributes to the establishment of a viable business case for the involved stakeholders by serving as a moderator.

France is a good example where high collaborative effort was undertaken within the "Pay-Buy-Mobile" initiative. Numerous NFC field trials are being executed with the goal of creating a single service platform that will do justice to the business interests of all stakeholders. In order to ensure this requirement, multiple TSMs, MNOs, handset vendors, chip manufacturers and retailers have been involved in these trials. For the first time since Simpay's failure, the initiative of GSMA, aiming at a standardization of technology and processes, can provide both the financial and the mobile industry with a clear path for the development of a sustainable business case and NFC service platform.

Delayed hardware standardization could now be overcome. Handset suppliers now have a clearer market path ahead of them, due to the standardized single-wire protocol (SWP) and Host Controller Interface by ETSI in 2008, followed by announced handset reference designs that are to be launched by global open-standard contactless platform developers such as INSIDE Contactless. This may lead to cost reductions in product development for handset suppliers, as well as to a shortening of their time-to-market process due to the defined standards.

However, the lack of NFC-enabled mobile handsets in the market is the second main hurdle on the path of a massive m-payment uptake. In advanced NFC-markets like Taiwan, where the ecosystem is completely prepared for service applications (POS readers widely available and the three major operators accepting all existing standards), no massive uptake of m-payment transaction volume has been yet recognizable. The reason lies in the lack of a variety of NFC-enabled handsets. One can observe a similar situation in Singapore, Malaysia, and Australia, where there is now a high penetration of installed NFC POS terminals, but only limited m-payment volume is observable.

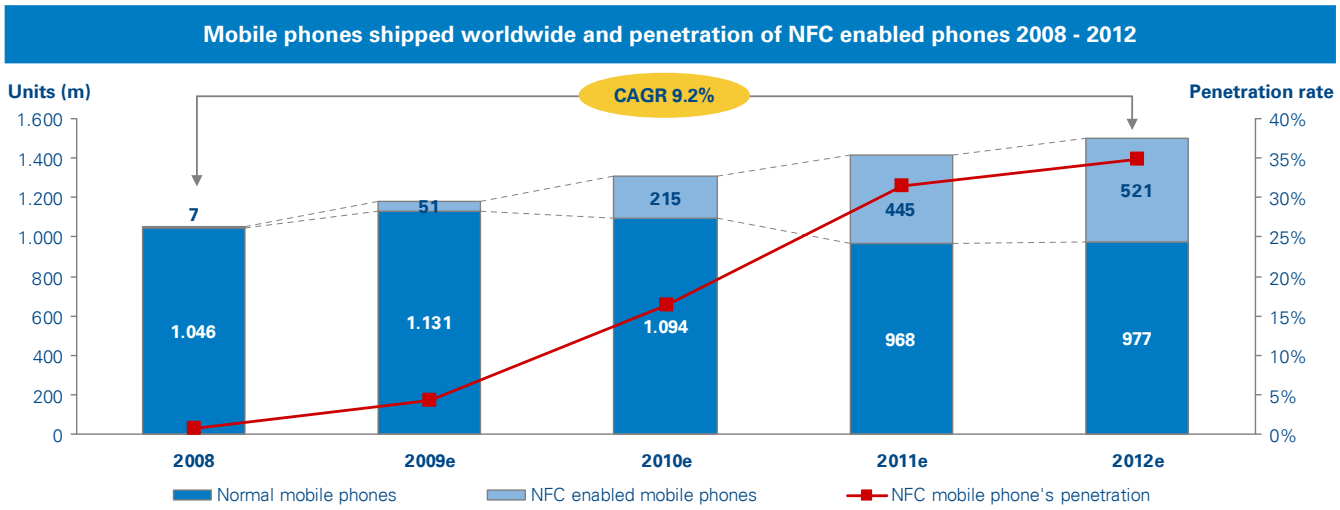
It will take time to conquer the mass market and suppliers need first a firm signal from other m-payment market stakeholders that a viable business case exists for all parties involved, although the standardization issue could be solved. New products need first to be developed, produced and launched, which will take time. Interviews with industry experts showed that the entire NFC mobile phone development-to-market process takes about one to two years. As the standard was set at the end of 2008, a range of new prototypes is expected by the end of 2009 and market launch of new phones earliest in the beginning of 2010. Educating consumers concerning the new technology and convincing the retail market to support the new payment channel will take time as well. Additionally, market penetration growth will be slowed as we expect hardware vendors to be affected by a prolongation of the normal handset replacement cycle caused by lower consumer spending as an effect of the financial crisis. Therefore, we envisage that a massive NFC service uptake will happen earliest in 2011.

Recent interviews with suppliers and existing sources indicate that more than 520 million NFC-enabled phones are planned to be shipped globally by the end of 2012, fuelled by a massive service uptake. However, Arthur D. Little believes that one-third of that is more realistic, or approximately 170 million NFC enabled phones by the end of 2012. *Exhibit 7 overleaf*

Mobile phones as future dominant technology carriers

Although we are currently some years away from a massive m-payment service adoption, we believe that NFC-enabled phones will in the future not only serve as simple m-payment instruments, but also incorporate a wider applicability, such as in advertising, healthcare services etc.). O2, the UK subsidiary of Telefonica, has been conducting pilots in new areas of NFC applications in 2008, one of them being healthcare services. One example is the equipping of health care workers with NFC-enabled phones to access patient records. This and other applications in the healthcare field are built on the anticipation that mobile technology will enable easy access to information on the move and therefore enhance the convenience for both patients and medical professionals.

Exhibit 7: NFC-enabled mobile phones will grow strongly and reach a considerable volume after 2010



Source: Bear Stearns, Interviews, Arthur D. Little analysis

In the marketing field, new NFC-enabled handsets, capable of performing advanced graphical and interactive features, will make the use of new services more appealing (e.g. smart advertising posters interacting with mobile phones) and increase customer loyalty. NFC technology will hence enable more elaborated handset features leading to a higher interactivity with end-users and eventually provide mobile phones with advantages over credit cards as the NFC technology carriers.

2.3 In order to promote market adoption, market players need to leverage their existing customer relationships and motivate retailers

Key success factors for market players to enable a massive m-payment market adoption will be the ability to leverage their existing customer relationships, reduce barriers for service adoption and motivate retailers to deploy POS readers.

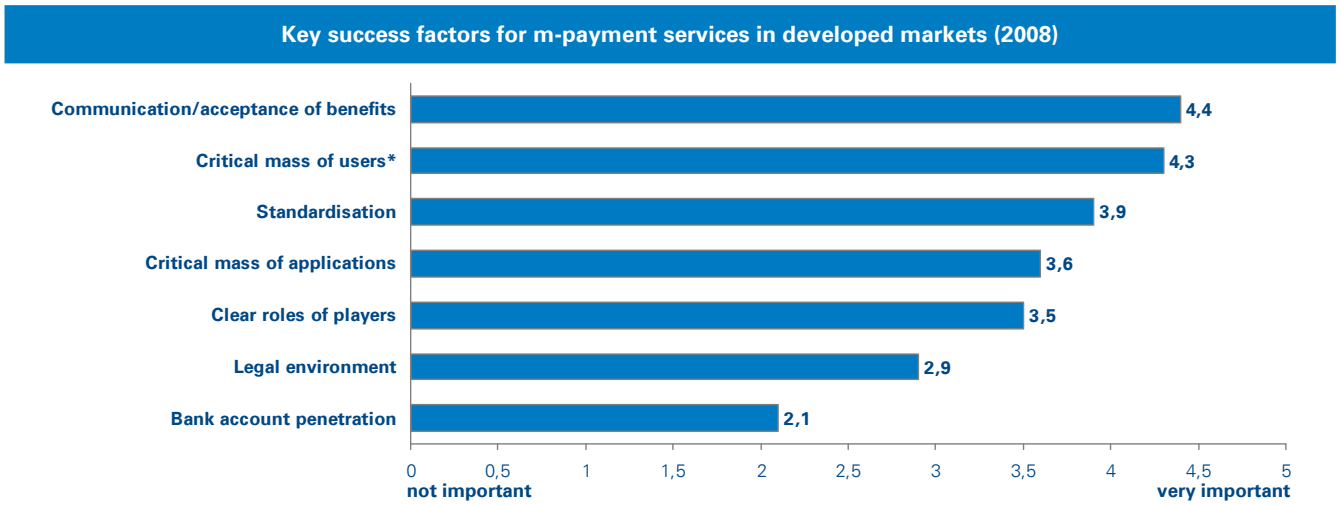
Based on our survey, we have identified seven key success factors for a successful adoption of m-payment services in developed markets *(Exhibit 8)*. A high bank account penetration together with a sound legal environment are important in order to enable providers, not only legally but also operationally, to offer m-payment services through the integration of banks.

A clear definition of roles among the value chain players is necessary for the development of a solid business case. A critical mass of applications and high level of standardization are significant, and simplify the attainment of the two most important key success factors: communication/acceptance of benefits and critical mass of users. The essential preconditions, ease of use and convenience for the adoption of end-users, which we highlighted in previous chapters, are covered by the key success factor communication / acceptance of benefits.

The findings of our study imply two important messages for value chain players:

- It is critical to leverage existing customer relationships in order to reach a high communication/acceptance of benefits and critical mass of users;
- In order to increase the chances of reaching the required critical mass of users, it is necessary for m-payment service providers to push retailers for the adoption of m-payment readers in their stores. Whether merchants will be willing to widely deploy POS readers depends on the margin squeeze of the transaction channel; merchants will only be willing to deploy POS readers, if m-payment is more or at least equally profitable for them than other channels.

Exhibit 8: Main key success factor is the communication/acceptance of benefits, besides reaching a critical mass of users



Source: Arthur D. Little analysis; *Users include retailers and consumers

Leveraging existing customer relationships

In order to best leverage their existing customer base, it is critical to make access to m-payment services as easy as possible. Vodafone and O2 in Germany, have recognized this, and have automatically cleared all their post-paid users for m-payment services on offer. The same approach has been taken by the Slovenian operator, Mobitel, which began offering its m-payment "Moneta" service in 2001 directly to its existing customers. Due to this tactical move, more than 50% of Mobitel's postpaid users have already conducted at least one m-payment transaction.

In contrast, the adoption of m-payments in Belgium, where Banksys launched both inter-bank and inter-MNO operable solutions, has been negatively effected by a complex activation process; the user needed to go to the operators' own dealerships in order to change their existing SIM card to a m-banxafe-enabled SIM.

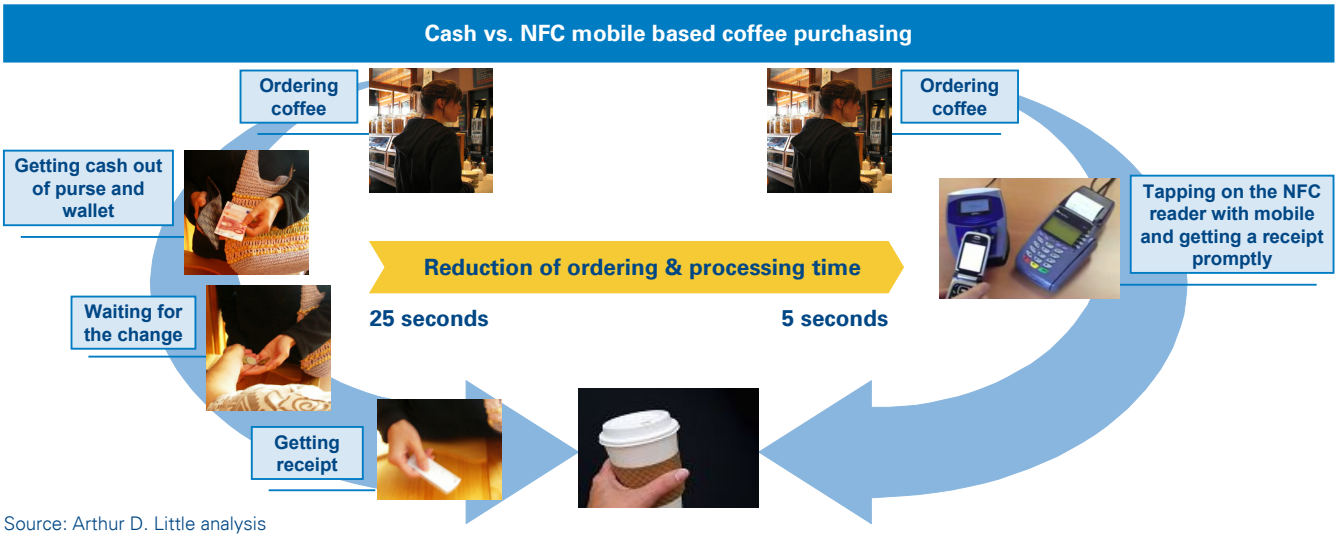
Once the adoption barrier is removed, m-payment services often encourage customer loyalty and decrease churn rate, as long as they have been targeted at the right market segment. The application of NFC-based mobile payments in the future will open gates for a wide range of new mobile phone applications that can positively influence customer loyalty and create new revenue streams.

Motivating retailers to adopt POS readers

The wide availability of POS readers in retail outlets is a critical prerequisite for the wide service adoption in retail stores. Merchants with an m-payment terminal benefit from contactless payment solutions through a reduction of the required throughput time for each single transaction. Therefore, the increased use of m-payment solutions can enable retailers to improve their operating processes.

Numerous trials that have been conducted worldwide have proved that NFC phones and contactless payment cards can significantly decrease the time required for conducting frequent daily low-value transactions. An example is the process for purchasing coffee as shown in the *Exhibit 9 overleaf*. When compared with traditional cash based payment, the purchase time decreases from 25 to 5 seconds, making it advantageous for both retailer and service users.

Exhibit 9: Time savings while buying coffee through an NFC enabled mobile payment system



Source: Arthur D. Little analysis

M-payments can also offer additional benefits to the merchants' business operations in the form of value-added services. An example for that would be automatic turnover and inventory controls for companies that manage vending machines.

The advantages outlined above, however, do not necessarily guarantee that the required critical mass of retailers can be achieved to support the further development of m-payments. The significant hurdle for retailers is the cost of new POS readers. While NFC POS readers are not much more expensive than normal POS readers, they do represent an additional investment. For this reason, in many cases, the installation costs of new POS readers might have to be at least partially covered by MNOs and financial institutions. This might also include the marketing costs for the promotion of new services. For instance, part of the credit for NTT DoCoMo's market success in Japan goes to the decision to pursue a marketing-push strategy by subsidizing merchants with POS contactless card readers and consumers with technology-ready mobile phones. In summary, although the system itself does deliver benefits for retailers, m-payment service providers do have to push retailers and might even have to motivate them financially to install POS readers.

2.4 Improved regulations and movements towards a more liberal ecosystem will encourage the development of "cross-border" m-payment solutions

The EU example shows that the m-payment market development will depend on the creation of a liberal regulatory framework, enabling increased competition and aiming at streamlining cross-border m-payment transactions.

The importance of cross border cooperation in providing an additional push for service adoption is undoubtedly high, yet regulatory frameworks need to be fine-tuned nationally and aligned regionally in order to offer network effects for established and new players. For this to happen, international organizations, such as the European Commission, have initiated regulatory changes and effects are to be seen in the coming two to three years.

The legal and regulatory environment has been identified as an important success factor for m-payment market development. An optimal legislative framework needs to consider standard rules of operations for both telecommunication and banking companies.

In the EU, this was until recently not the case. The eMoney Directive launched in 2000 did not recognize the new players in the m-payment industry, and hence did not clearly distinguish between financial and non-financial players. For instance, it required mobile operators and independent service providers entering the industry to have a significant deposit (more than USD 1.4 million [EUR 1 million]), which is usually required for a bank. However, it did not allow mobile operators as e-money issuers to invest their deposits in the capital markets, although retailing banks are normally allowed to. It furthermore required MNOs to define the e-money issuance activities as their primary business line, which is illogical. All this prevented many smaller mobile operators and new start-ups from entering the m-payment market. In some cases, as in France, banks even lobbied national regulators to aggravate the requirements for additional players to enter the market.

The European Commission has proposed the Payment Service Directive (PSD), which is broader in scope than the eMoney Directive, and is expected to be adopted by all EU member countries by the end of 2009. Nevertheless, the PSD directive provides rather guidelines than strict regulations, and thus can be applied to the m-payment market in a very liberal fashion. In addition, the directive is a precondition for the establishment of the Single Euro Payments Area (SEPA), an initiative by the banking sector in Europe that seeks to establish the same procedures and obligations across all EU countries. SEPA targets credit transfers as well as direct debits and payment cards.

In the meantime, the European Commission (EC) has been revising the current version of the eMoney directive and addressing all its negative aspects. This resulted in EC publishing a proposal, the Revised EMD, for the replacement of the E-Money Directive (EMD). The revised EMD is more aligned with the PSD directive. We believe that from a regulatory perspective, this adoption will a key milestone that will support the m-payment development.

Regulations in other developed markets, such as the US and some Asian countries, have been less of an obstacle for the development of m-payment. In Japan, the regulatory environment set non-discriminatory rules for the entrance of other market players than banks in the credit revolving business. NTT DoCoMo exploited this potential and took the initiative in developing an MNO-dominated m-payment ecosystem. In the US, m-payment service providers are required to register at the Financial Crimes Enforcement Network (FinCEN) as a money service business (MSB), but the regulatory acts as such do not specifically cover the m-payment area. Therefore, it is expected that future regulatory frameworks will specially cover m-payments and release more precise operational rules for service providers.

The regulatory framework is an important enabler for any cross-border m-payment market development. Hence, market players need to watch the development closely in order to be ready when the markets take off.

3. Trends in emerging markets

In emerging markets, the adoption of mobile payments as a first widely spread cashless transaction system will be driven by low-value, high-frequency transactions. Therefore, remittances will the strong growth driver for transaction volume, encouraging international cooperation.

