

Chicago Fed Letter

Are mobile payments the smart cards of the aughts?

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This article compares the much anticipated but ultimately stalled smart card revolution of the 1990s with the current expansion of mobile payment platforms, and asks how mobile payments fit into the larger payment system.

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In the past few years, payment networks and banks have begun to follow in the footsteps of start-up companies and offer mobile platforms, meaning in-person or remote payments via a mobile phone or other mobile device. Is this just another overhyped trend (like smart cards in the 1990s), a real payments revolution, or something in between? In short, are mobile payments the smart cards of this decade?

During the 1990s, payments industry analysts, policymakers, and academics predicted an eminent “smart card revolution” as providers began to use closed-loop trials and focus groups to test different types of cards. Smart cards look like credit cards but utilize a microchip to store identification and transaction information. The most famous smart card trial was the 1996 Olympic Games, when Visa developed a smart card for use at 1,500 merchants inside Atlanta’s Olympic stadium. Consumers were not inclined to embrace smart cards, given the other payment options available, especially because they were accepted in only a limited number of locations. Smart cards never took off in the general marketplace during the 1990s, and they remained in the trial phase because of ongoing challenges related to infrastructure, marketing, standardization, and profitability.

A decade later, we are just beginning to see the adoption of contactless chip

cards using radio frequency identification (RFID) technology. All of the major card networks and many large financial institutions have rolled out contactless products. Some very large merchants, such as McDonald’s and Wal-Mart, have invested in RFID infrastructure. More than 40,000 U.S. merchant locations accept contactless payments. Analysts estimate that there are 27 million contactless cards in the U.S. today.¹ Eleven years after the first major trial, smart cards finally seem to be gaining some traction.

In the current decade, a new payments revolution is being hyped that combines two subsets of mobile commerce—mobile payments and mobile banking. Mobile payments are defined as “any payment where a mobile device is used to activate and/or confirm the payment.”² A variety of solution providers, payments processors, and other institutions can offer mobile payments. Mobile banking, on the other hand, remains the exclusive domain of financial institutions that have a deposit relationship with a consumer. While mobile banking services can enable mobile payments, the reverse is not true.

Each subset of mobile commerce is predicted to grow exponentially in the marketplace. Some analysts predict that, globally, mobile payments will be worth \$55 billion in 2008.³ But as with smart cards, while mobile payments have gained ground in Asia and Europe, they have

not in the U.S. There are a number of reasons for this, including regulatory, market, technological, and cultural differences. First of all, the existing electronic payments infrastructure in the U.S. is expensive to replace, especially for merchants. In some cases, countries with less developed electronic payment systems have been able to move more

communication (NFC) technology is built into the phone.⁴ The other option integrates payments into the phone's software, enabling a consumer to use the phone as a virtual "mobile wallet." For in-person or proximity payments, consumers use the phone to make a purchase at a point-of-sale terminal that is equipped to handle the payment. Remote payments utilize SMS, wireless application

To be successful, any new payment form needs a large customer base and a high volume of transactions. The mere prevalence of mobile phones does not necessarily mean that enough consumers will embrace them as *payment* instruments. Mobile payments are in their infancy, and while consumers currently see their potential value, it is difficult to gauge their inherent value. Research suggests that consumers need more exposure to mobile payments possibilities before we can understand the factors driving adoption. Because of its high mobile phone usage, the youth market has been touted as the cohort that will catapult mobile payments into the financial mainstream. One survey found that, in the past year, more than 10% of respondents made a purchase with a mobile phone, while a slightly higher number made a person-to-person (P2P) payment with a mobile device. The same survey found that those aged under 25 purchase digital content for their phones, while those aged 25–34 are more likely to use phones to transfer funds.⁷

Importantly, although mobile payments represent another payment choice for consumers—who are estimated to make 58 individual payment choices each month—these payments often rely on traditional funding and settlement systems.⁸ In fact, many current U.S. mobile payment trials, especially those focused on proximity payments, are dependent on the existing magnetic-stripe-card-based infrastructure. In these cases, the mobile phone becomes a device through which consumers access payment card accounts, and arguably, no real payment substitution takes place. On the other hand, at some point in the future, a chip placed in a phone or another device could become the primary way that consumers access credit or prepaid accounts, eliminating the need for a physical card.

Payment trials and tribulations

There is a parallel between today's mobile payment trials and the smart card trials of the 1990s. Analysts agree that our legacy payments infrastructure represents one of the biggest obstacles to mobile payments. Because these new payment systems have had limited exposure, there

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quickly into mobile payments. Moreover, in some developing economies, such as those in the Caribbean and South Africa, the lack of telephone land lines brought more consumers into the mobile market faster.

