

6-2015

Assessing the Opportunities and Challenges with Big Data in the Mobile Payments Ecosystem

JUN LIU

Singapore Management University, jun.liu.2011@phdis.smu.edu.sg

Robert John KAUFFMAN

Singapore Management University, rkauffman@smu.edu.sg

Dan MA

Singapore Management University, madan@smu.edu.sg

Follow this and additional works at: https://ink.library.smu.edu.sg/sis_research



Part of the [Databases and Information Systems Commons](#)

Citation

LIU, JUN; KAUFFMAN, Robert John; and Dan MA. Assessing the Opportunities and Challenges with Big Data in the Mobile Payments Ecosystem. (2015). *Workshop on Internet and Big Data Finance 2015*. Research Collection School Of Information Systems. **Available at:** https://ink.library.smu.edu.sg/sis_research/2944

This Conference Paper is brought to you for free and open access by the School of Information Systems at Institutional Knowledge at Singapore Management University. It has been accepted for inclusion in Research Collection School Of Information Systems by an authorized administrator of Institutional Knowledge at Singapore Management University. For more information, please email libIR@smu.edu.sg.

ASSESSING THE OPPORTUNITIES AND CHALLENGES WITH BIG DATA IN THE MOBILE PAYMENTS ECOSYSTEM

Abstract

Information and communication technology (ICT) is an important driver of mobile payments in the financial services industry. Mobile payments (m-payments) technologies enable new channels for consumer payments for goods and services purchases, and other forms of economic exchange. The m-payments ecosystem involves multiple distinct stakeholders, and a high level of consumer data-sharing. In this paper, we will assess the current m-payments ecosystem, and discuss the challenges and opportunities with big data captured from m-payments transactions. We will also propose new directions to encourage research that will shed the light on how stakeholders can facilitate the successful adoption and realize the benefits from m-payment.

Keywords: Big data, data analytics, ecosystem, financial services, m-payments, mobile payments, stakeholders.

1. INTRODUCTION

Advances in *information and communication technologies* (ICT) have enabled the automation of banking products and processes by computers and networks, and led to improvements in the efficiency and effectiveness of financial intermediation-related activities in the economy. As they have achieved widespread use for accessing the Internet, mobile phones have increasingly become new tools that consumers use for banking, payments, budgeting, and shopping. *Mobile payments (m-payments)* allow consumers to make payments, transfer money, or pay for goods and services involving the use of a mobile device. According to the survey conducted by Federal Reserve Board (2014), 87% of the U.S. adult population have a mobile phone, while only 17% have made an m-payment in the U.S. in 2014. Although the use of mobile financial services has increased rapidly in the recent years, the development of m-payments in the payments sector has been relatively invisible to consumers and practitioners (Montgomery 2012). After 2011, companies and partnerships such as Square, Softcard, Google Wallet, PayPal, and Apple Pay expanded their efforts to create and bring m-payments technology and service innovations built upon NFC contactless chips, cloud servers and third party apps to the marketplace.

With large and powerful Internet firms having turned their attention to the payments market now, traditional financial institutions face an increasingly competitive environment, which is forcing them to participate in cross-industry alliances and to share their profits from payments with new entrants. Since current m-payment technology solutions involve a high level of consumer data-sharing, understanding the emerging challenges and opportunities associated with the next generation of mobile payments requires an integrated ecosystem view that involves multiple stakeholders (Au and Kauffman 2008, Liu et al. 2015). They include mobile network operators, financial institutions, mobile devices manufactures, trusted service managers (TSMs), third party processors and online payment service providers, payment card and ACH networks, regulators, consumers and merchants.

With m-payments, payments-related data can be collected anytime and anywhere through consumers' smart devices and merchants' point-of-sale (POS) portable. This is transforming how traditional financial institutions collect and analyze the data when they settle payments to a consumer's account and employ risk management programs. In this era of big data, societal-level data analytics and computational social science present significant new opportunities for the related stakeholders in the m-payment area to drive additional revenue, realize customer retention benefits, and enhance their value propositions (Chang et al. 2014). It has become possible for them to discover new dimension of data sources to support geotemporal and geospatial marketing analytics, sociophysical and situation-aware sensing, and communication tools to make more effective credit and payment risk assessments.