Further near-term expansion of mobile-based transactions in emerging markets will be characterized by the following four trends:

- M-payment services will become the first widespread, cashless transaction system, enabling cost-effective and secure transactions;
- End-user's benefits will mainly be created through low–value, but high-frequency transaction services;
- New Know-Your-Customer (KYC) norms will be developed forcing market players to find a balance between convenience of use and security controls;
- Remittance will be the strong growth driver for m-payment transaction volume and cross border cooperation.

3.1 M-payment services will become the first widespread, cashless transaction system, enabling cost effective and secure transactions

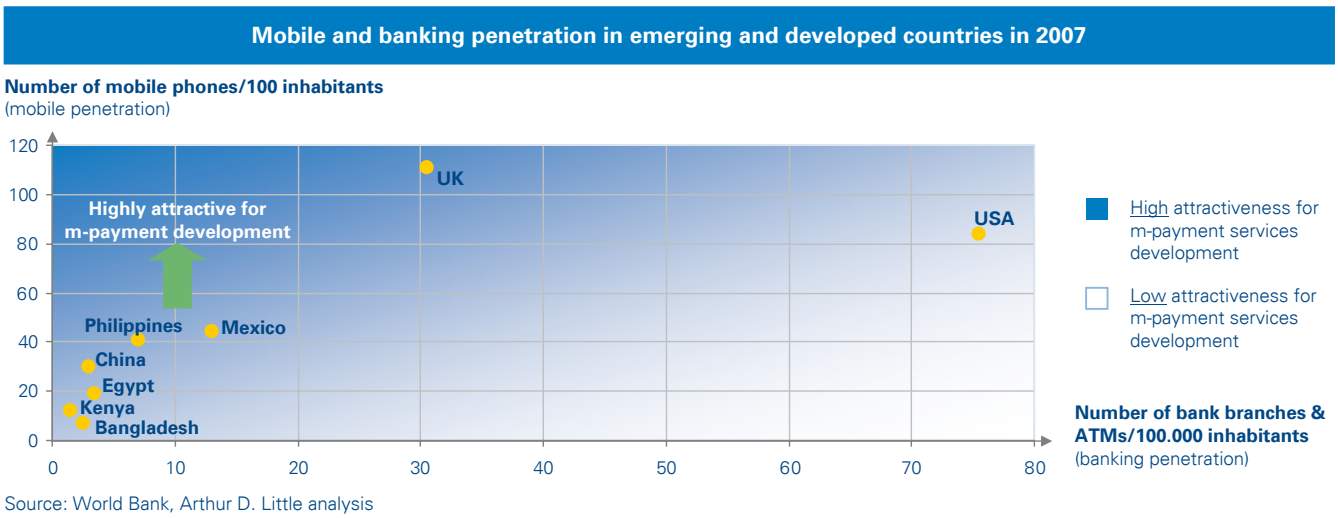
Several successful service launches have shown that emerging markets are a fertile ground for the development of m-payment solutions due to their limited banking infrastructure and growing mobile penetration.

Relatively low mobile penetration in emerging markets, compared to developed countries *(Exhibit 10)*, has thus far limited the take-up of m-payment services. Based on our survey, mobile penetration rates in emerging markets should continue to increase, reaching levels which would further strengthen the m-payment market development.

Another important factor affecting m-payments in emerging countries is that banking infrastructure tends to be rather undeveloped in terms of network of bank branches and number of ATMs (banking penetration).

Internet penetration in emerging markets also tends to be very low. In Africa for example, average internet penetration was at 4.8% in 2006, which was almost 8 times lower than

Exhibit 10: The specific combination of mobile and banking penetration of emerging countries make them attractive for m-commerce growth than developed countries



Source: World Bank, Arthur D. Little analysis

the European average. In comparison, mobile penetration was 21.6% in 2006 on average in Africa, which was also slightly more than 4 times lower than the European average.

These preconditions increase the attractiveness of emerging countries for the development of m-payment and m-banking solutions. Research has shown that countries with a relatively high mobile penetration and a low degree of development of their banking sector have the best preconditions for a development of m-payment solutions, and this is the case in many emerging markets. The Philippines, as one of the leading m-payment markets in emerging countries, support this assessment. China, India and Kenya are also expected to become key drivers of m-payment growth.

Retail banks that operate in these markets often do not have enough branches outside of highly dense urban areas, to enable them to facilitate countrywide cashless transactions. M-payment solutions, therefore, do not need to compete with existing banking infrastructure, and become more attractive to players in the market.

Even if credit cards are available in these markets, the majority of the people are reluctant to use them because ATMs and POS terminals are also mainly concentrated in urban areas. This leaves a great part of the population living in rural areas without banking services, and has lead to a cash-based society, as it is the case in Africa and to some degree in Asia. The non-banking population has shown a strong interest in an alternative solution that could enable fast, cheap, convenient and secure cashless transactions. M-payment represents a viable solution that can address all those aspects.

People in South Africa, for example, often pay couriers around USD 40 for a physical cash transfer. With mobile technology, they could transfer money at a cost of only USD 0.50. The South African provider Wizzit charges m-payment fees, which are on average 20% lower than traditional charges by banks and, as a result, we have seen high adoption rates of m-payment services in this market.

In Kenya, Vodafone's M-PESA solution has been adding on average around 200,000 subscribers monthly since its launch in 2007 and has reached more than 2,000,000 customers in just one year, which represents roughly 50% of the total population using banking services. Another example can be found in the Republic of Zambia in southern Africa, where the m-banking solution provider Celpay currently manages more than 5% of country's GNP through its m-payment platform.

Some major suppliers of mobile phones, like Nokia and Motorola, developed specially-designed handset for these markets, focusing on the devices' durability, functionality and relatively low purchase price. This enabled low-income consumers to equip themselves with mobile devices or use a shared access, which also drove the adoption of m-payment services.

Local governments and regulators have also played an important role in the development of m-payment services by providing an investment-friendly environment. In most cases, central banks and regulatory agencies governing the telecom industry do not have very strict laws and regulations that would inhibit the entrance of non-traditional players in the financial sector.

In China and some emerging markets in Africa, such as Kenya, governments are taking an active role in shaping market conditions in order to provide similar access to financial services in rural and urban areas, reducing the digital divide between regions within a country. Through such a behavior, regulators in emerging markets, in contrast to regulators in developed markets, have indirectly supported the development of mobile payment and banking services in their countries. One can observe that globally-active MNOs are recognizing the inherent growth potential in emerging countries and are increasingly penetrating those promising markets.

One year after its success with M-Pesa's commercial roll out in Kenya, Vodafone launched the same service concept in Afghanistan and Tanzania, and has plans for a service extension to India and Ghana. Orange is also active in emerging markets where its operations in Africa, Middle-East and Asia (AMEA) achieved a 50% growth in their customer base, as well as a 15% sales growth from 2006-2007. Their pilot service offer, Orange Money, in the Ivory Coast allows users to perform

financial transactions with their mobile phone, such as withdrawal and money transfer, bills payment, purchases at affiliated POS, airtime credit and transfer. Orange plans to roll out Orange Money commercially in this market after 2009, and to subsequently introduce it in three other countries: Jordan, Mali and Senegal.

In summary, growing mobile penetration rates and a limited banking infrastructure increase the attractiveness of emerging countries for the development of m-payment services. International value chain players are well-advised to watch the future development closely in order to take advantage of a strong growth opportunity as m-payment services will act as the first widespread cashless transaction system in many of these countries.

3.2 End-user's benefits will mainly be created through low-value, but high-frequency transaction services

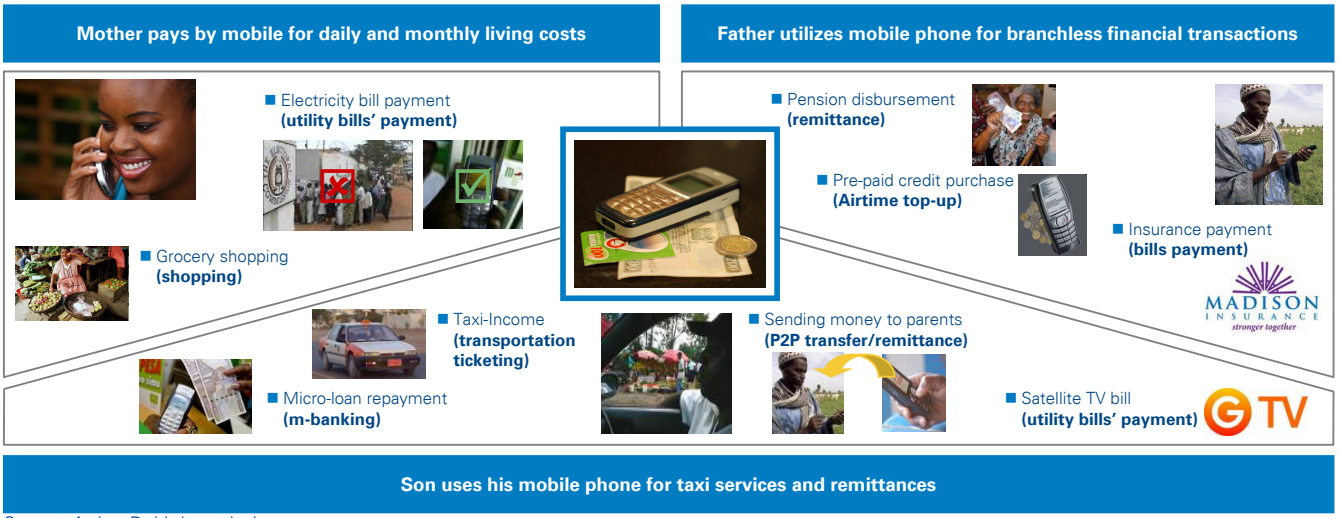
Service providers will continue to focus on simple, low-value, but high frequency transactions while leveraging their customer relationships. Governments and regulators will continue to encourage further development in m-payment services should be expected.

In the emerging markets, m-payment solutions are still a supplementary, but strongly growing transaction channel to the existing, but underdeveloped, banking system. The core value proposition that m-payment is currently offering are fast, cheap and secure transfers of cashless money. The following *Exhibit 11* gives an overview of currently offered m-payment services in emerging markets.

Up to now, low-value, but high-frequency transactions were in the spotlight of the main value chain players. The Kenyan M-PESA product, for example, gained 111,000 users in the first three months after its launch, conducting transactions worth roughly USD 15 on a monthly basis, generating total revenues of USD 6 million within the same period. Because the currently used mobile phones are mostly simple devices that support only voice and SMS/USSD functions, we expect that the service will still be provisioned through SMS and Unstructured Supplementary Service Data (USSD) channels in the near future.

One fundamental market condition for the development of the successful m-payment business case by Globe Telecom in the Philippines was the heavy usage of SMS by their mobile users. With 400 - 500 million SMS sent per day, its subscribers hold the world's leading position in short message traffic.

Exhibit 11: M-payment services offered in emerging countries (e.g. Kenya)



Source: Arthur D. Little analysis

In addition to a high usage of SMS, two other important preconditions for a successful service launch and expected uptake in emerging markets are:

- The development of a widely dispersed network of sales agents who enable cash-in and cash-out services both in urban and rural areas of a country;
- The education of the population on the basic features offered by this innovative, but simple transaction service.

Despite the strong growth of and interest in m-payments, the primary service offered in emerging markets will remain simple money transfers. This is as applicable for typical MNO m-payment service providers (e.g. M-PESA in Kenya, Zambia and Afghanistan), as it is for typical m-banking providers (e.g. Wizzit in South Africa) and independent m-payment service providers (e.g. mChek, Obopay, PayMate in India and MoneyBox in Nigeria).

In addition to money transfers, active players are currently offering or are moving into airtime top-up, virtual wallet and bill paying services. Orange, on the other hand, used airtime top-up as the first offered service in African countries in order to educate consumers in using their mobile phone as a payment tool. Airtime top-up is very well-suited to be the Trojan horse for entering the m-payment market, with a large base of prepaid users, and low-value, but frequent transactions.

Additional expansion possibilities lie in the B2B area. Vodafone, for example, has gained some experience in this area with its M-PESA; the company's local partner in Kenya, Safaricom, uses its payment platform for the distribution of salaries to their seasonal workers. In Afghanistan, Vodafone has collaborated with a local operator to offer also B2B applications, such as salary disbursement and airtime distribution through its M-PAISA branded mobile technology platform.

Besides market demand and competition, regulator framework is an important factor influencing the m-payment service offer. In emerging markets, the governmental bodies often push for a redirection of financial transactions into e-channels, because electronically they are easier to trace and thus increase the economy's transparency. Therefore, market players should expect legislators and regulators to further encourage the development of m-payment solutions.

We furthermore expect that established players will try to leverage their existing customer relationships and loyalty and try to move into more sophisticated banking services, such as bank loans. One example is Smart Communication in the Philippines where m-payment services are already contributing to an increase in customer loyalty. Churn rates of 0.5% for users of SMART Money services are considerably lower than the 3% for other users.

While still a supplementary transaction channel, m-payment solutions are growing strongly in emerging markets. M-payments are especially well-suited for low-value / high-frequency transactions, which will remain based on SMS & USSD technology. Although the main service offered will remain basic money transfers, airtime top-up is well suited to be the entry service offered for entering the m-payment market. If the three conditions, high usage of SMS, widely dispersed network of sales agents and education of the people, are met, a further strong growth of m-payment services is to be expected. Liberal regulations and open authorities will thereby further ease the market development.

3.3 New Know-Your-Customer (KYC) norms will be developed forcing market players to find a balance between convenience of use and security controls

The implementation and further development of KYC norms will remain a complicated matter in m-payments, particularly in emerging markets, as governments, regulators and market players have to find the right balance between convenience of use, low adoption barriers and appropriate security and anti-fraud controls.

The strong uptake of m-payment and banking services in emerging markets has raised a lot of public attention about the issue of protecting versus revealing private customer data. Today, national stakeholders are debating about this issue, and governments of developed countries also are concerned about the potential of using m-payment channels for illegal activities.

The purpose of "Know Your Customer" norms (KYC) is to provide guidelines, which will limit the use of m-payment channels for illegal and fraudulent activities. For a long period, retail banks worldwide have been required to establish guidelines and procedures in order to enable the identification of possible money laundering schemes and to file adequate reports to their national government bodies. KYC guidelines are considered as a proper tool for detecting suspicious activities of bank account holders. KYC norms are usually not universally defined; each bank or other financial institution is allowed to set up different procedures that fit their own operations.

Companies providing m-payment solutions in emerging markets often have varying guidelines with respect to KYC requirements:

- MTN Mobile Money in South Africa uses its roaming agents with their mobile phones to open customer bank accounts. Meanwhile the company also utilizes technology that allows a person to open a bank account via handsets with no direct bank interaction, which represents a rather open procedure.
- Celpay in Zambia utilizes the embedded mobile phone camera to capture the documents and picture of a person prior to the account registration.
- Philippine service providers have worked closely with the Central Bank for defining the KYC policies. The authorized subscriber must register in person at the service provider and present a valid photo identification document during cash in and cash out activities. In addition, the size of the customer's e-wallet is limited.

All stakeholders involved in the m-payment market are aware that having strict and complicated KYC norms in place could inhibit the growth of m-payment services. For this reason, m-payment and m-banking service providers are trying to limit KYC norms as much as possible in order for it not to effect its acquisition of customers.

In that regard, it is to be expected that new market entrants will impose less complex and strict KYC norms than the ones imposed by traditional retail banks. Therefore, we expect that traditional retail banks will try to push regulators to enact stricter KYC requirements, and thereby limit the potential of the m-payment channel for product up-sales into banking services.

Providers of m-payment and m-banking services are facing pressure from two sides: from national governments of countries where they operate, and from the international community. The pressure is coming from concerns, especially from the US, that the promising m-payment growth in emerging markets of Africa and Asia will lead to an abuse of the cashless transaction system. There are some indications that crime proceeds or contributions to terrorist organizations could in the future be transferred by the less regulated m-payment technology.

Proportionate KYC requirements should therefore be applied in order to fight potential money laundering activities, but at the same time keeping the service activation process as simple as possible. This implies that transactions involving higher amounts of money must require more strict KYC norms, even if it comes at higher cost for service providers and end users.

Most operators have already electronic systems in place, which are constantly analyzing customer's transactions. These systems track the transfer frequencies and alert if there are many suspicious low-value, but high frequency, transactions by one single individual. These tracking systems are not without any benefit for the service providers. It enables them to have a better insight into consumer behavior patterns by tracking and identifying the flow of funds. It hence represents a powerful marketing intelligence tool as well, in addition to being used for tracking potential criminal activities.

Overall, KYC will remain a complicate matter in m-payments particularly in emerging markets. Pushed by foreign governments and the international community, local governments, regulators, operators, banks and other players have to find the right balance between convenience of use and low barriers to adoption on one side and ensuring appropriate security and anti-fraud controls on the other side.

3.4 Remittance will be the strong growth driver for m-payment transaction volume and cross border cooperation

Globally growing mobile remittances with 146% p.a. will be the target area for m-payment services and will lead to the establishment of international strategic partnerships. Thereby, it will positively influence the m-payment transaction volume.

One of the most attractive P2P m-payment services is remittance. Remitting money is a widely-used practice in all emerging countries of Africa, Asia and South America. Moreover, the significance of money remittance is growing due to the uneven economic development of different countries, which increases the need for fast and easy remittance services to bridge salary differences. Strong migration trends are again increasing the importance of remittance.

