

New Payment Technologies: Back to Basics

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Abstract

A core function of any banking system is the provision of payments. However, a greater number of non-banks are becoming part of the payments landscape. Payments can be made via fiat or crypto currencies, bank credit or deposits, or funds transfers on the books of non-bank payment providers. Most of the focus of this article will be on technologies aimed at improving intermediated retail payment transactions either by increasing their reach, convenience, merchant sales, or decreasing costs for end-users or payment providers. In this article, older payment innovations are compared and contrasted with newer ones. Eight necessary attributes for successful payment innovations are identified and discussed. While there have been extraordinary technological advancements that will lead to significant changes in the way we pay for goods, the basic attributes necessary for successful payment innovations has changed little.

Key words: payments, innovation, platforms, financial institutions, nonbanks, two-sided markets
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How individuals shop for goods and services continues to evolve. Commerce is increasingly occurring via mobile devices across national borders at all hours of the day.¹ Meola (2016) cites a new study by BI Intelligence that mobile commerce will make up 45% of all U.S. e-commerce sales by 2020. Today, a traveller can purchase her plane ticket, use a car service to get to the airport, get through security, board a plane, use a car service at the destination, purchase meals along the way, and check into her hotel room by using her smart phone. These changes are possible because of rapid advancements in telecommunications, computing technology, and widespread adoption of mobile technologies.

The line separating brick and mortar from online or mobile purchases continues to blur. For example, Seamless is a network of physical restaurants that diners can choose to purchase meals to be delivered.² Food orders and payments are made via mobile devices or personal computers generally without human intervention. By using an online platform to access restaurants, diners are offered convenient dining options while restaurants increase their sales without increasing their seating or wait staff. Similarly, traditional online merchants such as Amazon are considering physical stores. With greater use of smart phones to make purchases, the retail marketplace requires more efficient, accessible, cost effective, and secure payments to meet the needs of end-users—buyers and sellers of goods and services.

While advancements in technology have increased connectivity among buyers and sellers, these advancements have also changed the way we pay for goods and services albeit at a slower rate. For example, mutual funds have made investing in various equity and debt markets relatively simple and effortless for retail investors. However, while the proceeds from the sale are credited to a customer's account by the end of the day, it may take more than 3 business days

¹ For the purposes of this discussion, mobile purchases are those made by smart phones or other derivative products such as wearable payment devices that combine payments with telecommunication infrastructure.

² In August 2013, Seamless merged with Grubhub.

for the deposit to be available at the customer's financial institution to make other payments. If these mutual funds are part of a special tax-advantaged college savings account from where payments are made to a college, the sale of the securities and making the college tuition payment may take longer than a week via the Automated Clearing House (ACH) network in the United States.³ Given today's technology, we should be able to do better in terms of the speed and efficiency of the conversion of payments into cash equivalents to be used in future transactions.

Payment innovations improve the payment system in at least four ways.⁴ First, innovations may improve the existing clearing and settlement processes required to convert payments into cash or bank deposits. For example, the ability of a check recipient to deposit checks via her mobile phone by taking a picture and uploading that image to her financial institution improves the processing of checks. In addition, financial institutions without widespread physical presence are able to better compete with those that have extensive branch networks for demand deposit (checking) accounts with remote check deposits. The remote capture technology is generally being offered by financial institutions but need not be.⁵

Second, payment innovations may provide access to existing payment networks for buyers and sellers that have not traditionally had access. For example, PayPal allowed individuals to indirectly accept card payments in an online environment. Although PayPal's initial success was a payment solution for eBay purchases, its payments reach has grown and

³ ACH networks were established in the early seventies in the United States to promote an electronic alternative to checks. Ironically, advancements in check processing allow consumers access to deposits within a day whereas in most cases, ACH payments take two days to clear. Same day ACH is expected to be available for certain types of transactions by the end of the year (pymts.com, 2016).

⁴ For a taxonomy of payment innovations and what characteristics determine successful ones, see Chakravorti and Kobor (2005).

