

Can E-Payment Systems Revolutionize Finance of the Less Developed Countries? The Case of Mobile Payment Technology

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ABSTRACT: Technological progress in mobile industry makes mobile phones the most adopted technology of the last decade by the rich as well as poor. Mobile phones were at first intended for voice communication; nowadays they are used for sending and receiving information providing many advanced services to their users. Recent generation of mobile phones allows consumers to carry out transactions in the real and the virtual world by the use of mobile devices through mobile networks. It is done by using mobile device such as mobile phone or PDA which is connected to payment access using mobile operator network. The aim of this paper is to analyze the technological evolution of mobile phones and to identify the macroeconomic consequences of their introduction into the financial sector.

Key words: e-payment system, mobile payments, financial exclusion, economic growth
JEL Code: G21, O30, R11

1. Introduction

Since a few years, new forms of electronic payments have emerged. Their aim is to enhance and improve the efficiency of traditional payment systems notably cash and checks. These new devices have information stored in a microprocessor or on a computer database which allow data- including account balances, personal information, PIN codes, the history of the shopping information and loyalty rewards- to be stored on the card. Among these new innovations, two monetary forms have quickly received considerable attention around the world. The first one is the electronic money card (also known as electronic cash, e-purse, e-currency, digital currency, digital money, scrip or digital cash) and the second one is the mobile payment via a personal mobile telephone (m-payment). The e-money card is a new means of payment which makes it possible to transfer value from card to terminal or card to electronic wallet, both in the real world and via networks. This monetary innovation is seen as a fundamental achievement; it carries a preloaded monetary value and can be used as a means of payment for multiple small value purchases (Van Hove, 2006; Hamdi, 2007). The purse contains a microprocessor in which information and monetary value are stored. It represents a technological advance on cards with magnetic stripes, and also includes a higher level of security that can dramatically reduce fraud because chip cards are much more difficult to counterfeit than magnetic stripe cards (Chaum, 1997).

Mobile payment is a new channel used to conduct financial or commercial transaction between buyers and sellers by the means of mobile devices through mobile network. It is done by using mobile

¹ The opinions expressed in this article are those of the author and they do not necessarily represent the official position of the Central Bank of Bahrain.

devices (Cell phone, PDA etc) that are connected to payment access using mobile service provider network. A service provider server is connected to the bank server using merchant which performs authentication and authorization function, and subsequently presented with a confirmation of the completed transaction². This payment technology eliminates the need to visit the bank's branch. Consumers can easily manage all their financial needs with a lower transaction costs.

In this paper; we will focus only on mobile payments technology for three reasons: first, because despite the strong interest worldwide in e-money, the technology is still at an early stage of development and many experiences were failing³ (Hamdi 2007, 2009). Second, because innovations in mobile phones have quickly evolved in the recent years and the mobile phone becomes the smart phone offering a wide range of services for its users. Finally, because the world adoption of mobile phones has exploded in the last few years (by the rich and the poor) making this technology the best device facilitating the financial inclusion for the poor. The aim of this paper is to analyze the possible economic consequences of the introduction of mobile money into the financial and commercial sector. This article is divided into two parts: first, we analyze the evolution of mobile phones' technology over the time and we present the different new services that are offered to their holders. Second, we study the challenge of mobile money as a new payment device facilitating the financial inclusion of unbanked households notably from the poor countries.

2. Evolution of the Mobile Phone Technology

The technology of the mobile phones has grown over time moving from the first generation in the 1970s to the fourth generation. Today's mobile phone is not only a simple device of voice communication, but also a smart telephone with many applications similar to a laptop. The aim of this section is to analyze the evolution of mobile phones' technology over time and to present the different new services that are offered to their holders.

2.1. Mobile phone as a communication device

Mobile phones were born in the United States in the early forties. They were a heavy device with restricted services; they were costly and constrained by imperfect mobility (Vesa, 2005). Since then, engineers and developers were working to improve the performance of the technology and to enhance its use. As a result the first generation (1stG) of mobile phones was born in 1970 and they were initially installed in vehicles; they were called "car phone service". The 1stG of mobile phones has started to be in widespread use in the eighties with the introduction of cell phones that were based on cellular networks. In the nineties the second generation (2ndG) of mobile phones using the Global System for Mobile Communication (GSM) technology was introduced. The new device was less large and more manipulative than the 1stG. It has allowed users to benefit from many new services such as the Global Positioning Service (GPS), Short Messaging Service (SMS), voice messaging, fax and other services. Consequently, mobile phones became popular and the number of subscribers rose drastically.