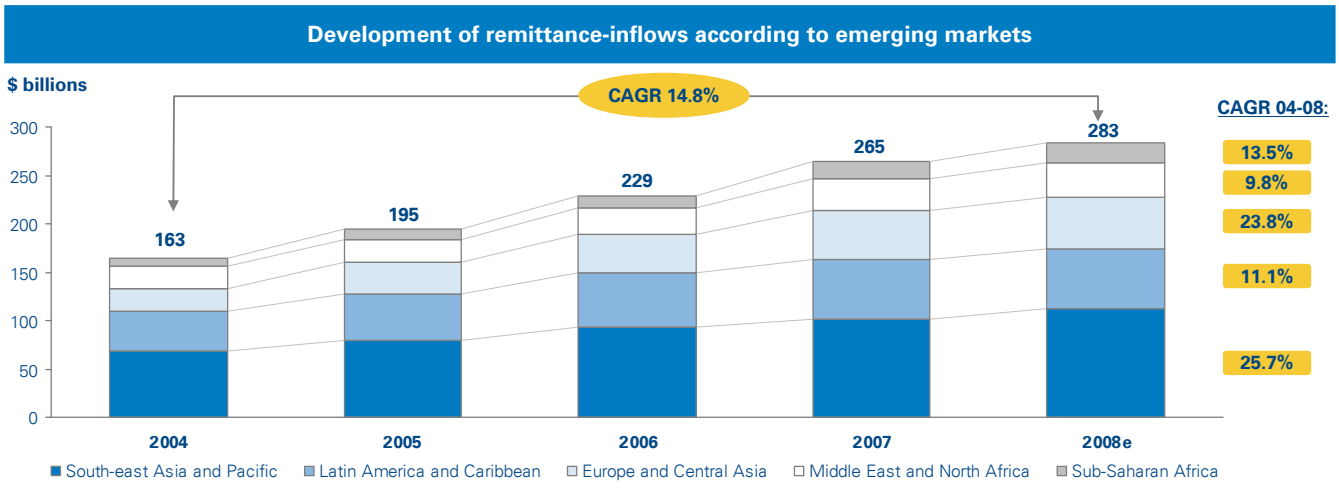
The amount of money remitted on an annual basis from developed to emerging countries in the period from 2004 to 2008 has grown at 14.8% p.a. reaching in USD 283 billion in 2008 *(see Exhibit 12)*. Regionally, we observed disparities in the growth of remittances. Asian and European countries have so far been the main growth drivers for global inflow of remittances. The growth of remittances to countries in South America slowed in the last two years, mainly due to the weakening U.S. economy, especially in construction and real estate, and a tighter enforcement of immigration laws. The growth of remittances to other regions, however, remained high. Main factors contributing to growth were the booming economies in Asia and some parts of Europe with a CAGR from 2004 to 2008 of above 23%.

Efficient cross border remittance services require the creation of international mobile payment networks through partnerships between MNOs and financial institutions around the world. The establishment of international networks is therefore critical for a successful growth of this service.

We expect the growth of remittance flows, however, to temporarily slow down in 2009, as a result of the global economic crisis caused by major bankruptcies in the US financial industry in 2008. Nevertheless, on a mid- to long-term basis, we expect the remittance flow to increase steadily.

In order to capture this growth, today's m-payment service providers are establishing strategic partnerships. A recent example of cooperation is the partnership between Philippine

Exhibit 12: From 2004 to 2008, total remittance flow to emerging markets has been steadily growing at 14.8% p.a., Asia and Europe being the main growth drivers



Source: World Bank, Arthur D. Little analysis

Globe Telecom, Lari Exchange, the leading financial exchange in the U.A.E., and German headquartered paybox with the strategic goal of increasing money transfers through mobile channels between the Philippines and sender markets in Asia and the Middle East. Western Union has also recently finalized a partnership with Globe Telecom's subsidiary G-Xchange as part of the GSM Association's MMT (Mobile Money Transfer) strategic initiative for the development of a simple security system for sending international remittances via mobile communication channels. Both partnerships aim to leverage their comparative advantages in cross-border remittance services: G-Xchange's 1.5 million GCASH service users on one side and Western Unions' wide network of agents on the other side. Moreover, Western Union has also closed a partnership with the second Philippine m-payment service provider Smart Money in order to secure and increase its national exposure.

Remittance is the most attractive m-payment service in emerging markets and has been growing at 14.8% p.a.; Asian and European countries being the main growth drivers. Due to the global financial crisis, we expect remittances to slow down in 2009, but take up again in the mid to long-term. In order to capture the inherent growth, m-payment service providers are seeking to establish strategic international partnerships, which will in turn positively influence m-payment transaction volume. For any value chain player, it is important to secure access to the right partnerships to effectively take part in the trend.

4. Conclusion

M-payments are growing globally at 68% p.a. and are expected to reach almost USD 250 billion by 2012, but are developing differently in emerging and developed markets. In developed markets, m-payment services will not substitute existing payment systems, as massive adoption will be limited to niche segments. In emerging markets, m-payment services will become the first widespread cashless transaction system.

We grouped m-payments services, differentiated from m-banking services, into business to person (B2P) or person to person (P2P) services, as well as into either remote or proximity payments. Most services are designed for a B2P environment, such as purchases at vending machines or ticketing. In the future, however, we also expect the development of P2P proximity payment services, which so far do not exist in the market. Hence, first mover advantages exist for any value chain player who is able to launch successfully a new P2P proximity service. Furthermore, we have seen that different economic, technological, social and cultural factors influence the development of economic markets and new services. Any market entry strategy or consideration of further investments should therefore assess those factors in order to evaluate the market attractiveness.

In terms of market and service growth, remittances will globally be the strongest contributor to transaction volume growth in the next 2 years with a compound annual growth rate (CAGR) of 25%. As of 2010, when proximity-based payments are expected massively rolled out on a commercial basis, retail purchases (e.g. shopping, restaurant payments) will become the major growth driver for transaction volume with a CAGR of 77%. In 2012, we expect m-payment transaction volume to reach almost USD 250 billion, growing at 68% p.a. We envisage proximity payments to growth with a CAGR of 118% and remote payments with 52% within the same timeframe, representing 51% and 49% respectively of the total transaction volume. Although Arthur D. Little expects proximity payments to outperform remote payments, value chain players should make their service focus country dependent. In emerging countries, remittances, as a remote payment, shows the highest growth rates and is second in absolute volume by 2012. In developed countries, proximity payments such as m-ticketing should rather be in focus.

Looking in detail at the transaction volume split into different regions, the strongest growth area will be the Middle East with a CAGR from 2008 until 2012 of 155%. In absolute volume however, the biggest share in 2008 goes to the group Japan, South Korea, Australia with 24% and to the "Rest of Asia" with 29%. The distribution is expected to change by 2012, when "Rest of Asia" will still lead with 33%, and Western Europe will move to second position with 17%. Overall, we expect emerging markets to growth faster with 76% p.a. compared to 56% p.a. in developed countries, and representing 65% of the total transaction volume in 2012 compared to 35% for developed markets. If value chain players plan to further invest into m-payment, emerging markets are from a pure growth rate and transaction volume perspective more attractive than developed countries.

The global financial crisis is also affecting the telecommunication industry, although with a slight delay. However, Arthur D. Little believes that the m-payment market growth will materialize despite the current financial crisis. Telecommunication companies will be forced to or are already cutting their capital expenditures (CAPEX). As m-payment services require a new, often complex and expensive organizational and process setup, telecommunication companies will be tempted to postpone the introduction of m-payment services in order to cut cost. They have nevertheless an incentive to launch m-payment services as the window of opportunity for market entry/expansion is now. In emerging markets, the underlying business case is defined and there is limited competition in regard to competing transaction channels. In developed markets, some mobile carriers may apply a "Wait-and-See" strategy, but with the solving of Near Field Communication (NFC) technology uncertainties, the perspectives for launching m-payment services in will also become highly attractive. Hence, we believe that telecommunication companies make m-payment investment restrictions not their first priority. Additionally, although the financial crisis will lower consumer consumption, which will

affect financial transactions in general, m-payment services will still be able to grow. Due to their cheaper transaction costs, they will be able to grab market share from traditional banking services and due to their better mobility, they will grow faster than less mobile payment channels such as on-line payments. Additionally, on the supply side telecommunication companies have an incentive to push m-payment services as a promising new revenue source facing often stagnating revenues in their core business segments of fixed and mobile telephony.

Situation in developed markets

M-payment services will not substitute existing payment systems in developed markets for mainly two reasons: First, a massive market adoption is limited to convenience-enhancing applications, which are difficult to build considering the already highly elaborated transaction channels in place, such as credit cards, e-banking etc. Our study showed that the acceptance of benefits (convenience) is the most important key success factor among the seven primary factors for the development of m-payment services in developed markets.

Second, a massive adoption is limited to niche segments where an increase in the current satisfaction level is easier to achieve. Key for market players is not only to fulfill the seven key success factors but also to leverage their existing customer relationships and motivate retailers in order to reach a critical mass of users and supporters. One option would be to directly support retailers financially by subsidizing the deployment of Point of Sale (POS) readers.

If merchants will be willing to widely deploy POS readers does depend on the underlying margin squeeze, but only a wide deployment will enable a strong growth of m-payment services. As said, in our opinion m-payment will not substitute existing payment channels but will lower their ARPU (average revenue per user) over time due to increased channel competition.

Concerning Near Field Communication (NFC)-based m-payment services in developed markets, Arthur D. Little sees a massive adoption of NFC based m-payment services taking place earliest in 2011. The main reasons for this are delayed hardware standardization, the related unavailability of a wide-range of NFC-enabled handsets and the lack of interoperability between countries. Value chain players should participate in trials in order to benefit from early market insights, in order to be prepared when all issues are resolved. The strategic initiative "Pay-Buy-Mobile" is already trying to simplify global technology standardization and speed up market adoption, but it is not yet fully effective. Recent interviews with suppliers and existing external sources indicate that NFC enabled phones will reach a global penetration of 35% in 2012. Arthur D. Little believes that only one third will be realistic, meaning roughly 170 million NFC enabled phones representing an 11% penetration rate by the end of 2012.

Improved regulations and movements towards a liberal ecosystem like the GSMA initiative or the planned Payment Service Directive (PSD) guideline will push market developments into going 'cross-border'. In developed markets, we see a shift of focus from gaining first mover advantages and establishing a dominant market position in one market towards a geographical expansion ensured through cross-border and cross-industry cooperation. Arthur D. Little therefore advices market players to build up network effects by establishing partnerships to enable international usability of their services.

Situation in emerging markets

M-payment services will become the first widespread cashless transaction system enabling cost effective and secure transactions. Emerging markets with their low banking infrastructure, but moderate to high mobile penetration offer fertile ground for the development of m-payment solutions and are often more attractive than developed markets. Arthur D. Little expects further strong growth in those markets, and so it is no surprise that international mobile network operators (MNOs) are already increasingly penetrating those markets. As they are pressured by established competitive payment channels in developed countries, international mobile network operators have a strong incentive to offer m-payment services to emerging markets where both regulatory and market conditions are beneficial. We hence recommend international value chain players to watch market developments closely in order to not miss growth opportunities.

Growth and market adoption will be accompanied by the development and implementation of proportionate know-your-customer (KYC) norms. Regulators, operators, banks and other players have to find the right balance between two poles: On one side, there is the required convenience of use and low barriers to adoption and, on the other side, there is the need to ensure appropriate security and anti-fraud controls. Hence, value chain players should take an active role in defining the KYC norms in order to secure their influence on the development.

In emerging markets, end user's benefits will mainly be created through low value but high frequency transaction services since m-payment solutions are still a supplementary transaction channel to the existing but underdeveloped banking system. Up to now, low-value/high frequency transactions were in the spotlight of market players and Arthur D. Little expects them to remain so. Mostly because simple money transfers will remain the main service offered. Especially remittance services are the sector to watch as they have been growing at 14.8% p.a., fueling transaction volume. Additionally, they will drive cross-border cooperation. Value chain players should therefore secure access to the right partnerships so as to effectively participate in cross-border remittance growth.

Implications for value chain players

As we have seen, **mobile network operators (MNOs)** are already moving into emerging markets with m-payment offers. For the vast majority of those markets, MNOs will be inclined to play the first-to-market game. This is primarily caused by favorable market demand attracting new players and by minimal competition from conventional payment-channels enabling fast market share gains. Regulatory actions and policies pushed by the competing financial industry may, however, limit the market development potential. Therefore, to preserve the long-term market potential, it will be crucial for MNOs to play continuously an active role in shaping the regulatory environment in emerging markets. In order to benefit best from the inherent growth in regard to the choice of services, MNOs should focus on low value/high frequency transactions and have a special focus on remittances in emerging markets. The success of remittance services will be especially dependent on the international usability. MNOs should therefore continue to build up cross-border partnerships to ensure inter-country operability.

In developed markets, we expect MNOs to shift from predominant low-value services, such as parking and transportation tickets, to high-value services enabled trough Near Field Communication (NFC) technology. Retail m-payments, for instance, will be such a service that will compete with existing conventional payment channels like credit cards or ATMs (Automated Teller Machine). Therefore, it is very important for MNOs to motivate a wide range of retailers to reach the required critical mass for a successful growth of m-payment services in development markets. This can be achieved, for example, by subsidizing the deployment of Point of Sale (POS) readers. On a national level, successful cases of m-payment service development in developed markets have proved that cooperation between MNOs in the adoption of an interoperable mobile payment platform, is the only way to assure for broad market success of m-payment channels. The more competing carriers participate in the development of a single mobile platform, the faster and more successful will the service take up be. Not only can such cooperation achieve an extended customer reach, but it will also lower the technical adoption barriers and create a more convincing value proposition for retailers.

The adoption of an interoperable mobile payment platform will consequently lead to an even margin level among multiple MNOs. If this materializes, MNOs can no longer differentiate themselves in terms of prices as all face the same cost structure. MNOs should in that case start to compete by creating innovative product bundles that are hard to copy and move away from single product price competition.

Financial institutions are far better positioned for shaping the m-payment and m-banking market development in developed than in emerging countries, because they can build on a strong infrastructure that increases their bargaining power. However, the reluctance often showed by the financial industry in this market stems from the fear that m-payment services may cannibalize their existing business. Up to now, m-banking has been the most interesting for financial institutions primarily as a

complementary channel, and mostly only in reaction to moves of competitors. However, m-banking and related m-payment services can be a differentiating factor among competitors and a powerful tool for customer retention and acquisition. The major advantage is, however, the new mobility of the m-banking services, which gives financial institutions the chance to tap into the sizable US micro cash payment market. This represents an attractive payment market, which has been dominated up to now by simple cash. Major credit card companies have identified this potential as a significant revenue growth potential and are taking one of the leading roles in bringing the Near Field Communication (NFC) based payments to consumers. Furthermore, through partnerships with mobile network operators, banks can increase their exposure to a broader customer base and push cross-selling possibilities. Overall, we recommend financial institutions to overcome their reluctance to m-payment services and take a more active role in the m-payment development, in order to occupy a central role in the value chain, while still deciding on a case-by-case basis if an investment is net present value (NPV) positive.

Merchants have a very important role in the development of the m-payment market because they are, for many m-payment services, the single connection point between suppliers and end-consumers. Although it is not entirely clear whether the m-payment transaction channel offers merchants higher margins compared to other transaction channels (e.g. credit cards), there are additional financial opportunities for these value chain players to exploit. Parking management companies, for instance, have realized both increasing rates of collected fees due to increased service convenience and significant operational cost reductions, which together led to an improved operational profitability. A similar logic applies to transportation companies offering m-payment services. Therefore, we recommend merchants to evaluate the m-payment channel as a means to increase consumer convenience, mobility and accessibility of their services and goods in contrast to seeing only the cost side. We expect that an increasing number of different types of merchants within the value chain will realize a significant upside potential for their business, once the Near Field Communication (NFC) technology takes off.

We see even now that in the health care field, for instance, numerous software applications are being developed relying on mobile phones and the NFC technology. For merchants, it is however advisable to wait until clear m-payment standards have been defined, NFC-based applications have been sufficiently tested and first consumer-pull signs arise.

In number of cases, we have seen that independent payment service providers play an important role in the development of m-payment markets. Their market potential lies mainly in the possibility to establish partnership relations with otherwise competing mobile network operators and banks. Overall, they support the market development in two ways: First, they are able to contribute to an easier and faster mass-market service adoption by being a mediator within the complex m-payment value chain. Second, as they have often more experience in broadly acquiring merchants in different market segments, they make it easier to achieve the required critical mass for a massive service take-up. Therefore, we recommend independent payment service providers to focus on the establishment of the required partnerships in order to compile an essential role within the m-payment value chain. This in turn will enable them to become non-exchangeable and increase their bargaining power when negotiating margin shares.

Additionally, we recommend independent payment service providers to cooperate with as many mobile network operators as possible. This is their major value contribution to end-consumers since they offer them m-payment services compatible with all major mobile networks, which is hard to copy by a single mobile network operator.

In the past, suppliers' involvement in the m-payment value chain was limited. As the main services were predominantly remote m-payments, which relied on already existing technologies such as SMS, Bluetooth or Infrared, no adaptation of currently offered handsets were required and, thus, no supplier involvement needed. However, the situation has changed with the introduction of Radio-Frequency Identification (RFID) and the evolvement of the Near Field Communication (NFC) technology, and today, chip vendors, Point of Sale (POS) terminal suppliers and handset manufacturers are more active.

Once again, we witness the battle for an industry standard concerning POS terminals and the secure element embedded in mobile phones. European Telecommunications Standards Institute (ETSI) has, through their Single Wire Protocol (SWP) standard, eased the way for a more aligned NFC development. Nevertheless, we recommend suppliers to participate actively in NFC trials in order to build up practical experience, improve their products and to establish important relations with other value chain players. This will improve their readiness for massive market growth.

Additionally, their participation in pilots can have a positive effect on early customer awareness, which is highly valuable in the market growth and deployment phase (e.g. merchants' preference for point of sale terminals and end-user's preference for certain handsets) and hence lead to first mover advantages. However, the appropriateness of participation in trials depends on which markets the supplier is active in and how likely those markets are to adopt Near Field Communication (NFC)-based payment solutions. Consequently, market assessments should precede any engagement in NFC trials.