⁵ Ingo money now offers check-cashing services via a mobile phone capture and instant access to cash for a fee. Ingo customers can deposit funds to payment cards that can instantly be used for mobile payments.

now includes point of sale and non-eBay online sales. Other innovations are geared towards providing financial services to those that for whatever reason do not have banking relationships.⁶

Third, large retail and social networks are well positioned to make future payment innovations especially those that leverage extensive network connectivity to promote greater sales which might otherwise be lost. For example, Facebook would like to increase sales of its advertised products by providing a seamless payment option via its messenger service.⁷ We will discuss why Facebook and other large platforms are entering the payments market.

Fourth, new payment systems may be created from scratch because existing infrastructure is outdated and may prevent future innovation. New payment systems are difficult to build because building new infrastructure is costly and usually has to occur alongside existing infrastructure with buy in of many stakeholders. The faster payments initiative in the United States aims to create a more efficient payment platform that is more secure and convenient for end-users. The Federal Reserve System (2015) outlines several desired improvements in speed, security, efficiency, international reach, and collaboration. Payment providers have already started to address these categories.

With the number of payments increasing among buyers and sellers that are non face-to-face purchases and who do not know each other, paper-based payments such as cash or checks may not ideal. However, acceptance of electronic payment instruments continues to be challenging for certain market segments such as peer-to-peer (P2P) payments although PayPal and Square along with other new payment providers are closing these gaps by allowing greater access to existing electronic payment networks. In other cases, new payment solutions are

⁶ Public authorities around the world with the aid of philanthropic organizations are increasing access to financial services such as payments, loans, and savings vehicles to everyone regardless of their socioeconomic standing. The broader movement is often referred to as financial inclusion.

⁷ Today, Facebook has 1.6 billion users worldwide. Usage of various Facebook apps account for 30 percent of American mobile Internet usage (The Economist, 2016).

necessary because of the high cost of safekeeping and transporting cash. For example, M-Pesa, which uses text messaging to initiate payments, is a successful replacement for many cash payments in Kenya.

To be successful payment innovations that are targeted at end-users generally have certain attributes.⁸ In this article, I put forth eight attributes or necessary conditions for payment innovation to be successful:

1. Increase Benefits to End-Users
2. Penetrate a Niche Market
3. Change End-User Behavior
4. Provide Incentives for Adoption and Usage
5. Offer Profit Opportunities for Payment Providers
6. Forge Partnerships between New and Existing Payment Providers
7. Provide Necessary Security
8. Adopt or Create Industry Standards

After discussing the payment infrastructure, we will discuss these eight attributes. We will also discuss how large networks or platforms such as Amazon, Apple, Facebook, and Google will continue to expand their presence into the provision of payments. Finally, some conclusions will be offered.

The Infrastructure

Let us start by defining some terms. A payment is a transfer of money from a buyer to a seller. The transfer may include physical currency, a transfer of funds between accounts at financial institutions, or on a ledger outside the banking system.⁹ Although the buyer and seller may have accounts at the same financial institution, in general they do not, so financial

⁸ There are payment innovations where the adoption of the innovation does not require end-users to change their behavior. In other words, end-users may not even be aware of the improvements such as backend fraud detection systems. The eight necessary conditions may not apply to these types of innovations.

⁹ There are also barter exchanges where one good is exchanged for another. We will not discuss barter exchanges in this article although it remains popular.

institutions have to offset claims between them.

A payment system is defined as a system for making payments along with the clearance and settlement process that follows. Such a system may encompass the means for buyers or sellers (if buyers have given authorization to do so) to initiate payments; communications and computation infrastructure to facilitate these payments to be made; contracts, laws, regulations and industry standards to establish rights and responsibilities of buyers and sellers; and other processes that enable payments to be made and settled.

At the core of any payment system is an interbank payment system that allows banks to transfer payments between each other. The interbank payment system can be operated by the central bank, a consortium of banks, or non-banks. Other payment networks may net payments by financial institutions and use an interbank payment system to settle residual amounts among financial institutions. Examples of such networks include MasterCard and Visa that use ACH and Fedwire, the U.S. real time gross settlement system, to complete their settlement process in the United States. Newer payment providers may build upon payment card and ACH networks to provide payment services such as PayPal.