In 2002, a third generation of mobile phones was appeared. The 3rdG was considered as a revolution in the telecommunication sector because it offers a wide range of advanced services for users such as broadband internet, Bluetooth, WI-Fi and the high-tech video call. Nowadays the demand for mobile phones continues to increase at a phenomenal rate of growth and prices continue to decline.

Table 1. Worldwide evolution of Mobile cellular subscriber (1997-2008)

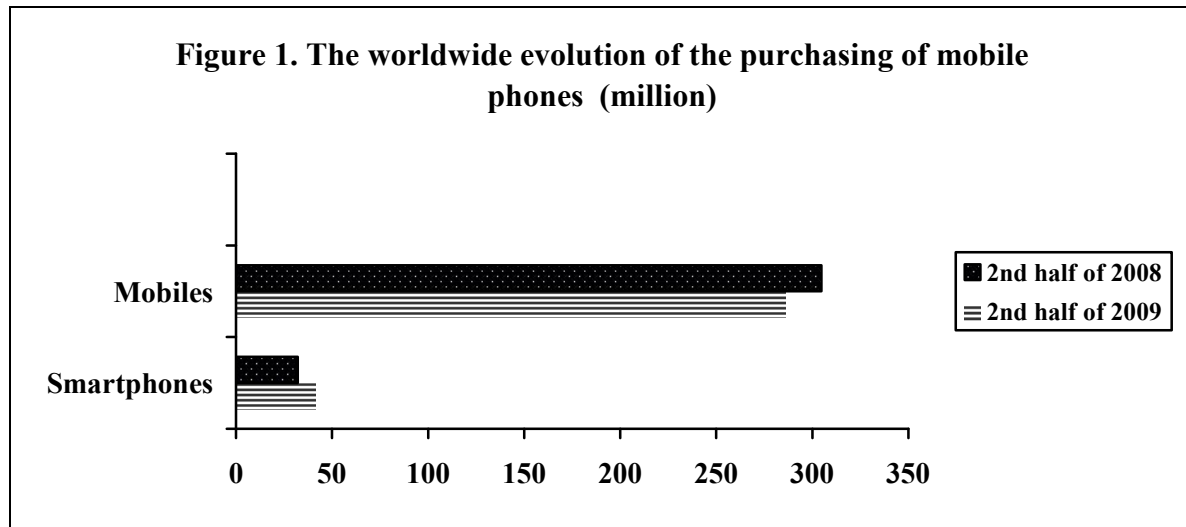
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mobile cellular subscribers (millions)	215	318	490	738	961	1'157	1'147	1'763	2'219	2'757	3'305	4'100

Source: ITU World Telecommunication/ICT Indicators Database 2009.

² Tata Consultancy Services (2008)" Alternative Payment Systems, Chapter-17 in Payment card". Certificate Program in Payment Cards Competency V1.3TCS FTC (A Domain Competency Centre)

³ Major e-money experiences are still in their primary stage and they have not been in widespread use so far either in the European Union or in other industrial countries.

The figure 1 illustrates the worldwide evolution of the mobile purchased in 2009 and Table 1 shows the worldwide evolution of the cellular subscribers since 1997. Mobile phones seem to be the most successful technology and the most adopted; becoming an integral part of the 21st century landscape.



Source: Gartner 2009

Innovation in mobile phones has always been evolving over the time and the technology has been improved. Currently, many sophisticated services are added to the 3rdG mobile phones including financial services. Nowadays the mobile phone is in a widespread adoption and this technology is not used only as a mean of communication but also as a new payment solution. Today’s mobile phones (called 4thG) can store money (as information) in the SIM card or in an internal or external memory card and can be used as a device to transfer monetary value from person to person in the real and the virtual world. Mobiles phone are becoming a means of payment and a channel to conduct financial services. This system was born in the recent years and it has received a large acceptability from emerging countries which are excluded from the financial services. In France, the experience of m-payment was first experienced on 20th of May 2010 at Nice; consumers seem to be charmed and 500 merchants are already interested about the adoption of this new payment technology.