Meanwhile, without extensive collaboration among participants, effective new revenue sharing models, and clear agreement on the ownership of customer relationship, the massive adoption of m-payments and the realization of potential benefits with big data will be hindered by a number of barriers. For example, in the absence of schemes that facilitate multilateral relationships, a fragmented market and inefficient co-creation of business value arise (Li et al. 2010). M-payments also offer a way to extend the existing bank-customer relationship, since new customers often are acquired by technology services providers and mobile carriers at the same time. In the mix, data are among the most important assets for financial services firms, so any disagreements that arise with respect to ownership and sharing need to be resolved across different parties. Multiple stakeholders need to function like an integrated coalition for the first-best business value outcomes to be achieved.

In this research, we will depict the current m-payment ecosystem, and discuss challenges and opportunities that we see in this industry area from the relevant technology and management perspective. We will also propose new directions to encourage research efforts that will shed light on how stakeholders can facilitate successful adoption and realize benefits from m-payments.

2. OPPORTUNITIES AND CHALLENGES WITH BIG DATA

We next discuss the new opportunities and challenges coming together with big data for different kinds of stakeholders in the m-payments ecosystem: financial institutions, mobile network operators, consumers, and merchants (Liu et al. 2011). (See Figure 1.)

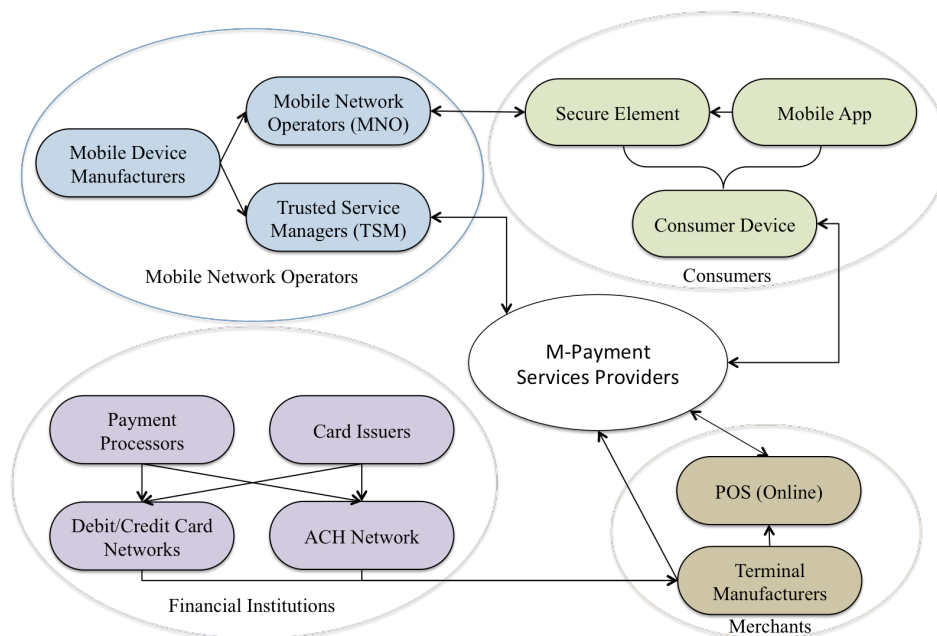


Figure 1. Stakeholders in mobile payment ecosystem

Financial institutions. With long-term experience in payments authorization, settlement, and clearing, and know-your-customer (KYC) rules, financial institutions have the data and related analytical capabilities for fraud protection, loyalty program and customer retention management, and anti-money laundering (AML). The interoperability of m-payments provides opportunities for banks to process m-payments for customers of other banks and other mobile carriers, rather than only access their own customers. This will help to maintain the central role of banks in processing payments, and allow them to keep a more trusted relationship with their own customers. However, due to strategic objectives and competitive pressures, different banks and carriers usually will not be able to achieve multilateral agreements on data-sharing. Mobile carriers are also establishing their own payments networks. The success of M-Pesa in Kenya and other countries in East Africa, for example, puts the banks in a position such that they face a serious risk of disintermediation (Bishko and Chan 2013).

In addition, the tokenization of the customer's financial credentials to randomly generate substitute values used to replace sensitive information also reduces the risks of the loss of financial, client-related, and other secure information and data breaches. Further multiple banks usually share the existing offline network of payment terminals. Yet each bank can only access its own customer data, which results in non-real-time and missing geospatial information on where consumers transact. By taking advantage of the global positioning and accelerome-

ter components of smart devices, banks can enhance their geotemporal and geospatial analytics capabilities to promote card usage and customer loyalty.