Finally, professional organizations and forums have begun in the last few years to claim a more central role in supporting the development of m-payment markets on a global scale. Similar to suppliers, their role has become more important with the evolvement of the Near Field Communication (NFC) technology. Also in this case, a certain level of cooperation among them will be necessary in order to avoid launching too many initiatives and creating confusion, which will result in delayed commercial service launches. Up to now, only few industry organizations managed to position themselves as leaders in bringing key industry representatives on one table and taking over the role of managing the whole standardization process as it was the case for the NFC technology standardization. For other organizations, we recommend to start by focusing on the dominant player and if this is not possible to identify niche areas for the establishment of first cross-industry relations.

Appendix A: Country profiles and ranking

A.1 Global ranking

Japan and Austria are still the leading countries for m-payment. Furthermore, few countries from both the developed and emerging world have strongly advanced with their positioning on the maturity market curve. When updating the global ranking of m-payment maturity, we assessed each country according to the following criteria:

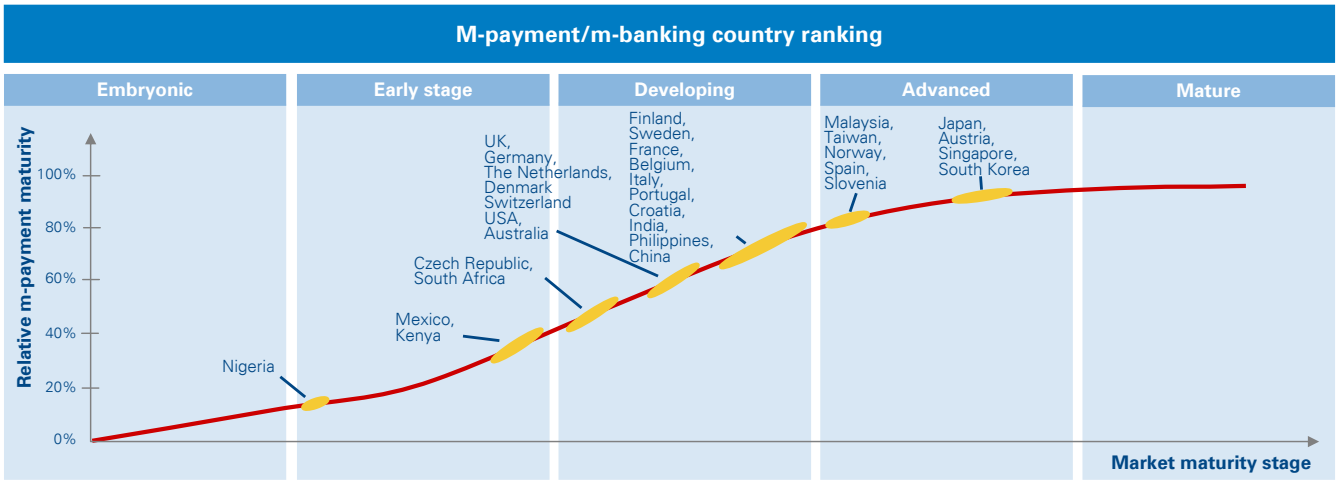
- The range and types of services offered;
- The existing number of pilots & rolled-out multi-party services on a commercial basis;
- The mutual efforts undertaken for standardization;
- The existence of a solid strategy for m-commerce.

The most developed markets in terms of m-payments remain Japan and Austria, followed by Singapore and South Korea. These countries are offering a wide range of services, and each country has a dominant market player positioned as the standard service platform provider being accepted by most competitors. The market development in South Korea may however be slowing, as there now are two companies competing for the prevalence of their service platform.

In some countries we have identified a high development potential due to either extraordinary service uptake or strong commitments to standardization among industry players. The Philippines, for example, have seen a strong service uptake recently, and France has experienced intense standardization efforts by all relevant m-payment stakeholders.

Most African and Latin American countries have not yet started to exploit the potential of m-payment services significantly. Nonetheless we expect a rapid development in these countries as soon as an optimal service platform is selected for implementation. *(Exhibit 13)*

Exhibit 13: The m-payment and m-banking industry has been growing steadily: Most countries assessed have already entered the developing phase of market maturity curve



Source: Arthur D. Little analysis

A.2 Country overview

A.2.1 AUSTRIA: NFC roll-out on a commercial basis

Austria has managed to maintain its leading position within Europe in the past three years. In particular, Telekom Austria's subsidiary mobilkom continued its efforts in acquiring m-payment merchants and strategic partners in order to foster a nationwide service adoption. *Exhibit 14* provides an overview of m-payment services in Austria.

The partnership concluded between mobilkom and its competitor Orange (previously ONE) in 2005 has been critical as it enabled m-payment service interoperability.

This strategic move allowed mobilkom to strengthen the position of its paybox platform as the dominant m-payment service solution, though the degree of popularity and the utilization level of the payment solution are still developing. Since October 2008, T-Mobile Austria and its subsidiary tele.ring joined the strategic service network and 4 million mobile postpaid customers in Austria can now access m-payment services without any signup barriers. Considering that the clearing can be done through the phone bill or via paybox, 95% of the m-payment market is covered. This operator independent service platform with most Austrian MNOs participating can be considered as the most significant m-payment cooperation in Europe.

In 2006, A1 Bank (subsidiary of Telekom Austria) launched the first mobile e-cash service as a fast, convenient and secure channel for different micro- and macro-payments. However, the service acceptance so far has been negligible.

Mobilkom Austria is currently the only European mobile operator that has commercially begun rollout of NFC services without the direct involvement of credit card schemes. Direct partners for the service rollout are NXP Semiconductors, Nokia, ÖBB (Austrian Federal Railways) and Wiener Linien (Vienna's main public transport provider). With an upgrade of the NFC service in September 2007, mobilkom users were enabled to use existing services such as mobile public parking, mobile lottery, mobile public transportation ticketing and mobile payment at vending machines via their NFC technology. However, we need to state that the NFC technology component in this case refers only to service initiation, while service delivery remained an SMS (WAP) based service.

Exhibit 14: M-payment users in Austria can spend a day without using any cash

Source: Arthur D. Little analysis

In order to eliminate any activation barrier for the new service, mobilkom automatically enabled its customers to use NFC functions making use of embedded NFC chips in outdoor interactive posters. This approach also boosted the sales of the only commercially available NFC-enabled mobile phone Nokia 6131. In the first eight months, more than 20,000 NFC phones were sold, which contributed to overall more than 1 million m-payment transactions registered on monthly basis in 2007.

In January 2009, mobilkom and ÖBB launched a further pilot offering end-to-end NFC solutions on SIM-card basis. The solution encompasses the entire process from ticket ordering to payment to ticket control. In contrast to previous solutions, the ticket will not be delivered via an SMS message, but instead will be saved in the Secure Element of the NFC mobile phone and validated by one-touch. The trial is supported by Nokia and will last three months on selected ÖBB trains in Austria.

The future development of m-payment in Austria will be determined by the adoption of additional m-payment services and payment options, as the market environment and, specifically, the joint service platform is already conducive to m-payments. The Austrian market is even more exciting as three major mobile telecommunications operators, Mobilkom (associated with Vodafone), T-Mobile and Orange, are expected to further invest into the Austrian m-payment market in order to transfer the knowledge gained across the group.

A.2.2 BELGIUM: Service interoperability on trial

In recent years, a couple of movements towards service interoperability in the Belgium m-payment market have led to an improvement of the overall conditions for m-payment growth.

In 2007, Banksys (the inter-bank e-payment company that has been bought by ATOS) teamed up with the three major national mobile operators BASE (KPN), Proximus (Belgacom) and Mobistar (Orange) to launch an m-payment platform. The goal was to enable their users and holders of national bank accounts to process payments via m-payment channels instead of debit bank cards.

The service itself relies on a SIM card, which is specifically enabled for the proprietary mobile signature technology of Banksys (m-banxafe). All new SIM cards distributed in Belgium by one of the three operators are pre-equipped with m-banxafe. Currently one third of the Belgian SIM cards are already compliant.

In order to use the service, end-users need to link it to their existing bank accounts. This can be done by the user himself on ATM's, on POS terminals or over the Internet via the presentation of the debit card. In the registration process, users have to choose a PIN code that is used for all banking transactions. M-banxafe payments are based on the same security level as the one used for EMV payments.

Different use cases have been launched based on this technology such as the top-up of prepaid accounts, banking operations (bank balance, last transactions) and the Pay2me service allowing independents and mobile professionals without POS terminal to accept electronic payments; the mobile phone acts as a payment terminal at the merchant side and as debit card at the customer side.

For a merchant who is a subscriber of one of the three participating mobile operators and who has a national bank account, the registration process is simplified and can be done over the m-banxafe website.

The payment process itself is fairly straightforward: The merchant needs to send a payment request using the payment menu of his/her mobile phone to initiate a transaction. A few second later, the customer receives an "m-banxafe" signature request for the transaction, which needs to be confirmed by entering the personal PIN. Finally, both the merchant and customer receive a transaction confirmation by classic SMS.

Pay2me payments are performed directly from bank account to bank account. The Pay2me business model is based on a fixed cost for each successful transaction (including communication and payment) invoiced on the Telco bill or prepaid account. Merchants pay currently EUR 0,49 and customers EUR 0,25 for each successful transaction without any additional basic subscription fees. Banksys receives a refund and pays an interchange fee to the participating banks.

In 2008, 17 millions m-banxafe transactions have been recorded from which most are still related to top up of prepaid accounts and banking operations. New uses cases will be launched in 2009 such as m-billing and internet payments using the m-banxafe signature.

Although the service usage itself is fairly simple, it is both inter-bank and inter-MNO operable and provides clear benefits for customers (convenience, speed, safety) and merchants (security of payments), we see potential hurdles for a massive adoption. The fact that each existing mobile phone user needs to go to his/her own operator to change his/her SIM card into an m-banxafe SIM card is a service activation barrier, which might hinder high usage rates – especially at this early market development stage.

Beside m-banxafe addressing remote macro payments opportunities, new entrants also launched micro mobile payment initiatives in areas such as parking (Mobile For), ticketing, internet (Tunz).

Belgacom recently acquired part of those companies in order to regroup those initiatives behind a single brand "Ping Ping" with a focus on proximity micro payments. They will extend the current pilots in the coming months.

A.2.3 CHINA: M-payment is still in the developing stage and a couple of challenges need to be overcome

After the restructuring of the telecommunications industry and the issuance of a 3G license at the end of 2008, there are now three mobile service providers dominating the Chinese mobile telecommunications market with a customer base of 641 million. This solid base enables the mobile operators to position themselves as the leaders on the national m-payment market.

China Mobile, the largest mobile operator in China, tried to leverage its position and established a joint venture with China UnionPay called "Umpay" in 2003. The service offer include utility bills, prepaid card sales, concert ticketing, online insurance sales and online software sales. In addition, China Mobile also works with JMB, a third party service provider, to launch the "PAYEASE" bank card service.

Besides this initiative by China Mobile, we see that m-payment initiatives have mainly been taken by independent service providers. Independent service providers have cooperated with mobile operators and retail banks on a regional level, in order to balance the uneven regional economic development and divergent market demand patterns (elderly population in rural areas vs. young, affluent people in urban areas).

SmartPay, one of the leading independent m-payment companies in China, has a partnership with both China Mobile and China Unicom. In 2006, SmartPay has announced to roll-out a mobile payment service in partnership with China Minsheng Banking Corp. (CMBC). Today, SmartPay has established partnerships with all major banks in China, including the four major state-owned commercial banks, for m-payment services. This partnership enables SmartPay to get access to a wide customer base in Chinese major cities where the partner banks operate. By 2007, SmartPay already had acquired more than 1 million m-payment users. The services offered range from simple air-time top-up or payment of mobile phone postpaid bills, to more sophisticated services, such as payment for digital cards, utility bills and lottery tickets. In order to get more merchants involved, SmartPay set up branches in 11 provinces in order to pursue local business development.

One very well-accepted m-payment service proved to be m-payment for lottery tickets, especially in Southern China, where lottery is popular. SmartPay's solution "Lottery in your Palm" solved logistic problems as buyers from rural parts of the region do not have to travel to distant selling points to buy tickets and collect their prizes. As online lottery sales are forbidden by the regulator in this region, using m-payment for lottery tickets has a unique advantage.

SmartPay also introduced a mobile- and telephone-based (via SMS and IVR) purchase of airline tickets in 2007 in cooperation with the travel agency Lu Hai Kong. Similar m-payment services were already introduced in Japan and we do expect that in the near future more sophisticated services will be launched in China too.

NFC trials have also been conducted in selected Chinese cities in 2006. Nokia led the initiative in cooperation with China Fujian Mobile Communications, Xiamen E-Tong Card Company and NXP (formerly Philips). During the trial period, more than 100 volunteer subscribers of China Mobile in the city Xiamen participated and used their NFC enabled Nokia mobile phone to make payments for public transportation, ferry boats, restaurant bills and cinema tickets. Since the feedback received was very positive, Nokia launched full NFC payment services in the cities Xiamen, Beijing and Guangzhou one year later. Due to the cooperation of Nokia with local transit card companies, NFC mobile payment can be used for payments at grocery shops, cinemas and different means of public transportation (underground, taxi, bus etc).

However, China is still in the developing stage of m-payment and there are a series of challenges to be overcome:

1) Model for co-operation between Chinese telecom operators and financial institutions

   Compared to traditional means of payment, telecom operators are involved in the m-payment process and want a piece of the profit, which used to belong to the payment service providers only. If no appropriate cooperation or reasonable profit sharing model will be developed in China, there is no incentive for these payment service providers to promote m-payment and with them playing a key role in the m-payment development, it will be difficult to boost m-payment business.

2) Simplicity of the Chinese m-payment process

   Currently m-payment is processed mainly by using SMS or WAP, which requires consumers to enter cumbersome text messages and the service access code. Afterwards, consumers have to wait to confirm the information sent by the operators. This leads to a long waiting time and inconvenience for consumers. Thus a simplification of the payment process is a key prerequisite to promote m-payment.

3) Consumption habits and concerns about security issues of the Chinese consumer

   Most Chinese consumers are used to cash or credit card payments, and they are still relatively unfamiliar with payment by mobile phone. Moreover, some Chinese consumers worry about the security of m-payment. As a result, although with security of m-payment being proven, consumers are still reluctant to transmit their confidential information such as identity, credit card information etc. via mobile network.

Nevertheless, considering the large mobile customer base, growing mobile phone penetration and rising demand for new payment options and increased convenience, we expect a significant market potential and a rapid development of mobile payment in China.

A.2.4 FRANCE: A leapfrog towards a future NFC-based m-payment market

Over the last two years, France intensified its ambition to become one of the leading European m-payment markets fostering cross-industry cooperation for the creation of interoperable m-payment solutions. Most of the launched large-scale initiatives were aimed at testing the applicability of NFC solutions. Unlike in the US, where credit card companies took the lead, in France major mobile operators took a proactive role in the development of NFC solutions.

Orange, as the major French and international mobile carrier, recently took the lead in pan-European NFC technology introduction through their involvement in the UK market in addition to their activities in France. The company aims to emphasize interactivity as a distinctive feature of NFC mobile phone-based payments, as NFC provides communication between users and shops, transportation companies and industry on the one hand, but also gathers feedback data on customer demand and creation of better profiled marketing campaigns for mobile operators and service providers on other hand.

A first trial was launched in 2006 in the French town of Caen, as a joint effort of Orange, Philips, Samsung and the retailers Groupe LaSer and Vinci Park. During the 6-month long project,

200 residents of Caen used NFC chip embedded Samsung mobile phones to shop in selected retail stores, pay at parking facilities and tourist sites around the town. In addition, it was possible to buy mobile content communicated through interactive posters around the town, as well as information on public transportation.

For example, in order to buy a ticket at the Vinci Park space, users passed their phone over a NFC reader at the parking entrance, triggering the issuance of an e-parking ticket displayed on the phone. Later, when exiting the parking area and moving the mobile phone over a reading terminal, the system automatically deducts the fee from the user's season card or mobile pre-paid credits.

A similar application was successfully tested in Bordeaux in 2007 and was the tipping point for Orange to start to rollout NFC-based mobile payment services commercially for retail shopping, urban transport and loyalty services in 2008.

In 2007, multiple representatives of different industries gathered together to discuss one of the most important field trials for testing of m-payment systems. The project is called "Payez Mobile" and consisted of four mobile operators (Orange, Bouygues Telecom, SFR and NRJ Mobile), representatives of the banking industry (Crédit Mutuel-CIC, Société Générale, BNP Paribas, Crédit Agricole and LCL, Groupe Caisse d'Epargne and La Banque Postale) and the credit card companies (Visa Europe and MasterCard Worldwide). The project involves 1,000 customers and 200 sales outlets in the towns of Caen and Strasbourg under the supervision of the Secure Electronic Transactions (TES) cluster of the Lower Normandy region. The main goal of the "Payez Mobile" field trials is to test a new multi-operator m-payment system and to evaluate end-user's interest in this payment solution. As the trial is focusing on NFC technology, various chip and equipment vendors participating in the project have the chance to test the interoperability of their equipment and devices required for NFC payment solutions. Vendors participating in the trial are Oberthur Card System and Gemalto (SIM cards & secured application management), Sagem, Motorola and LG (handset manufacturers) and Inside Contactless (supplier of different NFC components).

Although the "Payez Mobile" project is still ongoing, core project partners (BNP Paribas, Bouygues Telecom, Groupe Crédit Mutuel-CIC, Crédit Agricole, Société Générale, Orange and SFR, Visa and MasterCard) have already disclosed highly promising results. Users showed a great interest in a new payment solution due to its intuitiveness, processing speed and practicality. Moreover, easy usage and an "All-in-One" approach seemed the most popular characteristics of the system. Merchants have found the waiting time reduction as the most important advantage. Overall, the tested NFC payment system achieved customer satisfaction rates of above 90%.