Payments can be categorized into three types—value-based, account-based, and credit-based.¹⁰ Value-based transactions, such as cash and prepaid cards, transfer value that is acquired in advance. In the case of cash, buyers acquire cash from their financial institutions, merchants, or elsewhere and use it to make purchases or as a store of value.¹¹ The seller can use the cash for subsequent purchases, make a deposit at its financial institution, or hold on to it. Cash transactions are unique in that they are not intermediated by third parties. Bitcoin and other

¹⁰ See Chakravorti (1997) for more details regarding these payment classifications.

¹¹ Maurer (2015) discusses how monetary value can take on different forms such as currency issued by the government, cattle, or mobile phone airtime. In his book, he studies money across centuries, cultures, and socio-economic standing of transactors.

virtual currencies are trying to imitate this key feature of cash. In the case of prepaid, the value is loaded prior to making purchases and merchants collect the value and redeem it via a third-party.

Account-based transactions allow buyers to make purchases with value that resides in their accounts at their financial institutions or networks like Dwolla and PayPal where funds can be transferred among each network's participants. Distinct advantages that account-based transactions have over cash for end-users are the elimination of cash acquisition, safe-keeping, and handling costs.¹² Some studies find that cash is being replaced by account-based payments.¹³ An account-based transaction occurs¹³ when the buyer instructs its financial institution to send funds or the buyer authorizes the seller's financial institution to withdraw funds from her account. In the case of the buyer instructing her financial institution, the payment is only initiated if there are sufficient funds in the account. In the case of the buyer granting permission to the seller to collect funds from the buyer's financial institution, there is a risk that the funds will not be there when the payment is presented to the buyer's financial institution. However, for some types of seller-initiated payments such as debit cards, there are sophisticated communication infrastructures that report back to sellers that funds are available before payments are accepted.

Credit-based transactions involve an extension of short or long-term credit. Charge cards such as American Express generally extend short-term credit and expect the cardholder to pay in full at the end of the billing cycle.¹⁴ Credit cards allow cardholders to pay for purchases over a

¹² Virtual currencies and prepaid cards may offer some of these benefits as well.

¹³ Amromin and Chakravorti (2009) study the impact of an increase in debit card merchant terminals on the stock of currency in circulation by denomination for 13 countries from 1988 to 2003. They find that the demand for small denomination notes and coins decreased suggesting that the demand for currency to make change had decreased because there were fewer cash transactions.

¹⁴ American Express also issues traditional credit cards but the bulk of their transactions occur on charge cards.

longer time horizon. Credit-based transactions are generally approved in real time to make sure only authorized users access credit up to a predetermined limit.¹⁵ If proper procedures are followed, merchants are guaranteed payment.

Banks and non-banks are innovating to make the payment process more convenient, efficient, and profitable along with making electronic payments available to more buyers and sellers engaged in various payment activities. In the next several sections, we will discuss what are essential attributes that lead to successful innovations.

Increase Benefits to End-Users

New payment innovations must provide added benefits to end-users over existing payment choices. First, we will discuss the transition between cash and electronic payments. Second, we will discuss how payment innovations increase access to electronic payments. Finally, we will discuss how new payment products may provide benefits beyond payments.

Although there are societal benefits to moving away from cash to electronic payments, unless end-users and payment providers share in those benefits, the migration will be extremely slow or non-existent. Many policymakers and financial observers have cited the disadvantages of cash including consumer and merchant loss of cash due to theft, lack of recordkeeping resulting in its use for tax avoidance and illegal activities, the transmission of germs, and not being appropriate for non face-to-face transitions.¹⁶ However, cash offers two overwhelming advantages. First, it is ubiquitous. One need not have a relationship with a financial institution

¹⁵ There is a fine line between credit-based and account-based transactions, because financial institutions may grant credit for demand deposit accounts when accessed by debit cards, checks, or ACH payments.

¹⁶ Recently, I learned that in some developing countries, truck and bus drivers carry cash for a fee from cities to rural areas. Mobile payments may offer a more efficient solution.

to use cash. Second, it is anonymous. In other words, cash transactions leave no paper or electronic trails.