2.2. Mobile phone as a new payment device

Mobile money is a new payment technology used to facilitate financial or commercial transactions (called m-commerce) between buyers and sellers by the use of a mobile phone as an alternative for credit and debit cards, cash, or other means of payments. Monetary value is stored as credit information and can be transmitted through a secure applet. Mobile money can be used in the traditional market for both micro and retail transactions. Payment with mobile phones in the traditional market is based on contactless technology called Near Field Communication (NFC) with a compatible payment terminal. Similar to the stored-value card, an NFC is a new short-range device equipped with a chip that stores the users account information, while merchants require special Point Of Sale readers (POS). The chip is either separated from the SIM card of the mobile network operator or embedded in it. Customers can pay both by swiping the phone across a special reader or by composing a personal identifying code (PIN) into the phone to authorize payments via a short message service (SMS). Mobile money can also be used in the virtual market via the Wireless Application Protocol (WAP) service for the two kinds of transactions and without using a credit card or bank account.

Generally, m-money aims to replace cash for small transactions and eliminate its drawbacks⁴. M-money was also created to reduce transaction costs of traditional means of payments and to provide a new way of storing and transporting purchasing power temporally. This technology would facilitate

⁴ The costs of cash holding are high and disadvantages of cash are numerous – including retail transaction accounting, theft, loss of cash, safekeeping and security, deposit costs, as well as costs related to cash management services provided by financial institutions. For more details see Hamdi H (2007)

a variety of low value retail transactions and would consequently be a substitute for real cash. M-payment has also a great advantage compared to other POS cards: while debit or credit cards are not efficient for micro-payment because the transaction related-cost is high for both the consumer and the merchant, m-payment can be used at a low cost. As a modern and rapid payment means, it will certainly be of great convenience for its users.

M-money provides numerous benefits to consumers, merchants, banks and Mobile operators. Benefits to consumers include convenience, speed and possible rewards, such as discounts on future purchases, obviation of the need to have the correct change for a transaction or to handle a lot of small coins. The incidence of error in calculating change from transactions would also be reduced. Benefits to merchants include receiving cash in advance of the delivery of goods and services, increased loyalty, potentially faster payment processing at the point of sale, and potentially lower payment processing costs. Benefits to banks consist of gain of time related to cash and checks management. This means that they are better supervised by bankers than other traditional tools of payment (Hamdi 2007). M-money may also benefit to banks by reducing costs; enhancing customer service and improving the banking competitive advantage. For mobile operators, m-payments provide new opportunities to drive additional revenue via mobile shopping and payment traffic. Operators can enhance their services portfolio, encourage their brands and create strategic marketing differentiation - attracting new consumers.

3. The Relationship Between Mobile Payment Systems and the Access to Finance

Near than hundred years ago, an Austrian economist Schumpeter argued that banks play a major role in economic development due to their ability to managing risk, creating wealth and allocating capital into wealth-creating projects⁵. Banks have economies of scale in providing information; lowering transaction costs; mobilizing savings for investment and improving the liquidity of assets available to saver. Financial intermediaries may help promote resource allocation and accelerate growth by increasing savings and improving borrowing options and the reallocation of capital. For Schumpeter, financial intermediaries are at the core of financial development and financial development is the hub of economic growth.

In developed economies, banking sector is dynamic and the financial sector is highly developed. However, in poor countries, the financial sector is archaic and people face a financial exclusion. Financial exclusion is the phenomenon by which a certain segment of the population is deprived of the access to indispensable financial services; i.e. banking account. Financial exclusion can be a serious barrier hindering the economic development and an impediment to growth. In this section we firstly illustrate the relationship between finance and growth; secondly, we identify the macroeconomic consequences of the introduction of mobile payment into the financial sector.

3.1. Finance and growth: lessons from the theory

Finance is at the hub of economic development and financial services sector becoming one of the most significant sectors in modern societies. Affordable and appropriate finance enables business to work efficiently. The financial sector mobilizes saving and allocates credit across space and time; it provides funds for businesses to innovate, generate new technologies and new more productive ways of operating. Based on empirical demonstrations; scholars⁶ suggest that efficient financial systems are crucial in channeling funds to the most productive uses and in allocating risks to those who can best bear them, thus boosting economic prosperity, improving opportunities and income distribution, and reducing poverty (World Bank, 2008). In more advanced service economies, the financial sector employs more than the manufacturing of apparel, automobiles, computer, pharmaceuticals, and steel combined (Harker and Zenios 2000). As the table 2 shows; the financial sector is even more significant for economic development in both modern and emerging economies.

⁵ Schumpeter, J A. 1912. *“The Theory of Economic Development”*. Cambridge, MA: Harvard University Press, 1934.

⁶ King and Levine (1993, 2003), Levine and Zervos (1998), Rajan and Zingles (1998).