The "Payez Mobile" field trial is so far the first national French project integrated in the "Pay Buy Mobile" initiative of GSMA. Following the structure of GSMA's mobile NFC ecosystem, the "Payez Mobile" initiative managed to gather the critical mass of representatives belonging to the main entities; the integrated service providers cover 95% of the total retail banking in France. Nevertheless, it is still necessary to monitor overall influence of various players on the project's success, since individual interests need to be respected as much as possible. *(Exhibit 15 overleaf)*

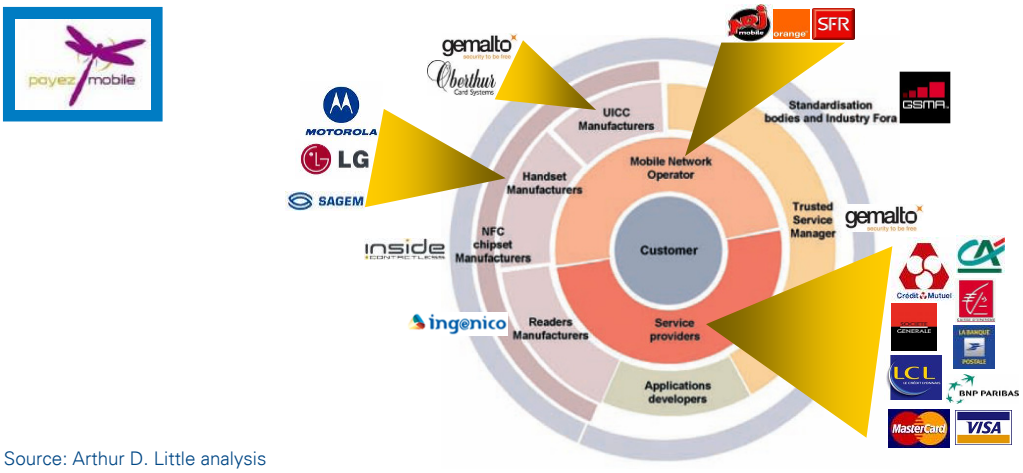
We believe that if future pilot projects are conducted in a similar way in other EU countries, a significant contribution towards the establishment of an m-payment standard and European market harmonization will be achieved.

French telecom operators and major chip vendors have also been looking into transportation ticketing over the last three years. Most of started trials have been focusing on the application of NFC-embedded m-payment technology in urban areas (trams, underground and buses) and on inter city train transportation. The feedback gathered from participating end-users confirmed a strong consumer appeal for NFC-based m-payment services.

In 2007, another working group, Ulysse, was established, which encompassed Bouygues Telecom, Orange, SFR, Keolis, RATP, SNCF, Transdev and Veolia Transpor. In contrast to Payez Mobile, Ulysse has gathered MNOs and transit authorities to develop NFC technology, while Payez Mobile is heavily relying on the financial industry participation besides MNOs. The working group is expected to support the interoperability aspects of new solutions. Considering the large effort being made by all key

Exhibit 15: Payez Mobile project has been closely following the defined guidelines of GSMA's Pay-Buy-Mobile initiative

GSMA's "Pay Buy Mobile" initiative applied in the French M-Payment Ecosystem



Source: Arthur D. Little analysis

industry representatives, a commercial launch of interoperable m-ticketing solutions can be expected in the next two years. However, Bouygues has been testing m-ticketing since 2005, and has not yet roll-out the service on any mass scale.

A.2.5 GERMANY: Transportation industry still driving mass-market development

The German m-payment market has been mainly driven by the transportation industry over the last two years. Unlike mobilkom in Austria, no dominant mobile operator has been able to take the lead in shaping the market development. Furthermore, multiplayer and cross-industry initiatives have been launched only on a small scale.

In 2006, Hanau was the first German town where NFC technology within a public transportation system has been commercially deployed. It followed a 10-month field trial by a regional transportation company Rhein-Main-Verkehrsverbund (RMV), Nokia, Vodafone Germany and Phillips. The tested system was evaluated by more than 90% of the project participants as a convenient payment solution, which they would continue to use in the future.

Subsequently, the RMV transport network continued its efforts in developing the "Handy Ticket" solution. In 2007, RMV teamed up with Nokia and T-Systems to further develop the system, which has been launched in Frankfurt. The existing systems were based on JAVA MIDlet technology, while the system on trial also included NFC-functions. For the purpose of the project, around 600 NFC tags (ConTags) were installed at 59 selected stops and stations in the city and at the airport of Frankfurt. These tags transmitted travel-related data over short distances automatically, while previously users had to enter the same information manually. As a result, end-user had to spend less time and effort regarding the purchasing process of a ticket. The system was commercially launched in the greater Frankfurt area in 2008.

Apart from urban transportation, there also have been developments in the field of cross-industry cooperation for long distance travelling. In the beginning of 2008, Deutsche Bahn (DB) partnered with Vodafone Germany and T-Mobile Germany for a trial of an NFC-based mobile ticket pilot called "Touch&Travel". Other partners engaged in the project were the public transport providers Verkehrsbetrieb Potsdam, Berliner Verkehrsbetriebe, Motorola, Atron electronic (technology

partner), Giesecke&Devrient (smart card developer) and NXP (semiconductor manufacturer). The project includes a test with 200 selected persons, who regularly travel with ICE, IC and RE trains between Berlin and Hanover. The pilot covers parts of Berlin's and Potsdam's public transport routes, such as regional trains, S-Bahn, underground, trams and buses. On the designated transportation routes, all station platforms and bus stops are equipped with touch points. The system calculates the ticket price after each journey and charges the customers via a monthly bill. If the trial "Touch&Travel" receives the expected positive feedback, it is planned to be expanded Germany-wide in 2010. As two major mobile operators are involved in the project and public transportation tests are planned, we expect more mobile operators to join the project. Furthermore, we believe that it will become the starting point for additional partnerships between MNOs concerning other applicability areas of NFC technology.

Paybox, the most active developer and provider of m-commerce solutions globally, managed to form the m-payment alliance "mpass" together with Vodafone Germany and O2 in 2007. The goal is to set up a nationally interoperable mobile payment system for remote and proximity payments. Because paybox's solutions are being deployed in Austria and other parts of the world, this partnership could lead to deeper inter-regional cooperation and additional new service introductions (e.g. cross-border remittance and international airtime transfer). We therefore expect other German mobile operators (e.g. E-Plus and T-Mobile) trying to join the "mpass" alliance.

In March 2009, we have witnessed an important strategic move of Deutsche Bank in the m-banking market when its Global Transaction Banking (GTB) division made a partnership with Luup (an international m-payment service provider) to offer its corporate and banking clients a cross-border m-payment service. Trough this deal, Deutsche Bank becomes one of the first entrants into the German (but also international) m-banking area.

A.2.6 ITALY: Poste Italiane aspires innovation with m-payments

Until 2007, Italian mobile operators had no particular focus on m-payment services. But with the launch of MasterCard's PayPass system in some parts of the country, moves by mobile operators were triggered and m-payment experienced a considerable uptake.

By the end of 2007, MasterCard entered into a partnership with Poste Italiane's business unit Banco Posta and launched its first PayPass pilot program in Italy. Banco Posta account holders were provided with a NFC-based PostePay Evolution MasterCard for retail purchases in selected supermarkets and cinemas, as well as fast food and restaurant chains in a six to eight months field trial.

Italy has one of the highest percentages of cash-based transactions in Europe. Thus, Poste Italiane deemed the field trial to be just the first step in nationally introducing new payment channels. In July 2008, PosteMobile (the MVNO of Poste Italiane Group) has been supplied with an m-payment software solution from Gemalto. Gemalto's software enables PosteMobile subscribers to send an instruction to make certain transactions via mobile, such as pay the mailing of a telegram, a fax, to top up prepaid accounts or to transfer money to a third party from their BancoPosta account and debit card – PostePay. With adequate marketing activities and acceptance by third parties, we expect this service to reach high take-up rates. PosteMobile has been very successful in introducing new payment channels. For example, within the first six months after its launch, PosteMobile acquired 200,000 BancoPosta customers using its m-banking service, out of total 250,000 new customers.

The first implementation of NFC transit technology in Italy, based on the partnership of Telecom Italia Mobile (TIM) and Gemalto, is a very important milestone for the development of the Italian m-payment market. Since the joint project has been launched, we consider TIM to target at a strategic positioning against new market competition. TIM participated in the bidding process for the Italian payment processor SIA-SSB, which has been put up for sale by its consortium of Italian bank owners in mid-2008. If TIM manages to acquire SIA-SBB, this would be the first case for an MNO to seriously enter the wide electronic payment market in form of a payment operator in Italy as allowed by the new EU liberalized regulatory framework.

The launch of the consortium Movincom in the second half of 2008 is the first evidence of a multi-merchant initiative for supporting the adoption of m-payments. In Italy As a common payment platform, Movincom aimed at attracting massive merchant pools, such as national railways, local transport, etc., in order to build a national standard. In September 2008, Telecom Italia announced an agreement with Paypass Mastercard.

These are all positive indicators for the future development of the Italian m-payment market. However, it is still to be seen, if a common or open service platform between dominant mobile operators will emerge in the near future. We consider this to be the key success factor for the massive significant service uptake in Italy.

A.2.7 JAPAN: Steady build-up of a usage environment

In Japan, the infrastructure for m-payment services is often provided by operators, such as NTT DoCoMo, KDDI, and Softbank. The reason for this is that there are already many users of "Osaifu-Keitai" (translation: wallet cellphone) which is a cell phone containing Sony's FeliCa, and which is utilized for m-payment services. The applications for m-payment services and related services are distributed by transportation operators, retailers, credit companies, e-money vendors, and operators.

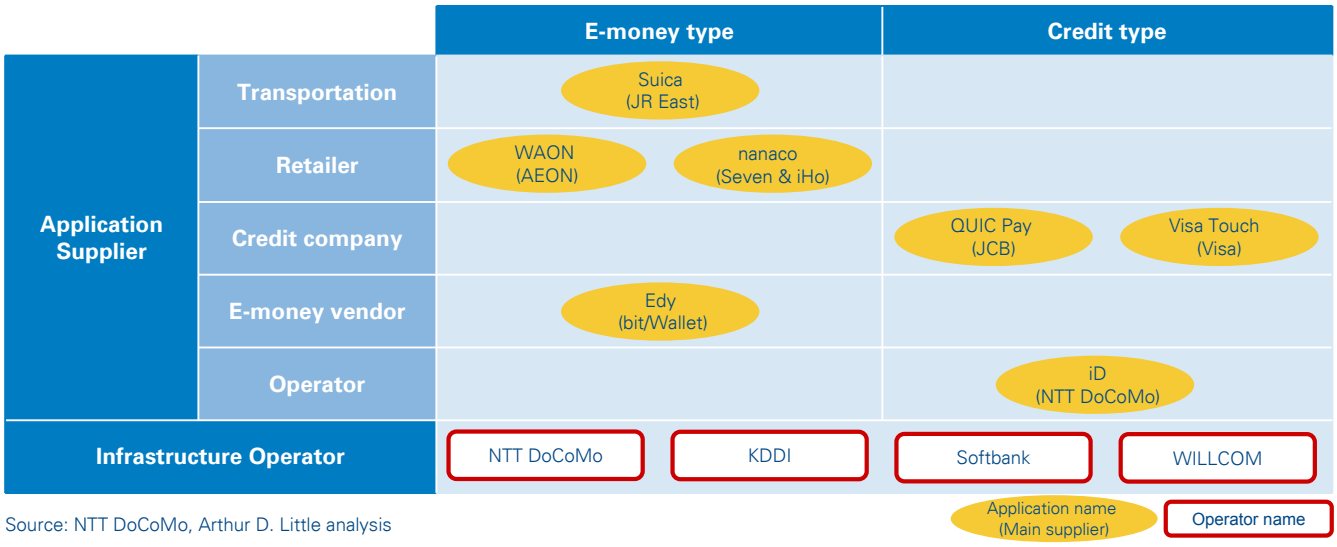
The users of "Osaifu-Keitai" install those applications into their cell phones with some combinations. Now, there are over 60 million "Osaifu-Keitai" users among the total 100 million mobile subscribers. The number of "Osaifu-Keitai" is expected to continue to rise over the coming years. Therefore, the basic infrastructure for m-payment is being built-up steadily. *(Exhibit 16)*

Service trends: Introduction of various "Points" programs for increasing the number of users

There are many kinds of services utilizing "Osaifu-Keitai"´, for example transportation, shopping, m-ticketing, member's cards and ID authentication. The services are provided by downloading various applications for "Osaifu-Keitai" and are similar among operators except for a few small differences. There are two primary payment methods for these services. The methods are e-money and credit type; e-money is prepaid with the payment system provided by the retail and transportation industries and credit is postpaid with the payment system provided by credit companies.

Examples of e-money are Suica (operated by JR East, providing convenience for paying rail and bus tickets with e-money), Edy (operated by bitWallet Inc. with over 40 million subscribers) and nanaco (operated by Seven & i Holdings Co.). The e-money

Exhibit 16: Relation between application supplier and infrastructure operator



Source: NTT DoCoMo, Arthur D. Little analysis

service is typically provided by the e-money administrator and affiliated stores. These e-money services are often utilized as the method for m-payment because procedures are simple. A few drawbacks, such as the requirement of charging e-money, however, are found.

Examples of credit include iD (issued by NTT DoCoMo), QUICPay (the service which was put in practical use by credit card company JCB Co., Ltd.); Visa Touch (provided by Visa). The service of credit type is typically provided by a brand which manages administrative operations, an acquirer which exploits affiliated stores, and an issuer, which issues credit rights such as credit card. In the case of iD, the brand is NTT DoCoMo, the acquirer is Sumitomo Mitsui Card Co., Ltd., and the issuer is Sumitomo Mitsui Card Co., Ltd. or Aeon Credit Service Co., Ltd. While the initiation procedure is very complex, using the service is very convenient; it is not necessary to make a charge to the card in advance for credit utilization, and a monthly usage amount is charged only once a month.

Another example of a loyalty program, Points, has been introduced by application suppliers. The Points earned can be used to purchase discount goods or some tickets at the subsequent payment. These Points are given along with the regulations of each payment service. Points are currently exchanged among other application suppliers. For example, it is possible to book a flight with no charge if you have purchased various home electronics.

Technology trends: Development of shared terminal, and progress of NFC

Sony's FeliCa has become the main chipset for m-payment in Japan. FeliCa is composed of a CPU, a memory, and an RF circuit. A user utilizes FeliCa by scanning it within 10 cm of the terminal. A user who uses a different application of Osaifu-Keitai for m-payment to that of the terminal will not be able to perform the transaction even if the hardware uses FeliCa. For the purpose of solving this problem, some affiliations have been realized, for example, the development of the shared terminal for iD and Suica and LLP among NTT DoCoMo, NTT Data, and JR East.

Regarding near future trends, NFC will be introduced in the Japanese m-payment market with the aim of compatibility with international terminals.

Issues for Japanese m-payment: Regulation setting for money equivalent Points

One of the biggest problems for Osaifu-Keitai is that Points have become value equivalent to money. Initially the Points program was just a tool for promotion, where users were only able to use the Points at a limited amount of stores. For the purpose of increasing users, the Points program was extended in order to be able to exchange Points at more locations. As a consequence, Points program has become complicated and difficult to be understood by users. There are also Points that can be exchanged for e-money. Some companies have considered such Points should be treated like debts. Because of this new situation the Financial Services Agency, METI (Ministry of Economy, Trade, and Industry), and Japan Fair Trade Commission have started to consider regulating Points. These government organizations are discussing new regulations carefully because the m-payment market might shrink if they control the Points program intensely.

A.2.8 MALAYSIA: Market movements in direction towards more cooperation

In Malaysia, mobile banking and mobile payment solutions are very diverse in nature. Mobile operators have tested diverse NFC and remote payment solutions. Banks such as Maybank provide true m-banking solutions that enable customers to access their current e-banking systems using a Java client on their mobile phone.

Collaborating with paybox, Celcom Malaysia is currently launching a mobile banking and mobile payment solution. In its first phase, Celcom provides mobile access to banking systems to enable customers to check their balance and transaction history, recharge their prepaid airtime and transfer money to each other. In a second phase, Celcom wants to expand the system in order to include other banking partners and provide extended remittance, bill payment and merchant payment services.

Maxis Malaysia has launched an m-money services integrating top-up and P2P services as well as remittances and international

airtime transfer services. Maxis' m-money service has been integrated tightly into its core data service by rolling up their SMS portal, campaign management, subscription management and voucher management solutions into one solution also provided by paybox.

A.2.9 MEXICO: Remittance potential still unexploited

In Mexico, some macroeconomic characteristics determine the options for the development of m-payment business. Mexico is considered to be one of the fastest growing telecommunication markets globally, and the second largest market in Latin America. Mobile penetration in the country is currently at around 60% and we expect it to grow additional 20% in the next two to three years. The conditions for m-payment seem even more favorable considering the banked population is just 20%.

Mexico is the third biggest country worldwide in terms of remittance received from emigrants working abroad. Remittance flows to Mexico are still growing, but the World Bank reported a relative growth decrease on an annual basis from 20% to 1.4% (in contrast to Asian and European countries). These slow-down results from a currently weakening job market in the US, especially due to the slow-down in the real estate and construction market, coupled with a tightened immigration policy affecting Mexican emigrants.

Up to now, international industry players have not made significant moves compared to other booming remittance markets, such as the Philippines. Although Mobipay International, being a wholly-owned subsidiary of the Spanish multinational banking group BBVA, is operating in Mexico since 2005, it has not launched any service specifically catering for this m-payment market demand. However, if major concerns about transaction security and regulatory questions related to money laundering are properly addressed, we expect BBVA to initiate a trial project targeting the population migrated from Mexico to the US in the near future.