An example of a substitute cash product that failed provides lessons to innovators that their products must provide clear benefits to end-users. In the mid-1990s, stored-value cards and other forms of electronic cash were going to replace cash completely. There were general-purpose stored value trials at the 1996 Atlanta Olympic Games and across certain blocks of Manhattan around the same time to introduce merchants and consumers to this cash substitute. Many of the \$5 stored value cards given away at the Olympics were saved as souvenirs with the original packaging instead of being redeemed for goods and services. In Manhattan, merchants were ready to accept stored value but not sufficient number of cards circulated to generate significant usage. In the end, consumers and merchants did not view stored value as being better than existing payment options. This payment application provided a solution to a yet to be defined problem.

Buyers and sellers may adopt non-cash payments to reduce cash handling costs and increase convenience resulting in more purchases.¹⁷ Electronic transactions require less human intervention and may be more efficient. Let us consider two examples. First, for many decades, gas stations had attendants that would pump your gas, clean your windshield, check your oil, and accept your payment. Today, motorists can pump gas and pay for it without interacting with any human primarily because of the ubiquity of automated pay at the pump options. Second, some merchants have banned cash acceptance altogether. An example of a mandatory shift away from cash occurred when major U.S. airlines decided to only accept payment cards for in-flight purchases to eliminate cash handling costs.

¹⁷ Cash collection and change making have become automated to some extent but eventually cash machines have to be serviced.

While electronic payments offer a host of benefits, not all sellers can accept all payment forms due to various reasons including cost and access. For example, although payment cards quickly became the payment of choice for online purchases, not all sellers, especially individuals, were able to accept payment cards because of high set up costs. PayPal provided a solution by allowing everyone to indirectly accept card payments via their network. In the physical space, Square allows anyone that sells products to accept payment cards if they have access to a mobile phone. By using Square, sellers that previously did not accept card payments because of high setup costs can sell to customers that may not have cash on hand resulting in increased sales. To receive funds faster with a lower fee, many U.S. cab drivers use Square to accept payment cards over the cab companies payment processor.¹⁸

Similarly, consumers may not have access to electronic payment instruments that are used for transactions because the need to have a relationship with a financial institution. Prepaid products allow consumers without checks, debit or credit cards to make purchases where payment cards are accepted. More recently, Digital Mint has installed ATM machines at check cashing outlets in several U.S. locations that convert cash into bitcoin that can be used at merchants that accept bitcoin. Some merchants find that accepting bitcoin is often cheaper than accepting payment cards.

Innovators in the payment space are finding that adoption and usage of successful payment innovations may require benefits beyond payments. For example, credit cards allow cardholders to access short and long-term credit to make purchases. The direct extension of credit by merchants preceded general-purpose credit cards. However, the comparative advantage

¹⁸ In the case of cabs, public authorities forced card acceptance because of safety concerns at the same time regulating their fees. However, some cab drivers still try to encourage cash payments because of higher explicit costs associated with payment card acceptance. In some jurisdictions, merchants including cab drivers are allowed to surcharge some types of payment transactions.

that financial institutions have in assessing credit risk has led to most large U.S. retailers partnering with financial institutions to extend credit. Not surprisingly, recent entrants, such as Square, are also extending credit to certain customers.

Penetrate a Niche Market

In this section, we will discuss successful niches that were initially targeted by payment innovators including business travellers, eBay shoppers, coffee chain customers, and government benefit recipients, employers' disbursement of payroll and gift givers and recipients. In all of these cases, the payment innovator has further expanded to other use cases.

The first general-purpose charge card, the Diners Club Card, targeted business travellers so that they did not have to carry large sums of cash or purchase travellers cheques.¹⁹ To entice hotels, restaurants, and other retailers to accept its charge card, Diners Club promised to deliver the patronage of high-spending business travellers to merchants accepting its card. Initially, the main source of revenue came from merchants in the form of a seven percent fee on the value of all purchases. American Express entered this market ten years later using a similar business model. To maintain some sense of exclusivity to signal higher spending cardholders to merchants, only certain individuals were asked to join for a monthly fee that continues today for certain exclusive cards.²⁰

Although initially created to settle monetary obligations between individuals using Palm Pilots, PayPal's initial niche market success was to facilitate transactions on eBay, which later

¹⁹ Travellers cheques are value-based payment instruments issued by third parties. Third parties provided guarantees to their customers that if their travellers cheques were lost or stolen and proper documentation was shown, cash would be returned. Merchants found that travellers cheques were associated with little settlement risk unlike personal checks. In addition, a certain percentage of travellers cheques were never redeemed resulting in additional revenue for issuers.