Table 2. Importance of the financial sector in selected countries (2009)

Countries	Number of people employed in the financial sector	% of active population	% of financial sector to GDP
France	430 000	2.5%	≈ 4 %
USA	2 500 000	7.5%	5. %
Germany	712 000	7%	5.5%
Italy	337 000	3.2%	3.5%
Switzerland	330 000	7%	9%
Cyprus	53.000	10%	18%
Israël	89 000	10%	18%
Singapore	65 000	8%	8%
Hong-Kong	87 000	8.2%	9%

Source: Us Bureau of Labor Statistics (2009), CPSS (2010) and Countries' Central Banks (2010)

In the modern financial service economies such as in the US, France, Germany and Switzerland, a large part of households are banked. More that 80 percent of customers have a banking account. The high financial inclusion allows households of developed countries to get better information about the financial environment; it increases the consumers empowerments and offers them a wide range of financial services such as new means of payments (stored-value-card, debit/credit card) and new delivery Channel of making transactions (e-banking, ATM). Financial development may allocate wealth in the economy to their most productive uses and creates an environment favorable for the entry of new firms, innovation, and growth. As King and Levine indicate (1993) *“higher levels of financial development are significantly and robustly correlated with faster current and future rates of economic growth, physical capital accumulation and economic efficiency improvements... Finance does not only follow growth: finance seems importantly to lead to economic growth.”*

3.2. The macroeconomic consequences of mobile payment

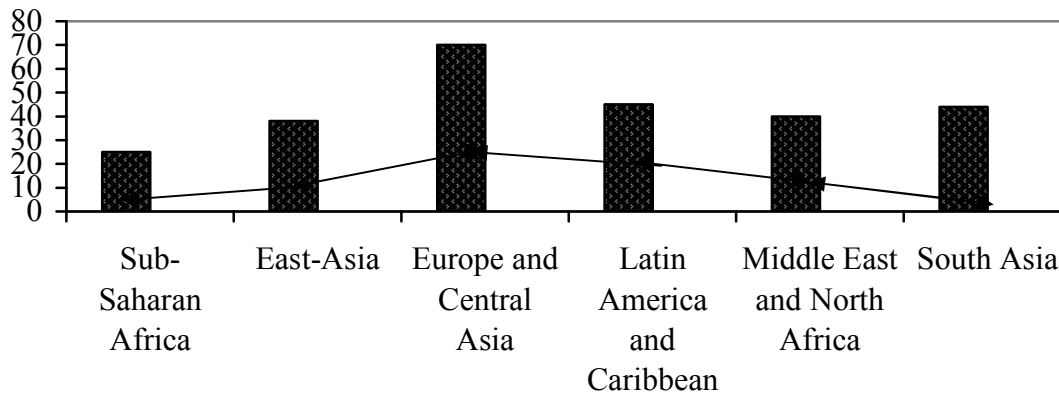
In the poor countries access to finance is narrow; people face a financial exclusion⁷. In some countries such as India or sub-Saharan Africa, almost 70 percent of population lives in rural areas where access to banking services is very limited⁸. According to a recent study of the World Bank (2008) more than 75 percent of people from developing countries are unbanked. Households save their money in their houses (pockets and cash boxes or under mattresses) because on the one hand, the density of the branch's physical footprint is not sufficient and on the other hand the banking services fees are unaffordable. People do not have bank accounts or payment cards and banks are only accessible to privileged elite (high income earners)⁹. In many developing countries, savers are required to deposit more than their annual per capita income in order to open a deposit account with a bank. For example, to open a checking account in Cameroon, a person needs more than \$700, an amount higher than the per capita GDP of the country. In other regions, the account maintenance is exorbitant and sometimes costs 50 percent of per capita GDP (30% in Uganda). The World Bank study (2008) shows that on average an amount equal to at least 50 percent of per capita GDP is necessary to open a checking account in some poor countries. The figure 2 illustrates the proportion of households with an account in a financial institution in many regions of the world. It shows that less than 20 percent of Sub-Saharan African households have a banking account. This situation inhibits the economic development, increases poverty and social inequality.

⁷ Financial exclusion refers to a process whereby people encounter difficulties accessing and/or using financial services and products in the mainstream market that are appropriate to their needs and enable them to lead a normal social life in the society in which they belong (EUROPEAN COMMISSION 2008, p 9).

⁸ IFAD (2001) *“The challenge of Ending Rural Poverty »*, Rural Poverty Report 2001. Oxford University Press.