At the same time, the U.S. wireless market is fairly atypical in the world in its complexity. There is no one set of standards for the high number of firms and networks involved in the wireless market, which can impede innovation and interoperability in different areas of the country. In Japan, on the other hand, NTT DoCoMo is dominant in the mobile market and was able to use its very large market share to influence merchants and financial services companies. Further, this telecommunications company also directly owns its own payment platforms to facilitate commerce, which would generally be a more difficult proposition within the regulatory environment in the U.S. In addition, largely because of legacy pricing structures, American consumers have been slower to adopt short messaging service (SMS) communication (mobile phone text messaging) than their counterparts overseas, and SMS is a critical part of many mobile payment systems.

How do mobile payments work?

There are two ways to think about mobile payments. One involves the phone as a chip carrier, wherein a computer chip using near field

protocol (WAP),⁵ or a proprietary solution integrated into the phone's software to initiate payments that do not require a point-of-sale terminal.

Many mobile trials in the U.S. have focused on remote payments, and some financial services companies have begun to relay financial information to customers using SMS. Some trials have utilized a chip-based model. In order to provide banking functionality, such as account balance checks, consumer alerts, and payment verification, most providers use an Internet-browser-based solution or proprietary software to connect to the bank's network. Depending on the structure, both proximity and remote payments might require a consumer to be connected to the financial system in some way, through a deposit account, credit card account, or debit card account. The advent of prepaid cards, however, enables some consumers to access these types of mobile payments without having bank accounts or credit histories.⁶

The promise of mobile payments

The number one reason given for the predicted rise of mobile payments is the prevalence of mobile phones coupled with consumers' willingness to adopt new mobile functionality. Globally, there are over 2.5 billion mobile phone users, surpassing Internet or personal computer users. In the U.S., there are more than 230 million wireless subscribers, and there are high users of mobile phones across all income levels.

is a lack of large-scale data sets to facilitate comparisons with other payment forms. It is also difficult to infer U.S. usage from international experience because of market differences, as discussed earlier. Understandably, companies involved in limited trials are unwilling to make significant infrastructure investments when it is not clear how consumers will react. Payment providers also typically assume that merchants will bear the costs of the new infrastructure, while merchants need to be convinced of the benefits accruing to them before making such investments.

Ironically, it is in part due to the ways that the smart card and mobile payment trials have been developed that it is difficult to gauge consumers' adoption of the new payment methods. Most of these trials have occurred in closed-loop or limited-scope systems and, by definition, test only one distribution method (phone or card) rather than several simultaneously. When consumers are out of the "trial zone" or away from areas that allow remote payment functionality, they are not able to use the payment devices. In the 1990s, limited consumer appetite, infrastructure costs, and uncertainty over issues such as standards, security, and customer relationships kept companies from moving forward with their smart card plans.

There is now a synergy between the mobile and chip worlds. As multiple mobile payment trials are in process, there are also an increasing number of chip-based card trials among major firms. Thus, mobile payments are not rising up in a vacuum—RFID/NFC chip platforms are simultaneously gaining ground as the networks and large financial institutions tentatively accept the possibility of moving to chip-based payments. For example, Wal-Mart's decision to require its top suppliers to put RFID tags on shipping crates has been influential, even though some suppliers balked at the \$0.25 to \$0.30 cost per tag. Further, the existing RFID infrastructure at the merchant level, while small, reduces a key initial hurdle for mobile payments adoption.

Multiple industries are needed to make a new mobile payments infrastructure

a reality. Obviously, telecommunications firms have a significant role to play, as do software and hardware companies, banks, merchants, and networks. Because of the large number of players, analysts question who will be "in charge" of mobile payments in the future: Who will deal directly with the customer, absorb the risk, pay for the infrastructure, and foster innovation? And how will revenues be divided to ensure that the cost to the consumer is sufficiently attractive?

Some analysts argue that banks play the most crucial role in the equation and that mobile payments will never truly take off without an effective mobile banking platform. But this is one payment form that banks can't exclusively dominate. They need the cooperation of phone companies that are looking for new ways to differentiate themselves in a crowded market. As banks compete with each other for similar customers, so do phone companies. However, they are not necessarily vying for the *same* set of customers. Mobile companies have high penetration rates among unbanked and lower-income households whom banks find hard to reach, while phone companies might be able to lure higher-income customers who would be willing to switch from Internet payments to mobile payments.

Is there a "killer" mobile application?

Mobile holds a significant advantage over contactless cards in the area of paperless two-way communication. Card-based models do not allow for the sending, receiving, and presenting of information, as mobile devices do. Internet payments made via personal computer are most similar to mobile payments in this regard, but currently require more cumbersome hardware. As we enter the age of the Apple iPhone and similar devices, it becomes clear that mobile phones now have the ability to operate as small-scale computers. Some mobile payment platforms involve specific downloaded software, and NFC chips can carry a substantial amount of data. Moreover, as technology advances with innovations such as WiMAX,⁹ Internet connections through mobile devices will become faster and more readily available.