²⁰ Back in the 1990s, American Express used the slogan "membership has its privileges," suggesting an exclusive club. Other payment card networks such as MasterCard and Visa also have high-end credit cards targeted at cardholders with higher incomes.

purchased PayPal and more recently spun it off. PayPal allowed sellers of all sizes to indirectly accept payment cards and ACH payments. In 2015, PayPal processed 4.9 billion payments accounting for \$282 billion and had over 179 active accounts across 200 markets according to its website.

At the beginning of this century, prepaid cards started to enter the marketplace in two varieties—closed loop and open loop. Closed loop cards such as transit cards have been around previously. Transit services provide a captive niche segment where the transit authority can force payment innovations on their ridership to create a large network of users. In some cases, these closed loop cards started to be more widely-accepted such as the Octopus card in Hong Kong.²¹

The Starbucks closed loop prepaid card is one of the most successful closed loop card that competes with other payment forms at the register although today the prepaid value is more often accessed by mobile phone. Today, close to 20 percent of spending at Starbucks occurs through its mobile app in part because of its loyalty program. Currently, Starbucks has \$1.4 billion on its balance sheet from consumers that have loaded their apps and gift cards but has not been spent. Furthermore, in 2015, \$40 million in prepaid sales was not redeemed. Not surprisingly, Starbucks has recently announced its plans to issue general-purpose prepaid cards with Chase to take advantage of essentially interest-free loans from its customers.²²

Alternatively, open loop prepaid cards that leveraged the broader payment card network infrastructure started to gain traction in some niche markets that already had a large base of merchants accepting branded cards such as American Express, MasterCard, and Visa as a check or cash replacement for specific types of transactions. Open loop prepaid cards have found niche

²¹ For more discussion regarding the Octopus card, see Chakravorti and Jankowski (2005).

²² Figures for Starbucks are taken from Brinkly-Badgett (2016).

markets such as gift giving, employee benefits such as pre tax medical and transit benefits, payroll, and government benefits.²³ Open loop prepaid cards leveraged existing payment infrastructure with a clearly defined value proposition resulting in market adoption and usage.

Change End-User Behavior

There are strong human and firm behavioral aspects that influence the types of payments that are adopted and used. Generally, consumers and merchants are reluctant to change their payment habits rapidly. Existing payment forms take a long time to disappear, if ever. Currency has been around for centuries but has yet to disappear even though many have forecasted its demise because there are certain types of payment use cases where cash is preferred.²⁴

Many economic studies on payment behavior of consumers have found strong resistance to change from existing technologies. Furthermore, studies on payment adoption and usage find strong demographic effects such as more educated and higher income consumers are generally more prone to adopt and use a more diverse set of payment forms.²⁵ Consumers are reluctant to change especially if they have been using a payment instrument for decades. For example, with check payments, consumers were generally returned their checks for many years and this provided evidence of payment. However, when checks were truncated, many financial institutions started to charge customers to have their checks returned, eliminated the practice, or provided images instead. When physical checks were no longer returned, check images were often made available online generally without additional fees. Today, email alerts or pop up notifications on smart phones provide real time payment verification substitutes. In addition,

²³ See Chakravorti and Lubasi (2006) for a discussion of the various types of distinct use cases for general-purpose prepaid cards.

²⁴ For predictions of the “death” of cash, see Forbes (1967), Gleick (2006), and the Economist (2007).

²⁵ For a longitudinal study on the demographics of payment adoption and usage, see Connolly and Stavins (2015).

many financial institutions have tried to replace paper statements with electronic ones by providing their customers incentives but many customers have not yet embraced electronic statements.