⁹ The ethnical race, income, education, sex are other reasons for being unbanked. In this paper we consider that for poor economies, the major reason is the expensive cost of financial service. For more detail, see FDIC(2009).

Figure 2. Proportion of households with an account in a financial institution



Note: Figure shows the highest and lowest national percentages for the countries in each region. Arrows reflect the median for each region. Source: Honohan (2006).

Nowadays, mobile payment seems to be the best tool able to create a new financial architecture and capable to reduce the financial fracture between the rich and the poor (HAMDI 2010). In Africa, more than 50 percent of population has a mobile phone and less than 20 percent of them have an account in a financial institution. Around the world, 1 billion of poor people are unbanked but do have mobile phones¹⁰. The CGAP study (2009), expects that by 2012 the number of mobile subscriber will attain 1.7 billion, making mobile phones a direct conduit to nearly half of the world's unbanked people.

The move toward an m-payment system may provide a fabulous opportunity to realize greater financial inclusion. Barriers to the use of financial services may disappear progressively and financial services will be accessible to all at an affordable price. With mobile phones, customers do not have to walk miles to find a banking branch; they are instead carrying the banking branch in their pockets (Bueno, 2008). Thus, access to financial services will increase when the use of mobile for commerce rise. This situation may encourage households to have a banking account and to enjoy the benefits of financial services. The use of mobile phones technology for everyday commercial transactions could make economic activities flourish, enabling the entrance of new firms and encouraging people to consume¹¹. Money under mattress could move into the financial institutions and it could be better managed in favor of economic activities such as credit allocations and investment. Banking activities will become dynamic, access to loans will be easier and economic activities will prosper. In this sense, mobile phones have the potential to bridge the digital divide and allow organizations and individuals to reach out to one another more easily than ever before¹².

In this paper we suppose that m-payment could facilitate the financial development (inclusion) and that the financial development could contribute to increase incomes of the poorer (through interest earned) and enhance their ability to undertake profitable investments and other activities. As a result, m-payment could enhance GDP of poor economies. Many developing countries such as Philippines, Kenya and Brazil have tested the m-payments experience in their economies. Consequently, their mobile operators, financial institutions, consumers, merchants and the economy on a whole, have

¹⁰ National Consumer Law Center (2009), "Cell Phone E-Wallets for the Unbanked and Immigrant". NCLC Report. June 2009, Boston.

¹¹ According to Global Insight Research, growth in electronic payments in the U.S, has added an additional US\$6.5 trillion to real consumer spending (adjusted for inflation) over the last two decades. The cumulative gain was almost US\$10 trillion, a growth increase of 0.5 percentage points per year, or the equivalent of 1.3 million new jobs.

¹² GS1 Group (2008), "Mobile Commerce: opportunities and challenges Mobile Commerce Overview: why mobile is changing the way business happens. GS1 Mobile Com White Paper February 2008 Edition

started to benefit from the financial and the technological innovations. The CGAP study (2009) shows that m-payments activities have generated in 2009 US\$7.8 billion in new revenues for the mobile money industry coming from transaction fees, improved loyalty, and more cost efficient airtime distribution¹³. In the near future m-payment could incontestably revolutionize economies and finance of the third world.

4. Conclusion

Since the last decade, the mobile phone industry has gradually added many services to be accessible through the use of mobile phone. As a result, the demand for mobile phone has increased considerably making them highest demanding telecommunications technologies of the last few years by rich and poor households. Currently, mobile networks cover more than 80% of the world's population and nearly 3 billion people are estimated to have a mobile phone (ITU 2009). The most recent generation of mobile phone (4thG) offers financial services to their users. Mobile phones are becoming payment devices able to transfer monetary value from person-to-person in the real and the virtual world. Today one can pay with mobile money without revealing the personal mobile phone number and authorize all the mobile phone payments with a mouse click.

The aim of the present contribution is twofold: first it presents the evolution of the technology in mobile phones industry since the seventies and second it analyzes the economic consequences of the high penetration of the technology for the less developed countries. We demonstrate that the performance of mobile phones and the new services that they offer (financial services) make this technology the best tool facilitating access to basic financial services for the poor. Mobile phones are the only available technology that can change economies of the developing countries. The move toward an m-payment system creates an unprecedented opportunity to extend the benefits of financial services to the third world.

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¹³ CGAP study (2009), *"Window on the Unbanked: Mobile Money in the Philippines"*. Available at <http://www.cgap.org/p/site/c/pubs/>.

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