MasterCard has defined Mexico as a market of interest for the deployment of their PayPass contactless payment system. By the end of 2006, a first pilot project for a new payment platform in Latin America has been launched in cooperation with Banamex, Mexico's second largest bank. The scope of the project was rather limited as it only covered 10,000 selected cardholders in the city of Monterrey who were enabled to use contactless technology for paying at McDonalds's restaurants. Nevertheless, in the end, we expect that the positive feedback and the acceptance of end users will lead to a potential involvement of local mobile operators in trial projects with eventual commercialization of the NFC mobile based payments within the next two years.

A.2.10 NETHERLANDS: Market initiatives mainly led by the finance industry

Alternative payment channels have good potential for development in the Netherlands because, in comparison to its neighboring Western European countries, the Dutch banking network is less developed with less dense countrywide network of installed ATMs. However, internet-banking seems to have predominantly filled this gap as, in 2008, the Netherlands had the highest e-banking adoption rate in Europe. As an equally inexpensive payment channel, e-banking puts pressure on the development potential for mobile based payments. The Netherlands also have a high acceptance of direct debits, for payments such as telecom, energy, rent, etc. providers. Another important aspect to be considered when looking at the Dutch m-payment market is the high acceptance of the e-wallet on the bankcard, called 'chipknip', which is installed on the chip of the card. Its use has grown rapidly over the past years, in particular for parking and food vending machines. In Rotterdam, for example, the only accepted payment form is the e-wallet. This can be regarded as a potential competitor to m-payment.

Most initiatives for new m-payment solutions that have been launched in the Dutch market were driven by mobile operators. However, in the beginning of 2007, Rabobank started to offer its customers a payment system relying on mobile phones called RaboMobile. Partners in this endeavor were the multimedia company Talpa and Orange. RaboMobile m-banking solution enables its users to make money transfer orders, transfer funds between savings, payment and investment accounts, check their balances and use additional services, such as SMS notification about balance changes on the account.

In the same year, RaboMobile took part in another important initiative. The initiative aimed at testing NFC-based mobile

payments in retail environment and included KPN, LogicaCMG, Schuitema (C1000), Rabobank, KPN and NXP Semiconductors. In the scope of the six-month pilot project, 100 selected customers of the supermarket C1000 in a small town in Molenaarsgraaf could use their mobile phones as a regular debit card. In addition, pure payment customers were given the option to store digital discount coupons received in the C1000 store, and use them for in-store shopping or for buying mobile content, such as ring tones, wallpapers.

Although the feedback collected during the pilot project has been very positive, no plans have been revealed for a commercial rollout on a wider scale in the near future. We therefore think that these Dutch companies may rather choose to follow standardized solutions and systems that are already approved in Europe and then might develop their own m-payment systems with limited applicability within national borders.

A.2.11 NIGERIA: An immense unbanked potential

Base on our analysis, Nigeria represents one fifth of the African m-payments market potential. While the bank account penetration has stagnated at 20%, mobile penetration has already reached 30%, increasing at an annual rate of 50% with prepaid accounts making up 95% of the total market.

Among various initiatives that were tested, MoneyBoxAfrica seems to be a promising service currently being approved by the Central Bank of Nigeria. With MoneyBoxAfrica, Nigeria's leading investment institution Integrated Capital Services is setting up a large mobile financial ecosystem in alliance with banks, financial switches and micro finance institutions. Nigerians need an affordable line of services that allows them to execute financial transactions remotely and conveniently with their mobile phones. M-banking seems to be an attractive alternative for all income groups in Nigeria.

MoneyBoxAfrica that runs on the paybox Mobiliser platform does not require customers to sign up for the service; they just buy a payment scratch card on the street. Then, using any phone, they text a message with the scratch card number and can start to save money or send money to any linked-in bank account or to a phone number up to a limit of USD 50. To perform higher value transactions of up to USD 500, end customers can sign up for a MoneyBox bank account and receive a PIN code and a local ATM card. By sending text messages, they can remotely send money into their accounts, top up their phones, pay utility bills and tithes, buy insurances, send money to friends and relatives and withdraw cash at agent locations or ATMs. In order to satisfy the strictest security requirements for higher-volume transactions, end customers can load an application on their phone to get access to credits and to make investments.

A.2.12 NORWAY: Improving the Nordic m-payment channel

The development of mobile commerce in Norway has been strongly influenced by the two dominant players in telecom and financial industry, Telenor and DnB NOR.

Already in 2006, DnB NOR commercially launched m-banking services. The Group considered the mobile payment channel as important as internet banking. The services offered by their m-banking solution encompassed among others: money transfer between accounts, balance accounts and payment checking as well as SMS notifications upon order execution.

In 2007, Telenor started to cooperate with Norway's banking industry to further enhance the convenience of mobile phones as a payment channel. The partnership was closed with the Norwegian Savings Banks Association and the Norwegian Financial Services Association (FNH) who jointly developed BankID as an electronic proof of identity that is normally used for identification and signing of agreements over the internet. This collaboration should enable Telenor subscribers to make use of the same system for identification and secure contract-signing via their mobile phone.

MasterCard has partnered both with Telenor and DnB NOR to launch its PayPass solution nationwide in 2008. The solution itself is based on established standards in the Norwegian market, such as mobile phones equipped with NFC SIM cards for the secure storage of the payment program and personal user data. This project is the first launch of a NFC technology field trial in the Nordic region. In the future, we expect a strong

involvement of credit card companies in Norway and other countries in the Nordic region, given the fact that the inhabitants are known as heavy credit card users and Norwegian banks are top positioned in Europe in terms of technological innovations.

LUUP, an independent Norwegian m-payment service provider, is expanding its activities through Europe, such as in the UK, Germany and Poland, as well as Middle Eastern and Asian countries, by establishing partnerships with leading financial institutions. The company aims to build an open and independent global infrastructure enabling P2P payments. It also seems that m-payment used as a retail payment mechanism represents an opportunity for further adoption of the service platform.

LUUP's m-payment service platform can be used by customers of any mobile operator. Persons above the age of 14 can open accounts through SMS initiation and complete the registration via a web-based sign-up process. As customers typically pay fees under 10% compared to the premium SMS operator fees which are normally over 25%, the basis for higher revenues and increased profit margins is provided.

A.2.13 PHILIPPINES: Hot market for remittance business

In recent years, the Philippines have been positioned as one of the most advanced markets in the emerging world concerning mobile money transfers. So far, two of the country's largest mobile phone operators, Smart Communications and Globe Telecom, have dominated the market. Along with regulatory flexibility this situation created optimum conditions for the development of m-banking and m-payment.

SMART, the first national operator offering m-banking services cooperated with Banco de Oro and was branded SMART Money. In the scope of the partnership, Banco de Oro provided the normal transactional services based on a full range of cash and debit card services. Therefore, the business model implemented by SMART Money is more bank- than telecom-driven as the bank is fully responsible for activities like account security, audit and fraud management. Typical services offered by SMART money are cash deposits and withdrawals, cash and airtime transfers between users, cashless payments at retailers with a SMART account, payments with a MasterCard, bill payments and remittance.

Since 2004, the company has been offering an SMS-based remittance service known as "SMART Padala". This service allows emigrants to deposit money at partnering banks in areas where Filipino immigrants live and also to specify a desired money recipient in the Philippines who is subscribed at SMART. After the money has been transferred, a notification text message is sent to both the sender and the recipient who can then use the mobile account to specify a certain withdrawal amount and pick it up at a partnering institution in the Philippines. The fees charged for the remittances through the "SMART Padala" are considerably less expensive than traditional wire services including courier costs.

Four years after SMART Money was launched, Globe entered the m-commerce business with its GCASH products. Unlike SMART, Globe does not rely on a bank as partner, but maintains and operates an own clearing house facility which records all transactions and settles deals between retailers and GCASH customers. Due to this initial operational set-up, the approach is a telecom-driven business. In consequence of this approach, Globe is directly responsible for fraud management and the prevention of potential money laundering. Furthermore, GCASH's service replaces the regular bank account with an 'electronic wallet' feature that allows users to send and receive cash and make payments, including bill payments, donations and online purchases via SMS messaging. Due to established partnerships with companies in developed countries, Filipino emigrants can send money via a SMS message to Globe subscribers in the Philippines. The recipient can pick up the cash from any Globe Telecom retail point by showing an appropriate SMS message on a mobile phone and a personal ID. Within the Philippines, the service is also applicable to P2P money transfer. All costs are transaction-related, while the key for massive uptake were tightly controlled transaction charges. At the end of September 2007, close to half a million out of more than 19 million Globe Telecom subscribers were active GCASH users.

In 2008, an important milestone in the development of the growing international remittance market has been reached with the conclusion of a partnership between Western Union Co., Globe Telecom and Smart Communications. Money remitted on an annual basis from developed to emerging countries in the period from 2002 to 2007 has more than doubled reaching USD 240 billion in 2007, whereas the Philippines as the fourth largest remittance receiver accounted for USD 17 billion.

Up to now, the remittance market has been globally dominated by few traditional players such as Western Union. The recent boom of mobile remittance services caused traditional players to adapt their existing business model. A potential market share decline needs to be prevented and a wider pool of oversea Filipino workers needs to be captured. The partnership between Western Union, Globe Telecom and Smart Communications intends to create a symbiotic relation. Western Union's global reach and agents' network is paired with an active subscriber base of both providers in order to increase the ease and flexibility of moving money back home to friends and family at lower costs than before.

A.2.14 PORTUGAL: Telemultibanco as one of the market pillars

With one of the densest ATM networks in Europe (1.07 per 1000 inhabitants vs. the European average of 0.74), Portugal has seen an m-payment market development that mimics the evolution of its banking system. It is characterized by inter-player cooperation & standardization and by a trusted third-party, SIBS, an inter-banking society, which manages the underlying infrastructure and facilitates the settlement of transactions between players such as banks, merchants, consumers and operators.

TeleMultiBanco, offering a universal solution for accessing ATM services including payments via mobile phone, represents the cooperation of the three mobile operators Optimus, TMN and Vodafone as well as Portuguese banks, via SIBS. The service can be accessed by a Java application download, a phone call to an automated response system, a SMS message or the operators' WAP portal. Apart from standard payments of services (such like utilities) and purchases (online, mail-order), users have access to a variety of other ATM operations such as top-up of pre-paid mobile phone accounts, checking account balances and transaction reports and transferring money to other accounts.

A.2.15 SINGAPORE: Aiming at replicating the Japanese success story

In the early stages of the m-payment market development in Singapore, the government played an important role in creating a favorable environment for the m-payment ecosystem. Combined with a high mobile penetration rate and technology-savvy customers, this led to the formation of a highly developed m-payment market.

As of the end of 2007, NFC technology made its inroads into the m-payment market in Singapore. A partnership between StarHub, one of the major mobile operators, and EZ-Link, a contactless smartcard service based on Sony's FeliCa smartcard technology, was concluded to execute a six month field trial for NFC-based payments. As EZ-Link is a widely accepted payment instrument at retailers and in Singaporean public transportation, 2,600 selected testers were enabled to buy services and goods by tapping their mobile phones on NFC readers that were installed in approximately 1,000 different locations. Additionally, information exchange was provided by smart tags embedded into interactive posters (e.g. bus service information, information on movies displayed in cinemas, promotions at shops). The feedback received after the trial closure confirmed that 70% of the participants liked the services.

After the successful EZ-Link trials, StarHub went one step further. The company recently signed a memorandum of understanding with NTT DoCoMo to be the first mobile operator outside Japan to test and pilot the Osaifu-Keitai service. The widely accepted Japanese concept of mobile wallet is supposed to be introduced in Singapore, encompassing a variety of services: e-money, identity card, fare card for underground, train and bus transportation, credit cards, as well as diverse loyalty cards. Being the first mover of NFC technology introduction on a market with such favorable development conditions, such as high technology-savvy population, and an easy-upgradeable existing infrastructure, gives StarHub a competitive edge. However, we expect a reaction of the competition, which may hinder a harmonized approach towards mass-market adoption of the technology.

A.2.16 SLOVENIA: Still leading the m-payment market in the CEE region

Slovenia is one of the most advanced m-payment markets in the Central Europe. The leading Slovenian mobile network operator Mobitel already launched its m-payment system "Moneta" in 1999. In order to support a massive adoption of the m-payment service Moneta, the company made it available by default to every postpaid Mobitel user unless he or she requested not to participate. In the first phase of its existence, Moneta was a closed system just for Mobitel users. All the retailer acquisition was done exclusively by Moneta. In 2004, following the regulation change, the system has been opened to multiple banks, so customers could use a debit or credit card with multiple accounts. Furthermore, an additional Slovenian mobile carrier – Debitel accepted the Moneta payment platform.

Along with an adequate promotion policy, this led to a constant increase in the user base and the creation of a strong brand appeal. In the period from 2006 to 2007 alone, Moneta's user base rose from roughly 100,000 to 190,000 service users. The growth of transactions and value has been significant as well: From 2004 to 2007, the number of Moneta transactions increased seven times, while total value of the transactions increased 13 times.

The wide dispersion of POS terminals all over the country enables the use of Moneta for paying parking fees, lottery tickets, restaurant bills, taxi bills, as well as goods in different stores. Further on, Moneta customers often use the service for online payment. Another innovative service applicability is the mobile payment of fines at the local court.

Concerning the further development, we expect the establishment of m-payment service interoperability between Mobitel and other alternative mobile operators besides Debitel to occur sometime in 2009, though no progress has been achieved since 2005.

A.2.17 SOUTH AFRICA: Fruitful ground for m-banking

South Africa provides an excellent example of how a banking infrastructure deficiency in an emerging market can be overcome by an innovative mobile phone based business model. Wizzit and MTN MobileMoney offer competing solutions that up to now have managed to satisfy the needs of the unbanked population in South Africa to a great extent. Wizzit operates as a Bank of Athens division, while MRN Mobile Money has been launched as a joint venture between the mobile operator MTN and the Standard Bank in 2004.

Since both companies have been involved in the issuance of e-money and acceptance of deposits, the regulator requires them to operate just like other licensed banking institutions.

Both Wizzit and MTN MobileMoney offer a wide range of m-payment services: P2P account transfers, air-time top up, payment of utility bills and receiving salaries through an m-bank account.

As a substitute for a regular banking infrastructure, Wizzit has built a task force of 2,000 trained agents, so-called Wizzkids. They perform all banking related activities: introducing the offered services, performing KYC procedures and issuing new debit cards. MTN customers can open accounts using OTA downloadable software or software already embedded in their SIM cards. Unlike the Wizzit services that are open to mobile phone owners with any carrier, MTN MobileMoney services are only available for MTN subscribers. As a service to its customers, MTN MobileMoney offers agent assistance for account opening and also provides the option of activating an account via internet.

Wizzit service users can deposit and withdraw cash via a network of 3,400 offices of the partnered Post Office and ABSA Bank and additionally withdraw cash on all available ATMs nationwide. Users of the MTN MobileMoney service also receive a MobileMoney cash card that can be used for cash withdrawals and deposits at Standard Bank branches and ATMs.

Up to now, Wizzit has managed to acquire more than 200,000 service users, while MTN MobileMoney has approximately 80,000 users. The key challenges for service adoption are the change of user behavior, significant marketing efforts for service promotion and related trainings and a favorable regulatory environment for the introduction of more complex banking services by non-banking organizations.

A.2.18 SOUTH KOREA: Market potential to be exploited through NFC technology adoption

Besides Japan, South Korea has been among the first countries worldwide to introduce mobile payments. However, in contrast to Japan, the market development has not been driven primarily by a single player, but resulted from competing solutions and different hardware offerings. Though in 2005 the main players SKTelecom, KTFreetel and LGT agreed to use a common m-payment acceptance device known as a 'dongle' and agreed to adopt RF(NFC) way not IrD way.

In 2006, SK Telecom has partnered with NPX for a large scale six-month field trial of NFC applications. 400 selected users took part in the project and could use their phones for contactless payments at retailers that have previously been equipped with NFC readers, as well as for ticket purchasing and timetable enquiries of the public transport system. Furthermore, users had access to interactive posters that could be used to download ring-tones, wallpapers and ticket information. This trial received positive feedback and provided SKT with a good basis for a future rollout of NFC technology-based m-payment solutions.

In 2007, SK Telecom brought its existing cooperation with Visa International to the next level. Jointly, they rolled out a contactless payment application on a commercial basis by introducing a universal SIM (USIM) card that is personalized over-the-air (OTA). With this service launch, the partnering companies aimed at leveraging the 50,000 existing contactless readers at merchants across South Korea and addressing the 30,000 SKT subscribers. So as to avoid potential adoption barriers, the Visa PayWave contactless application was available for download via mobile internet, and the USIM card has been made transferable between phones without loosing its functionality. Moreover, in order to address user preferences for different mobile phones, the service has been offered with 17 different types of handsets.

In 2008 SKT, KTF and LGT started One chip multi-banking services with 17 local bank having joined since then. The 3G handsets were provided by Samsung and LG and the service was deployed at around 40,000 ATM/CDs.

The Korean mobile operators are also taking an active role in the GSMA project that is aimed at defining a common approach for using NFC communication in payment processes. KTF has been the first company among 34 leading mobile operators to start a Pay-Buy-Mobile payment trial. The trial confirmed that Korean users show great interest in the offered services, mainly due to its simplicity and convenience.

Recently, SKT and KTF launched an m-banking service called "T-Cash", respectively "Show T-money". "T-Cash" and "Show T-money" are USIM-based m-payment platforms, which enable 3G handsets to be used for a variety of services, such as public transportation, taxis, museums, etc. The service itself though is not new as it is only the mobile version of "T-Money", a well-known service which has been a very popular contactless means of payment in various formats such as stand-alone smartcard, embedded credit card, handset accessories in South Korea.