Consumers can be enticed or, in some cases, forced to change their payment behavior by governments, merchants, financial institutions and other consumers. For example, governments can require electronic transfers for social security benefits, tax collection, and payment of its vendors although such a policy took many years to implement in the United States. Many merchants, especially most restaurants, do not accept checks. There is also a “tribal” effect where consumers can be swayed by other consumers to use a new payment form.²⁶ Finally, consumers can be given incentives to change their behavior which we will discuss in the next section.

Similarly, merchants are also reluctant to change when it comes to payments. For example, to reduce fraud, the payment card networks have introduced EMV (originally developed by Europay, MasterCard, and Visa) uses chip technology instead of magnetic stripe for card authentication along with a signature or PIN. EMV adoption has been slow in the United States because millions of cards need to be replaced with microchips and merchants had to install new terminals to support the technology. Today, not all merchants are enabled and some that are may bypass the chip technology because of the additional time required to go through the checkout. To encourage merchant uptake, the card networks shifted liability to merchants for fraudulent transactions if this technology is not used.²⁷

²⁶ In a recent conversation, Peter Colbert, a payments entrepreneur and founder of Inamo, suggested that the tribal effect as a strong force to gain market traction in payments.

²⁷ Robin Sidel (2016) reports that although it is difficult to put a dollar figure on the additional burden of the liability shift for US merchants that have not adopted EMV, he states that experts estimate it at millions of dollars for the first eight months and predict this figure will likely to increase.

Provide Incentives

Similar to any other aspect of human and firm behavior, pecuniary and non-pecuniary incentives may be necessary to induce adoption and usage by buyers and sellers. When PayPal introduced its payment solution, it paid \$5 to both senders and receivers of PayPal payments. This was an effective strategy to gain market share quickly although some analysts may have questioned the use of venture capital funds for this purpose.²⁸

For more mature payment markets, incentives can be used to attract greater usage and steal customers from other payment providers. For example, credit card rewards enticed some cardholders to use their credit cards instead of alternatives such as check, cash, and debit cards.²⁹ Credit card rewards are also used by card issuers as a competitive tool to steal cardholders from competitors.³⁰

Alternatively, some merchants may provide disincentives such as surcharges for certain types of payment instruments that may be more expensive to accept.³¹ For example, some merchants impose surcharges for credit card payments or impose fixed fees for acceptance of debit cards. Some merchants attempt to use moral suasion to convince consumers to use payment instruments that may result in faster receipt of cash or bank deposits.

In the Chicagoland area, the toll road operator charges half as much to motorists that use tolltags, a prepaid transponder, instead of cash.³² Such a strategy reduced traffic jams, improved payment processing, and reduced pollution from cars waiting to pay tolls with cash. Today, tolltag users, unlike cash users, do not go through tollbooths at all resulting in fewer bottlenecks

²⁸ The discussion of PayPal's marketing strategy is based on a conversation with Peter Thiel, a cofounder of PayPal.

²⁹ For more on credit card rewards, see Ching and Hayashi (2010), and Carbó Valverde and Liñares Zegarra (2009).

³⁰ See Agarwal, Chakravorti, and Lunn (2010) for more on how rewards are used to increase cardholder spend and debt on a specific card.

³¹ For discussion of surcharging history in the United States, see Chakravorti and Shah (2003). For an empirical study of surcharging in the Netherlands, see Bolt, Jonker, and Renselaar (2010).

³² For more details, see Amromin, Jankowski, and Porter (2006).

on the tollways. The incentives clearly worked to change consumer behavior and reduce pecuniary and non-pecuniary costs associated with toll collection although significant initial investment was required to set up toll collection without tollbooths.

While incentives are effective in promoting change in payment behavior, who ultimately pays for the incentives continues to be hotly debated by payment system participants in various jurisdictions. To address this issue, several economists contributed to a new area of research called two-sided markets expanding on the network economic literature.³³ This literature suggested that in order to get buyers and sellers on board a platform, one type of end-user may pay more than the other. The underlying economic premise is the platform should consider the joint cost to serve different types of end-users and the joint benefit accrued to all types of end-users. All types of end-users gain when there are significant numbers on the other side.