Card networks, such as VISA and MasterCard, have existing infrastructures for credit and debit contactless payments (Townsend 2014). However, they lack the access to customer demand deposit accounts and related data. Without collaboration among competing card networks, they will not be able or willing to share necessary data with each other. Also, when there is wide adoption by member banks, card networks can maximize their transaction volume through m-payments. Apply Pay serves as a third-party solution provider, for example, that orchestrates supports for different branded cards in brick-and-mortar stores. The transaction cost represents a percentage of interchange income that card networks have to share, as well as a fixed value transfer.

Mobile network operators. MNOs are vital in enabling the operation of the technology channel for mobile payments. SoftCard, developed in a joint venture involving Verizon, AT&T, and T-Mobile, launched an NFC application in mid-2012. With limited experience in financial and payment services, mobile carriers have to establish new relationships with financial account holders and develop complex data center capabilities that comply with industry security standards. Their capabilities in customer subscriptions, device provision, value-added services, and account management transformed the consumer payments process in some unbanked and under-banked countries. This especially includes M-Pesa's payments innovations in East Africa. By acquiring customer financial data, MNOs can extend their existing customer relationships, and their involvement in the m-payments ecosystem is instrumental in driving the development of innovative m-payment services.

The MNOs are not indispensable in the m-payments ecosystem though. Independent service providers and mobile devices manufacturers play key roles in data transmission security. For example, in Apple Pay's ecosystem, Apple guarantees payment-location data via NFC chip and biometric security, and all customer financial credentials are assigned, encrypted, and securely stored in the Secure Element, as a dedicated chip in an iPhone. iTunes owns 800 million accounts, which is essentially the world's largest credit card database (Arora 2014). The single source of payments enables Apple Pay to integrate online and offline retailers. By participating in the payments sector, Apple obtains the capabilities for analyzing almost all of the aspects of consumer financial activities and purchase behavior. However, antitrust issues in the market may arise around such a powerful technology services vendor, as we have seen with Google of late in Europe, with its alleged control of key data.

Merchants. Merchants are a critical stakeholder in the adoption of m-payment systems. They are interested in secure payment at the point-of-sale, timely authorization and settlement, manageable investment in infrastructure, less costly compliance of data protection obligations, and reasonable interchange fees (Contini et al. 2011). The Merchant Customer Exchange (MCX), created by retail companies in the U.S., has been developing a merchant-focused m-payments platform to avoid the interchange charges (CardNotPresent.com 2014). As a result, some large U.S. retailers, including Wal-Mart, CVS, and Rite Aid, have refused to commit to Apple. This is because the rival MCX payment system will punish the stores for adopting Apple Pay (Wells 2014).

The customized, integrated communications, and location-aware, real-time capabilities of mobile payments are made possible by data analytics for consumer targeting in mobile marketing, promotions, and advertising. Through m-payments systems, merchants can provide highly personalized services and support commercial interactions with customers who are more likely to buy. Integrating rewards and loyalty programs into m-payments services also can increase the cross-selling capabilities that merchants can use to enhance their profitability.

Consumers. Consumer demand for mobile technology is very high, but payments with cash or credit/debit cards seem to have already largely met their service demand. Concerns about the security of the technology are also a common reason for not using mobile payments (Federal Reserve Board 2014). M-payments must provide a convenient, inexpensive and secure payment method in order to achieve critical mass adoption by consumers. Since consumer behavior data are collected and analyzed, the issues related to consumer protection and privacy should be addressed by new regulation.

3. RESEARCH DIRECTIONS FOR M-PAYMENTS

We next propose a series of research questions and directions on the new generation of m-payments at the consumer and merchant, financial institutions and payments industry levels.

At the consumer and merchant level. The typical existing patterns of consumer and merchant payment behavior may hinder the adoption of m-payments. Both consumers and merchants may not have a compelling reason to change their methods of payment. If the expectation is that consumers will not change, then merchants are likely to be reluctant to incur investment costs for new technology at the point-of-sale. Since the development of m-payments systems requires consumers and merchants to come on board, examining adoption will be an important issue. So we ought to ask:

- What are the main factors that help or hinder the adoption of mobile payments by merchants and consumers? Will adoption by other stakeholders influence their decisions to adopt?