SKT and KTF collaborated with Korea Smart Card (KSC, T-money operator) for the deployment of the mobile version of "T-money" and are now applying a fee-sharing model. SKT already experienced service uptake of the new service with 50,000 T-cash subscribers within the first 15 days of operation and is targeting at 500,000 subs by the end of 2009.

In contrast to previous efforts and the m-payment service (MONETA), the market players collaborated based on their experiences. They learned that collaboration is more important than competition and that the domination of the m-payment market is not achievable due to the necessity of developing and educating customers directly. The eco-system of m-payment consists conjointly of a credit card company, a device manufacture and a mobile company.

We expect the players in eco-systems to be able to expand their customer base continuously with the key success factors being:

1. To leverage existing customer experiences with 'contactless' payment methods and to focus on their transition to mobile platforms by emphasizing the 'easier way' of m-payment (SKT appeals "T-cash" is easier to recharge with enhanced service scope, more retail chains, online payment opportunities, etc.)

2. To avoid conflicts and competition with existing payment service providers like credit card companies; instead to focus on utilizing other players from different value chains.

This could be a unique approach in South Korea while 'similar means of payment' are already very popular. Importantly, SKT already aims at entering the Chinese market in order to replicate this approach in cooperation with government or municipalities.

A.2.19 SPAIN: Increasing interoperability speeds up the market development

The Spanish market is one of few in the world where the key industry stakeholders, mobile operators, banks and regulators, joined forces to develop a service platform called Mobipay.

The alliance for Mobipay has managed to approach a critical mass of retail partners in order to make the solution viable: Banco Bilbao Vizcaya Argentaria (BBVA), Santander, Central Hispano online merchants (SCH), Telefónica Móviles, Vodafone and Amena. Today, across the country, the service is used by 10,000 taxis, 40,000 online merchants, and 2,000 retail shops. For all transactions, the USSD channel was used as payment solution and linked to existing credit and debit cards of customers.

As of 2007, BBVA has cooperated with Visa, Ingenico and Nokia. 200 selected test persons have been equipped with Nokia 6131 NFC phones utilizing a Visa PayWave application linked to a BBVA credit/debit card and Ingenico contactless readers have been installed in selected bars and restaurants around Madrid. It is expected that five years after the commercial roll-out, the service will be used by 500,000 people.

Another trial for the introduction of NFC technology has taken place in 2008. A local public transportation company in the town of Malaga, Empresa Malagueña de Transportes (EMT) has been using mobile ticketing already since 2005. This year, the company launched a trial with Mobipay and Orange for the introduction of NFC based ticket purchases. The further development needs to be monitored.

A.2.20 SWITZERLAND: Limited m-payment services so far

Even though the mobile market in Switzerland is well developed, with 6.5 million cell phones and a population of 7.7 million Swiss citizens, there has been only a limited use of m-payment services so far.

In general, there are three main m-payment players active in Switzerland: Epark24, Xsmart and Postfinance, the daughter company of Swiss Post and the only financial service provider in this group. Epark24 focuses on mobile payments for parking (Epark24) and purchases at small food stores, flower stands and mobile payments in hotels and restaurants. The last three services are promoted under the brand Epay24. Customers pay their bills by calling a 0900-number, which then directly charges the amount to their cell phone bill. The service is also supported by Postfinance. Customers can hence opt to settle their bills through a direct deduction from their bank account via a mobile authorization code. This service however requires customers to have an active Postfinance bank account, which limits the potential customer base. Epark24 relies on the telecommunication infrastructure of the mobile operator Sunrise, but the service can also be used by customers of any MNO or MVNO. From August 2007 to December 2008, Epark together with Epay24 managed to process 150,000 transactions. This translates roughly into 290 transactions per day.

The goal of Xsmart is to develop and offer mobile marketing and payment solutions. So far they offer mainly m-ticketing services based on SMS such as MobileARENA (full service package aiming at outsourcing the order-, delivery- and promotion-process to mobile technology), MobileSKI (activating the skipass via SMS) and MobileTRAVEL (purchasing tickets for public transportation and parking).

As of January 2009, Swiss Federal Railways (SBB) has been offering m-payments through their Mobile-Ticket Shops. Although the service is open for users of different mobile networks, customers need to register for the service initially on the website and download a software application (free of charge). A potential hurdle for a massive service uptake besides

this relatively complicated sign-up procedure is the handsets restriction: only java capable devices are compatible.

With regards to the banking sector, up to now traditional banks have shown limited interest for the development of an m-payment channel.

The first coordinated moves of the Swiss banking industry have been seen at the end of 2008, when Credit Suisse, PostFinance, Swisscard, Visa Europe together with Swisscom and Telekurs Multipay (company for cashless payment transfers in Switzerland) have launched a three-month long pilot project, which introduced NFC-based Visa payWave services in Switzerland. The market scope of the trial was limited to 150 selected employees of project partners who could pay for meals in their company's canteen by waving the mobile phone in front of an NFC reader. The aim of the trial was to get first market feedbacks regarding the commercial and technical applicability of the solution as well as its user-friendliness.

Until now, we have seen only a limited m-payment development in Switzerland, largely due to inadequate interest of banking industry players. Postfinance has been the sole financial service player that has been so far pushing m-payment services. However, we expect other banks in the near-term future to start to participate in the design of new mobile-based payment services, as soon as the NFC technology provides the market with standardized hardware and a proven business case for the m-payment value chain players. This will lead to further market competition, service innovation and, subsequently, to more significant market uptake. From a mobile operator perspective, we have just seen a promising attempt to push the introduction of m-payments by the establishment of a workgroup between all three major mobile network operators Swisscom, Orange and Sunrise.

A.2.21 TAIWAN: New Asian test area for NFC applications

Taiwan is recognized as one of the most important global test beds for the NFC technology. During the last two years, three Taiwanese mobile operators, Taiwan Mobile, Far EasTone Telecommunications and Chunghwa Telecom launched numerous field trials for NFC-based m-payments together with their technology partners and major players from the finance industry.

In the beginning of 2007, Taiwan Mobile partnered with ViVOtech, Inc. as NFC equipment vendor, MasterCard and Taipei Fubon Bank to launch the NFC mobile phone payment pilot program at selected and prestigious retailers across Taipei. Participants of this pilot had a chance to use the ViVOwallet software application on their NFC mobile phones for viewing and selecting payment cards and for redemption of coupons at ViVOpay-enabled POS.

Later in 2008, Taiwan Mobile decided to roll out NFC payment services nationwide with a new partner, Gemalto. The primary rationale behind this partnership was to enable simple service adoption and activation by end users. Gemalto provided Taiwan Mobile with the world's first commercial NFC SIM-based payment system. The main advantage was that users did not have to upgrade their phones, but only had to change their SIM card. Gemalto also had the role of TSM and business facilitator, as all partners in this venture were reluctant to share sensitive business information with the other parties and were afraid to let the partners get in touch with their own customer base.

The third largest Taiwanese mobile operator Far EasTone Telecommunications (FET) also partnered with Gemalto in 2007 to bring SIM card-based NFC services to Taiwan. In addition, FET launched NFC m-payment services based on the Single Wire Protocol (SWP) technology after having completed a pilot together with a few local partners (Taishin International Bank, Kaohsiung metropolitan MRT (Mass Rapid Transit) system operator, 7-Eleven convenience stores, R-T Mart hypermarkets and Shin Kong Mitsukoshi department stores) in 2007. The post-pilot survey showed that out of 200 participants, 90% confirmed their satisfaction with the fast transaction process and the convenience provided by mobile credit card payment. The participants though were concerned about multi-functionality, security, handsets and customer service.

Chunghwa Telecom, Taiwan's largest telecommunications company, has launched four NFC trial projects so far. The last trial was conducted together with one of Taiwan's largest banks,

Chinatrust Commercial Bank, and Visa Inc. and the payWave contactless technology was being tested. Organizers of the six-month m-payment trial put 500 Nokia-made mobile phones on sale to consumers and allowed them to download an OTA contactless application to their phones, as well as to tap chip-tags for receiving electronic coupons.

As shown, all three national telcos in Taiwan have been trying to establish partnerships with financial companies to develop NFC business models and projects. On one side, FarEastone worked with international mobile phone suppliers and telecom companies, while on the other side, Chunghwa Telecom and Taiwan Mobile partnered with Taiwanese mobile phone suppliers to develop new business models for the market. Therefore, we see Taiwan currently as one of the leading regional markets in terms of NFC technology deployment.

A.2.22 UK: Many initiatives for market testing, but development, limited by lack of coordination

In the last few years, we have witnessed numerous individual initiatives led by the financial industry, mobile operators and third party players concerning the introduction of new m-payment services in the UK.

Reporo, a mobile shopping company, had raised more than USD 1 million funding to develop its all-in-one mobile platform in 2006. The company provides mobile shopping services across multiple networks, including O2, Orange, T-Mobile, Virgin and Vodafone. More than 25 UK retailers are selling products via Reporo, including PC World, Lastminute and Oddbins.

In 2006, ActiveMedia Technology has carried out the first live trial of an end-to-end mobile ticketing in cooperation with London's nightclub Ministry of Sound and PayPal. Club visitors were able to buy, receive and redeem an entrance ticket on their mobile phone by utilizing the interactive voice response technology (IVR) of PayPal's payment service.

In the beginning of 2008, Orange UK has launched a pilot project for mobile contactless services in cooperation with the Manchester City Football Club (MCFC). In the scope of the project, selected MCFC season ticket holders were given NFC-equipped mobile handsets to replace their existing contactless cards. In the first project phase, the football fans were allowed to use their mobile phones to enter through the turnstiles for home games. In the second phase, users were given the chance to purchase club merchandise and refreshments during the games where they obtained loyalty schemes and discounts with their mobile phones.

Atos Origin started to implement its mobile ticketing solution across UK's rail networks including London and South Eastern, First TransPennine Express and Arriva Trains Wales. In the beginning of 2007, the company already had more than 90% market share, providing the mobile ticketing solution to all UK train operators.

Later in the same year, we could observe some train operators taking a proactive role in the introduction of an m-payment ticketing channel. Chiltern Railways has become the first train company in the UK that sells m-tickets to passengers, cooperating with YourRail, Cubic Transportation Systems Mobiqa, and ts.com.

The most significant among recent m-payment trials in the UK is the eight-month pilot project for NFC technology on mobile phones initiated by O2 and supported by Transport for London, TranSys, Barclaycard, Visa Europe, Nokia and AEG. In May 2008, 500 selected test users from the O2 customer base were given the chance to use their mobile phones for payments at selected sites in London.

Each test user was provided with a Nokia 6131 NFC handset with an installed O2 wallet. Just like a normal wallet, it held various everyday cards, including Oyster for the public transportation across London and Barclaycard for the purchase of goods (maximum USD 14.6) through contactless payment readers at selected retailers in the London area. The testers could also check available funds on their phone any time and locate nearby retailers that accept the contactless payment. Further on, they were enabled to use their NFC handset on selected smart posters to prompt for more information on the product/service or download the content. The initial feedback gathered during the project was very positive. However, the

decision on a commercial rollout will depend on the final evaluation of the solution's usefulness, security and ease of use.

A.2.23 USA: After initial failure, m-banking is now taking off fuelled by new technologies, entrepreneurial companies and the mobile-oriented habits of younger customers

While the U.S. has not been a leader in the development of mobile financial services, the mobile space is emerging with an emphasis on account management, rather than m-payments. M-banking is still a push product for U.S. banks as many consumers are not aware of this service and/or are concerned about privacy and security issues. Furthermore, customers are becoming increasingly suspicious of the behavior and actions performed by banks. Nevertheless, m-banking has seen a rapid increase from a negligible number of users at the end of 2006 to 1.7 million at end of 2007 to 3.1 million by the end of 2008 (according to estimates). As of early 2009, Bank of America had 1.9 million active users of its m-banking service compared to just one million at the end of June 2008. This figure may be compared with about 29 million users of its PC-based online-banking service.

U.S. banks have been experimenting with m-banking services for years, assessing needs of their customers. In 2002, Wells Fargo scrapped a service that allowed customers to check balances and make transactions from their phones due to disinterest. Bank of America had a similar experience before re-launching its m-banking services in 2007.

The new m-banking service allows customers to register online to activate the service. Afterwards, they can access their accounts from their mobile phone in a similar way as from their computer. The service is accessible by more than 85% of mobile phone subscribers in the U.S. having mobile internet access via Verizon Wireless, Sprint-Nextel, AT&T or T-Mobile. The offer includes a wide range of services including payment of bills, mortgages and home equity lines, fund transfers between Bank of America accounts and views of transaction details as well as the ability to check balances for savings and credit card accounts and receive e-alerts as text messages.

In the beginning of the year, Bank of America launched an updated software application that allows consumers to check their balances and pay bills through Apple's iPhone. Today, about 40% of Bank of America's mobile customers access the service via iPhone or iPod touch. Fortunately, the now widely available (EV-DO Rev. A and HSPA) high-speed mobile wireless networks have made it easier to view canceled checks and pay bills. In another example, Wells Fargo & Co. has begun to promote a service that allows business clients to approve wire transfers through their cell phones.

Although until now m-payments have not been the major contributor to m-banking in the U.S., banks clearly foresee their future importance. Citibank is currently testing services that use cell phones instead of credit cards and allow customers to pay through their phones. In addition to banks and mobile operators, independent m-payment service providers are playing an important role in launching m-payment services in the U.S. One of the most notable of these independents is Obopay, founded in 2005 and starting operations in 2006 Obopay could rapidly established a leading position in this area.

Although Obopay focuses on offering P2P (person-to-person) services, it also offers typical services such as bill payments and, soon, proximity payments. Although an early (2006) partnership with the MVNO Amp'd Mobile failed with the latter's bankruptcy in mid-2007, its core idea is still very much alive. The service allows mobile users to send money to any mobile phone number and to receive money from any Obopay user as well as to buy goods and services at more than 5.5 million retail locations and almost 400,000 ATMs across the U.S. To enhance the service, Obopay also collaborated with ViVOtech to allow users to access the ViVOwallet and pay for goods by waving NFC-equipped mobile devices at the 160,000 retail outlets equipped with a ViVOtech POS device.

In 2007, Obopay ran a pilot project with Citibank. Initially, participating Citi customers in Boston and Chicago were enabled to add money to their m-payment accounts via a joint web site, through credit card or electronic bank transfer. Later on, Citi announced the launch of an expanded pilot including a new mobile person-to-person money transfer service, claiming it as the first real-time

P2P mobile money transfer service in the U.S. with the ability to directly link it to a bank account. The service allows customers to use their phone's Web browser, SMS text messaging, downloadable mobile application and to send and receive money from mobile phones of friends and family members.

Together with MasterCard Obopay is developing a commercial product to be launched during 2009. The service will provide a front-end interface for mobile person-to-person payments handled by the card network's MoneySend remittance system. In another effort to build usage, Obopay changed its systems in 2008 to allow its users to send money directly from their checking accounts to recipients' bank accounts.

On the top of so far established partnerships, Obopay has managed to secure significant investments from the major handset vendor Nokia, targeted at product and market development. We see therefore an example of an independent service provider that has recognized the importance of partnerships with key value chain players for market expansion and positioning.

Citi has also entered into a partnership that involves the technology provider Firethorn (now acquired by Qualcomm and operating as its mobile commerce subsidiary), namely Citi Mobile for Cards. This mobile service allows Citi's credit card customers to access real-time credit card account information on their mobile phones. The service encompasses among others: viewing real-time balances, paying bills, setting up future payments, transferring money, searching for a branch or ATM, and connecting directly with customer service representatives. All Citi Mobile transactions are secured by 128-bit encryption, while the client's PIN and access are only active on a registered phone.

Another large bank, HSBC, launched a six-month mobile phone payment pilot in 2007 through its credit card unit HSBC Credit Card Services, in cooperation with MasterCard and ViVOtech. In the scope of this pilot project, 200 HSBC employees in New York, Chicago and other large US cities tested the use of NFC-enabled mobile phones for contactless credit card purchases. By introducing contactless debit cards in late 2005 and contactless credit cards in 2006, HSBC had already made the new NFC technology available to its users. Due to positive feedback, HSBC extended the pilot by allowing its debit cards to be downloaded onto NFC mobile phones, so that a multi-card NFC mobile phone field trial could be realized.

In 2006/07 Firethorn and AT&T conducted a trial on m-banking and m-payments services for BancorpSouth customers. The responses of the participants showed that m-banking is the second most popular channel, with on-line PC-based banking still holding the leading position. The majority would use mobile banking to check the status of their financial accounts. Among the respondents 30% said they would pay all of their bills using m-banking, while almost 75% believed they could make more informed spending decisions; 87% of the respondents preferred their bank's online web site for enrolment and 83% were likely to recommend m-banking to others.

In 2007, the mobile operator AT&T together with Firethorn and a number of financial institutions such as Wachovia Corporation, Regions Financial Corporation and SunTrust Banks signed agreements for the application of Firethorn's m-banking and payments platform. This platform allows users, among other services, to view account balances, transfer funds, receive and pay bills, and erase the contents of their mobile device if it is stolen or lost. In late 2008, the Firethorn platform was extended to the Apple iPhone.

It can be observed that similar partnerships are being implemented with other players. In 2008, Verizon Wireless and Firethorn announced that customers of major financial institutions, including Wachovia, SunTrust, FirstBank, and BancorpSouth, will get access to their accounts via their mobile phones.

We consider that these partnerships on the U.S. market are building a solid foundation for long-term growth in the adoption of m-banking and m-payment services. Their strengths lie in their nationwide coverage that provides convenient access for consumers on an "anywhere, anytime" basis, and the significant budgets that can be applied for marketing and educational campaigns as well as the availability of the services on popular, standardized platforms. However, it has to be considered that the variety of solutions brought to market from various program

issuers creates complexity and the risk of confusion among consumers, which has been and remains a significant inhibitor to the rate of growth of mobile-enabled financial services.