Because of the efficient electronic payment mechanisms in the U.S., mainstream consumers might be interested in mobile payments for reasons beyond *payments per se*. It is not always necessary to be able to pay for anything from anywhere anytime, but consumers might find great utility in being able to send and receive financial information from the same device that they use to make payments. As behavioral economists are quick to point out, many consumers like to budget their purchases. One of the benefits of using mobile payments is that it facilitates recordkeeping to help consumers stay within budget. For example, some prepaid card companies have begun offering a text message service to consumers who would like to be notified of each transaction. This type of real-time account recordkeeping can be especially beneficial for consumers with low balances or those who are sharing accounts with family members.¹⁰ Moreover, merchants can derive value from the information exchange made possible through the mobile phone or device by developing loyalty programs and targeted marketing campaigns.

It is this interconnected functionality that makes mobile payments unique. A mobile payments platform can integrate

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ISSN 0895-0164

payments, banking, and real-time two-way data transmission. The same cannot be said of cash, checks, or cards. However, most mobile trials have been siloed into remote payment pilots that direct consumers through existing payment networks and utilize SMS to relate information or chip-based trials that enable proximity payments. A “killer” application might allow consumers to use both, as well as provide recordkeeping software for budgeting purposes and other appealing features that consumers would embrace.

Unfortunately, the very aspect of mobile payments that makes them appealing carries risk. While firms can use two-way authentication and other security measures, consumers and merchants might be wary of mobile payments in a system where data are broadcast over airwaves and are at risk of interception.

Surveys show that consumers would prefer to receive mobile payment offers from banks rather than third party processors or phone carriers, perhaps because of security concerns or familiarity.¹¹ The incorporation of successful security measures that are not burdensome will be important to mobile payment business models. Companies that can capitalize on a “trusted source” reputation might ultimately be more successful in this space.

Conclusion

Today, smart cards, which debuted unsuccessfully in the 1990s, and mobile payments are gaining popularity simultaneously as payment providers seek to capitalize on the information-sharing capabilities of mobile and chip-based payments that are not available in paper or magnetic stripe payments. Due to the many ways that mobile phones are integrated into consumers’ daily lives, there

is potential to avoid the pitfalls of the past experience with smart cards in developing a robust business model around mobile payments.

It is important to note that while the mobile phone might be the most obvious initial channel for large-scale adoption of a new payments infrastructure, it need not be the only channel—unless the infrastructure that is eventually built is specific to one form of payment. In the future, we may look back and see that the specific focus on mobile phones or smart cards was limited in scope. A new payments evolution may be realized by a nexus of networks, financial institutions, and technology providers that can ensure a safe, reliable, convenient, and ubiquitous *chip-based* payment platform—be it via a mobile phone, RFID tag, contactless card, or another, as yet unforeseen, payment instrument.

¹ Packaged Facts, 2007, *Smart Cards in the U.S.: Contactless Payment Cards*, report, Rockville, MD, May 1.

² S. Karnouskos and F. Fokus, 2004, “Mobile payment: A journey through existing procedures and standardization initiatives,” *IEEE Communications Surveys and Tutorials*, Vol. 6, No. 4, pp. 44–66.

³ Celent LLC, 2006, “Mobile commerce: Dealing with the devil in the details,” report, San Francisco, CA, February 13.

⁴ Some solution providers have also placed RFID tags on the phone’s memory card to enable proximity payments.

⁵ WAP is an open, international wireless communication standard, whose principal

application is to enable Internet access from a mobile device.

⁶ Prepaid cards are prefunded, with monetary value recorded on a magnetic stripe. In the case of open-system cards, such prepaid cards can be used on the existing card networks in the U.S. and elsewhere.

⁷ Financial Insights, 2007, *Financial Insights 2007 Consumer Payment Survey*, report, Framingham, MA, April.

⁸ American Bankers Association and Dove Consulting, 2005, *2005/2006 Study of Consumer Payment Preferences*, report, Washington, DC, October.

⁹ WiMAX is defined as Worldwide Interoperability for Microwave Access and aims to

provide wireless data over long distances, in a variety of ways. J. Van, 2007, “Taking wireless to the WiMAX,” *Chicago Tribune*, April 12, p. 1.

¹⁰ K. Jacob and C. Boyd, 2007, “Mobile financial services and the underbanked: Opportunities and challenges for m banking and mpayments,” Center for Financial Services Innovation, report, April.

¹¹ CheckFree Corp. and Firethorn Holdings LLC, 2006, “CheckFree and Firethorn partner to deliver mobile banking and bill payment services for financial institutions,” press release, Atlanta, GA, November 9.