The regulatory framework with respect to consumer protection in m-payment services is not yet very well articulated. New study and assessment are required on whether new regulations should address consumer protection issues, such as identity management, cyber security, and prepaid mobile accounts (Contini et al. 2011). This prompts other questions:

- How can regulators leverage the presence of the large amount of data that are available and shared among different stakeholders, as a basis for more well-informed oversight and consumer protection?

At the financial institution level. MNOs are likely to view banking and payment systems from a somewhat different perspective than third-party processors and online payment providers do. They will be constrained by the highly-regulated marketplace and positions of entrenched providers of payments products. This suggests the necessity of financial institutions' participation and support in order to create new payment schemes that can be successful in the future. On the other hand, the senior management of financial services firms will need to consider the changing technology and market landscape, and how to assuage the financial and strategic risks that are present, while maintaining a central position in the payment services ecosystem. Relative to the participation of financial institutions, additional research questions will be important for researchers to pursue:

- What can financial institutions do to formulate strategies and practices to be successful with emerging technology innovation in the m-payments area?
- How can financial institutions take advantage of new data analytics capabilities provided by m-payments to enhance profits and customer relationship?

At the payments industry level. There are different kinds of m-payment business models, including the telecom- and bank-centric, independent services providers, and TSM models that represent some of the current m-payments market practices. Research can assess:

- What kinds of collaborative business platforms will be appropriate for the future development of mobile payments systems, while supporting consumer welfare and financial stability? And who will play the key roles in the ecosystem to guide its core activities toward success?

New risk management schemes need to be devised to handle disruptive m-payments innovations. Some of the issues include payment fraud and control, the tokenization of financial credentials, trusted services management, and so on. Thus, we ask:

- How are m-payments innovations creating new impetus for the transformation of current risk management practices with respect to payment systems?

Developing effective schemes that facilitate multilateral relationships among stakeholders regarding customer data and revenue sharing is essential for business value co-creation in the payments ecosystem. So it makes sense to explore the following issues also:

- What kinds of customer data-sharing and ownership schemes are needed?
- And what bases will the industry adopt to achieve fair revenue sharing for m-payments services?

When technology providers at industry level have successfully addressed these issues, the secure, convenient, and efficient m-payment systems will attract the adoption of financial institutions and consumer. Merchants will then correspond to the consumer demand change.

References

- Arora, N., 2014. Seeds of Apple's new growth in mobile payments, 800 million iTunes accounts. *Forbes*, April 24
- Au, Y.A. and Kauffman, R.J. (2008). The economics of mobile payments: understanding stakeholder issues for an emerging financial technology application. *Elec. Comm. Res. Appl.* 7 (2), 141–164.
- Bishko, C. and Chan, P. (2013). M-Pesa and GCash: can 'lean regulation' be a gamechanger for financial innovation? *Forbes.com*, October 3.
- CardNotPresent.com (2014). Report: MCX merchants snub Apple Pay. Johnson City, TN, September 18.
- Chang, R. M., Kauffman, R. J. and Kwon, Y. (2014). Understanding the paradigm shift to computational social science in the presence of big data. *Dec. Supp. Sys.* 63, 67-80.
- Contini, D., Crowe, M., Merritt, C., Oliver, R. and Mott, S. (2011). Mobile payments in the United States: mapping out the road ahead. Federal Reserve Bank of Boston, Boston, MA
- Federal Reserve Board (2014). Consumers and mobile financial services 2014. March. Washington, DC.
- Kauffman, R.J., Li, T. and Heck, E. van (2010). Business Network-Based Value Creation in Electronic Commerce. *Intl. J. Elec. Comm.* 15 (1), 113-143
- Liu, J., Kauffman, R.J. and Ma, D. (2015). Competition, cooperation, and regulation: understanding the evolution of the mobile payments technology ecosystem. *Elec. Comm. Res. Appl.*, in press.
- Montgomery, K.C. (2012). Testimony on developing the framework for safe and efficient mobile payments. U.S. Senate Hearing, Washington, DC.
- Townsend, M. (2014). Apple teaming up with Visa. MasterCard on iPhone wallet. Bloomberg, September 1.
- Wells, C. (2014). Why some merchants say no to Apple Pay? Wall Street Journal, November 4.