Nonetheless, almost all large U.S. banks offer m-banking services, and even small banks are starting to offer m-banking. By the end of 2008 about 245 banks offered m-banking still representing only 2% of total all U.S. banks (in terms of number of banks, not size). In most cases, banks are offering m-banking free-of-charge, as they believe customers - particularly younger ones - are likely to consider m-banking as a standard requirement.

A.2.24 OTHER COUNTRIES

The **Australian** incumbent Telstra has collaborated with National Australia Bank and Visa International to launch a field trial for m-payments based on the NFC technology in 2008. The NFC trial has been taking place in Melbourne with around 250 Visa, Telstra and NAB customers. The test persons have been given a smart phone with NFC capability in order to be able to make small purchases at about 30 designated retail outlets with installed NFC readers. Depending on the feedback, the commercial deployment might be possible in the next couple of years.

Croatia was one of the first European countries introducing m-parking as early as 2001. The service has achieved tremendous success, and nowadays it is applied in more than 50 cities throughout the country, being the leader even in comparison to traditional payment channels (70% market share in 2007). However, Croatian MNOs lately adopted only m-ticketing as another m-payment opportunity. The service was developed by the Infoart Group (co-developer of the successful m-parking solution besides Vipnet) and introduced in Croatian capital's public transportation in 2007. Apart from that Vipnet and T-Mobile offer few other SMS-based services (e.g. P2P money transfer services, utility bills payment). As long as P2P services are limited to only one single mobile operator (i.e. Vipnet) and to only one financial institution (i.e. Raiffeisen), we consider uptake potential to be limited.

There is a long history of m-payments in **Czech Republic** with voting via premium sms and m-ticketing for transportation services being the most successful m-payment applications. It seems that these two services fulfill the key success factors of m-payment uptake – unmet convenience – with m-ticketing based on a SMS model with all subscribers from all three mobile operators T-Mobile, Telefonica O2 and Vodafone being able to use the service. However we have not seen significant progress of m-payment markets lately, though m-parking services has been introduced to the citizens of Prague. It seems that operators are not able to agree on a viable business model that suits all stakeholders: operators, banks, retailers and customers. In particular m-banking uptake can be regarded as likely due to the fact that operators currently charge approximately a 10% service charge for any transaction (compared to 3-4% charged by Czech banks and payment providers). In order to boost m-payment uptake a couple of key issues need to be resolved: transaction charges need to be lowered, the ease of use needs to be enhanced, the operators and banks need to clarify and agree on a business model and regulations need to be simplified.

Denmark has a long history of m-payments, similar to other Nordic countries. Already in 2001, Orange Denmark (now owned by Telia) partnered with the Danish inter-bank group PBS to provide mobile based micropayments. In that early period of m-payment market development another initiative among Danish MNOs has been launched: Sonofon (owned by Norway's Telenor) has partnered with the carrier TDC as well as with the technology providers Siemens and DanNet to test the applicability of m-parking services and in-store m-payments within the supermarkets chain of the group Dreisler Storkob. However, in contrast to initial activities pushed by MNOs over the last period, we have seen independent service providers and merchants leading the development of the Danish m-payment market. Easy Park as one of the major parking management companies in Nordics has begun to cooperate with Danish cities to offer m-parking services. In the beginning of 2009, an agreement between the Danish IT-company Unwire and Danish public transportation companies DSB, Movia and Metroselskabet lead to the possibility for passengers in the metropolitan areas in Denmark to purchase their metro-, bus- and train tickets by sending an SMS. Besides applications in the transportation industry, in 2008 there were new m-payment services launched by a Cellpoint Mobile (an independent

provider of mobile solutions in the area of m-payments). Cellpoint Mobile partnered with Denmark's first and largest online bookstore Saxo to offer customers the option to buy books through a mobile shop based on Cellpoint Mobile's mPoint technology and DIBS' Internet Payment system. The Royal Danish Theatre has also decided to offer their customers the option to purchase tickets via the mPoint technology of Cellpoint Mobile. We expect that MNOs in Denmark will take a more active role in the rollout of m-payment applications and the m-payment market development marketing the future.

Estonia is considered to be one of the leading European markets in terms of usage of innovative mobile technologies. M-parking services were already launched in Estonia in 2000 and adopted by all three mobile operators: EMT, Elisa and Tele2. Currently, the second most frequently used application is m-ticketing in public transportation of the capital Tallinn and the city of Tartu. The acceptance of m-payment is supported by the government. For example, the country's parliament approved a law making Estonia the first country to allow voting by mobile phone in the next parliamentary elections in 2011.

In Finland, m-payment services have a long history. Already since 1997 some mobile-based banking services, such as credit transfers and balance inquiries, have been available. In 1997, the Finish MNO Sonera launched the first m-payment applications for buying soft drinks from vending machines at Helsinki-Vantaa airport and as of 2000 application also included payment of parking fees, restaurant bills and movie tickets. In 2002, Sonera launched an operator-independent m-payment service with Luottokunta, the Finnish interbank group, named 'Shopper' which enabled subscribers to pay by mobile phone at a range of shops, including Pizza Hut and Tiimari general stores. With regards to the NFC technology, Finland has been one of European countries where municipal authorities have been very active in supporting the technology development. Already by the end of 2006 authorities of the Tampere city have strongly contributed to the launch of the NFC trial program in the city's public transportation. The project participants on the technology side were TeliaSonera, TietoEnator (IT service company) and Nokia. Besides Tampere, the city of Oulu has been important tested for the NFC technology. In 2007, the city's officials have developed a strategic plan that supports development of IT potential within local community. Oulu has joined a SmartTouch project that has brought more than 20 European partners (among which were Nokia, Gemalto, TeliaSonera, Nordea etc.) and which aimed to test NFC technology in number of community services in period 2006-2008. Over this period, community of the city of Oulu has tested 10 trials of different NFC service applications. These applications ranged from ones that we have often seen in other countries like: purchasing of bus tickets, m-parking, or restaurant service, to more innovative ones like: NFC based blood glucose management or NFC application in the school environment.

In Kenya, Vodafone developed the mobile payment solution M-PESA which is operated by the local mobile operator Safaricom. Only one year after its launch in 2007, M-PESA had 2 million customers or 50% of the banked Kenyan population due to the service's convenience, simplicity, security and low costs. Unlike Wizzit and MTN MobileMoney in South Africa, M-PESA does not offer typical m-banking services but focuses more on simple (micro) money transfers. The huge success of this business model is being replicated in other developing countries in which Vodafone operates. However, the success of M-PESa has also spurred competition from regional market contenders. Zain, one of the leading MNOs in the Middle East and African region, has partnered with leading international and regional banks (e.g. Citigroup, Standard Chartered) to launch in 2009 its Zap mobile money service in African countries where the company already operates. Zap will be initially available in Kenya and Tanzania prior to launch in Uganda. Besides the service portfolio very similar to one that M-PESA is offering, Zap will enable over 100 million potential service users to send cross-border airtime trough the Zain's One Network service across Kenya, Tanzania and Uganda.

The mobile commerce industry in India is in the growing phase as many entrants are trying to position themselves as the leading service provider. We see that main mobile operators like Airtel and Reliance are already offering a wide range of m-commerce services, ranging from the frequently used bill payment to the more expensive airline ticketing. Financial institutions like ICIC Bank offer typical m-banking services in

cooperation jointly with Reliance. Independent service providers such as PayMate, OnMobile, mChek and Obopay offer a diverse range of m-payment services often open to subscribers of all mobile networks. Since India is one of the countries leading remittance inflows, cross-border remittances will be a future area of m-payment business growth.

Poland is an example of a European country where an independent service provider has driven the m-payment market. MPay, as an independent player, has introduced diverse services ranging from m-parking to recently launched "Pay With Your Mobile" service which was born as a result of a partnership between Citi Bank's Polish subsidiary, Citi Handlowy, Warsaw Transport Authority, Zarzad Transportu Miejskiego and a MNO, Polkomtel. Initially the m-payment platform was only planned to be used for municipal transport, but mPay has even higher goals than solely the extension of its service application, it aims at creating a common standard for m-payment in Poland.

In **Sweden** SMS loans are currently experiencing an enormous uptake. Specialized SMS loan players are emerging at a high speed and up-to-date there already more than 30 players on the market. By sending a SMS including the personal identification number, a specified amount is credited to the requestor's bank account. Credit amounts are usually between EUR 100-300 with interest rates being very high (so-called 'charges'). Further m-payment services like m-parking or m-ticketing for public transportation are also becoming more and more popular in Sweden. In addition, Dialogue Communications recently (December 2008) launched its mobile billing services in Sweden, which allows customers to buy products and services over the mobile internet. The WAP billing solution is currently only available for one-off purchases and allows customers (vendors) to design their own mobile Internet sites, which are able to charge their customers directly to their mobile phone bill.

Turkcell, the leading mobile operator in **Turkey,** Garanti Bank, one of the three largest financial institutions in the country, and E-Kart, a technology partner, have joined forces for m-payment trial using NFC technology at the end of 2007. The trial was been launched as a part of the GSMA "Pay Buy Mobile" initiative. We consider Turkey to have a high potential for mobile based NFC technology adoption as Garanti Bank implemented MasterCard's PayPass contactless payment system in 2006 and already around 3,000 retailers across the country use the contactless readers.

In the **Ukraine**, Ukrgasbank JSB developed the first m-payment solution in 2007. The SMS based payment service allows subscribers of the mobile operator Golden Telecom to pay for services in restaurants, hotels or at retailers that are subscribers of the service.

Appendix B: Contributors and references

B.1 Interviews

In 2008 and 2009, we have conducted more than 70 interviews with industry experts from diverse industries, such as mobile operators, banks, credit card companies, payment service providers and suppliers, in 35 countries. *(Exhibit 17)*

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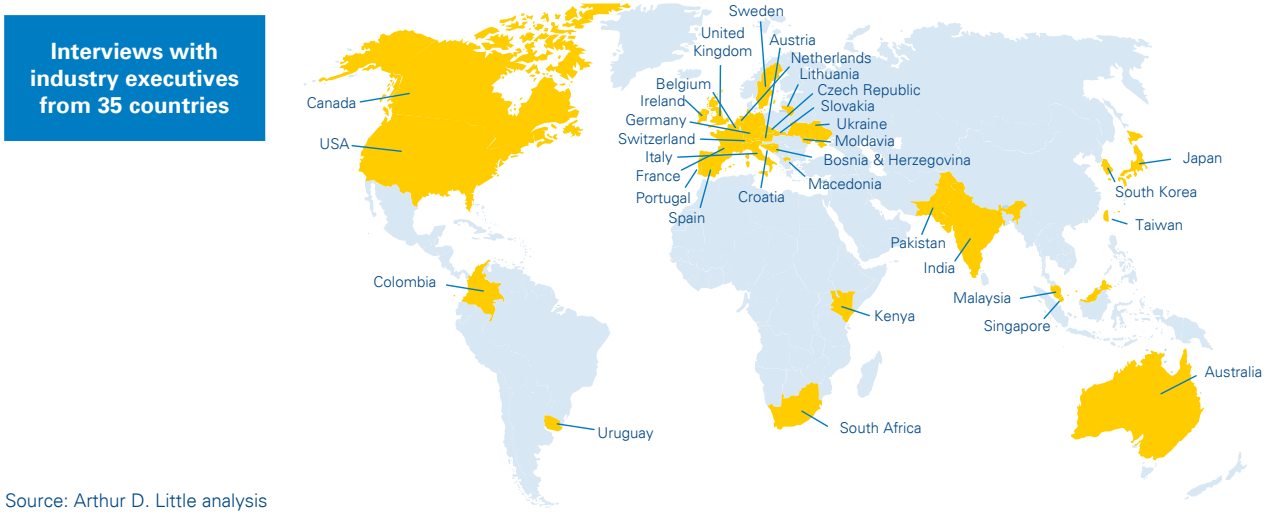
Exhibit 17: More than 70 interviewed industry experts, representing 35 countries on 6 continents contributed to the fourth Arthur D. Little's edition of the M-payment report series



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Appendix C: Definitions and acronyms

Term	Defintion
ARPU	Average Revenue Per User
ATM	Automated Teller Machine
Bluetooth	Chip technology enabling seamless voice and data connections between a wide range of devices through short-range digital two-way radio. It specifies how mobile phones, computers and PDAs interconnect with each other, with computers, and with office or home phones
Card cloning	Unauthorized duplication of credit cards
Churn	For any given period of time, the number of customers who discontinue their use of a service divided by the average number of total customers.
CP	Content Provider
CRM	Customer Relationship Management
Customer	User who orders the content, service or physical good using a mobile device
Customer Retention	The process of building a relationship with customers by learning as much as possible through surveys, demographics and psychographics.
Digital signature	An electronic signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and possibly to ensure that the original content of the message or document that has been sent is unchanged. Digital signatures are easily transportable, cannot be imitated by someone else, and can be automatically time-stamped. The signed message provides prove that it arrived, meaning that the sender cannot easily repudiate it later.
Data mining	Sorting through data to identify patterns and establish relationships
Dual SIM phone	Mobile phone capable of using two different SIM cards simultaneously.
eCash	Developed by DigiCash and the Mark Twain Bank, eCash is the ability to use real money in an electronic purchasing system over the Internet. A customer sends a check to Mark Twain Bank, which in turn sends the customer software that gives access to the ecash Mint. The customer can then use the funds when purchasing goods and services on the Internet. Cancelled in 2001.
E-Money Directive	The EU E-Money Directive imposes requirements in respect to electronic money (e.g. that the electronic money must be redeemable for cash at an equal value) and obliges electronic money issuers to implement safeguards against money laundering. It defines electronic money as monetary value stored on a chip card or on a computer's memory, which is accepted as a means of payment by undertakings other than the issuer.
E-Wallet	Provides a portable secure database for personal data. The data is kept secure providing password protection using industry standard encryption algorithms.
GPRS	General Packet Radio Service
HCI	Host Control Interface positioned between the smart card platform and mobile devices' application processors
HTTP	Hyper Text Transfer Protocol
i-mode	Proprietary packet-based information service for mobile phones. i-mode delivers information (such as mobile banking, and train timetable) to mobile phones and enables exchange of email from handsets on the PDC-P network. Launched in 1999 by NTT DoCoMo, i-mode is very popular in Japan (especially for email and transfer of icons), but is not currently being used elsewhere, PDC, WAP.

IR	Infrared
IrDA	Infrared Data Association
IVR	Interactive Voice Response
J2Me	Java 2 Micro Edition
KYC	Know Your Customer norms refer to a policy framework applied by banks and other financial institutions, which aims at knowing new customers before opening any account in order to prevent identity theft, identity fraud, money laundering, terrorist financing, etc. KYC norms imply verifying customers' identity and address by asking them to submit documents that are accepted as relevant proof. They can be applied occasionally, although a customer has already opened a personal account.
Merchant	Provider of the content, service or product
Micro browser	Modified Web browser that allows users to get internet data on a handheld wireless device.
Micro payment	An online payment transaction with a minimal value. Micro payments are typically too small in value to be processed on a credit card so they function as digital cash.
Mobile network operator (MNO)	Provides the infrastructure for ordering and payment, for digital goods also responsible for delivery, including the metering of download volume, elapsed time for data sessions and the like.
MMS	Multimedia Messaging Service
NFC	Near Field Communication is a wireless communication technology characteristic for its short-range accessibility. It provides data exchange between NFC enabled devices at about 10 centimeters distance.
OTA	Over The Air is a method of provisioning handsets with the necessary settings with which to access services like MMS or WAP.
B2P	Business To Person
P2P	Phone To Phone
Payment confirmation	The customer confirms the payment outlay on the mobile phone.
Payment service provider (PSP)	A company that provides settlement of the payment from the user to the merchant
PIN	Personal Identification Number
Point of sales	The actual entry point of the sales order into the system; in real life, the cashier in a shop. For m-payments also a taxi ride, a video or game server, etc.
POS	Point Of Sale
Proximity Payment	Also referred as contactless payment, it covers non-cash payment transactions without any physical connection between the consumer payment device and the physical POS terminal. Thus the resulting financial transaction will be transferred to the issuing bank using standard payment network infrastructure.
Pricing method	In real life price per good. For digital content a range of options: price per volume / time, per event, recurring per period, etc.
PSD	Payment Services Directive (PSD) aims to create a European market for payments while improving national businesses at the same time, offering consumers wider range of less expensive services.
RFID	Radio Frequency Identification Device

Remote Payment	Purchase made over the network
Reverse Billed Premium SMS	Reverse-billed premium rate SMS deliver content to mobile telephone handsets for a charge. Consumers typically subscribe to a service and are then charged a premium for the messages that they receive.
SEPA	Single Euro Payments Area is an initiative by the European banking sector which aims to establish the same procedures and obligations across the EU countries for credit transfers, direct debits and payment cards.
Server Wallet	An encrypted database of a customer's data stored on a server.
SIM	Secure Identity Module
SMS	Short Messaging Service
SoHo	Small Office, Home Office
SP	Service Provider
SWP	Single Wire Protocol is a specification for a single-wire connection between the SIM card and an NFC chip in a mobile phone.
TSM	Trusted Service Manager
User identification and authentication	User is identified, e.g. using the MSISDN of his mobile phone. For authentication, the PSP verifies that the phone with the given MSISDN is involved in the transaction assuming that the account owner is in possession of the phone when the confirmation takes place. Requesting the customer to enter a PIN can enhance the authentication. The option to use a PIN depends on the desired trade off level between customer purchase convenience and the limits needed to lessen fraud risk.
WLAN	Wireless Local Area Network

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M-payments are surging ahead

There are distinct growth opportunities to exploit in developed and emerging markets. In some markets, customers can already pay the restaurant bill via their mobile phone.

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