Let us consider the potential of finding a compatible match at a bar or an online dating service. The more balance there is between end-users—males and females—the more attractive a bar or dating platform becomes. In some cases, bars may waive cover charges for single women and dating platforms may have different fees for men and women. In other words, different end-users may have different willingness to pay for the service but will only pay for the service if there is ample selection to be matched with.

In the payments context, merchants may be more willing to pay for a payment service if there are sufficient number of consumers that participate because each merchant may have more to gain than each individual customer. One such mechanism is the interchange fee that the merchant's financial institution pays the consumer's financial institution in a four-party payment card network.

³³ For excellent summaries of this literature, see Rochet and Tirole (2006) and Rysman (2009).

Profit Opportunities for Payment Providers

Existing or new payment system participants require sufficient profit opportunities to bring new innovations to market. In some cases, payment technologies are bundled with other financial services where some payment services may be loss leaders. Also, cross subsidies from one type of participant to another may exist. In the retail context, sellers of goods and services often offer attractive financing terms to increase sales such as car dealers, gyms, and appliance stores. In today's e-commerce and m-commerce retail markets, large players have had to improve payment processing such as Amazon's patented one-click shopping to not lose sales because of a complicated payment process requiring a lot of data.

Retail payment services are often loss leaders. Free demand deposit accounts have been the norm for many years and still common in the United States.³⁴ Another example is the almost free access to short-term credit from credit cards if the balance is paid off every month. Issuers make the bulk of their revenue from interest income from cardholders that pay interest on balances carried from month to month. In the United States, there is intense competition for cardholders resulting in some issuers extending frequent-use awards or attractive financing terms.³⁵ However, enhancements to the payment system are not free and require investment. Positive expected return on investment, increased ability to sell other products, or cost reductions are necessary for innovations to be implemented.

Operating the payment system as a utility or being run by the public sector may not provide sufficient incentives to innovate. Some observers have argued that government-operated

³⁴ In positive interest rate environments, financial institutions earn interest on idle funds in demand deposit accounts. Deposits are also a relatively cheap source of funding for banks and are less prone to runs because of government deposit insurance. Financial institutions are able to earn money on other aspects of demand deposit accounts such as penalty fees for non-sufficient fees. For more on checking account fees in the United States, see Chakravorti and McHugh (2002).

³⁵ For an empirical analysis of the impact of rewards on consumer usage of one credit card over another in their wallets, see Agarwal, Chakravorti, and Lunn (2010).

payment systems may lack the proper incentives to innovate because their objective is not to maximize profits.³⁶ Comparing the check and ACH systems in the United States where the Federal Reserve operates some of the infrastructure with private sector operated debit and credit card systems with little central bank involvement, one observes that debit and credit card systems eliminated paper processing and implemented real-time electronic account approval decades before check truncation. Only after the terrorists attacks in 2001, the Federal Reserve was instrumental in passing the Check Clearing for the 21st Century Act (Check 21 Act) that allowed an image of a check to be a negotiable instrument. The Check 21 Act enabled the truncation of the original check. Today, third parties have started to cash checks through remote capture as an alternative to physical check casher outlets.

Partnerships between Payment System Participants

While many payment innovations occur outside the banking system, successful innovations are generally those that eventually partner with banks. Generally, banks have access to existing payment system rails, provide legal and security infrastructure, and are experienced with credit and settlement risks. Given heightened regulation of payment activities by the public authorities, these partnerships are even more important.³⁷

The relatively slow adoption of general-purpose mobile payments highlights the need for partnerships. Providers of mobile phone services, manufacturers of phones, financial institutions, and other payment system participants including merchants and consumers play a key role in the adoption and usage of mobile payments. In some rare instances, coordination

³⁶ A notable exception to government-operated payment systems is real-time gross settlement systems where systemic risk concerns and provision of liquidity when needed may justify government involvement.

³⁷ In addition to various customer protections and safety and soundness rules, anti-money laundering and “know your customer” regulations often pose great challenges for non-bank payment providers.

among various participants can come together rapidly. For example, during the disaster relief efforts after the earthquake in Haiti, the Red Cross implemented a donate-by-text program whereby mobile phone users would be billed for their donations by their mobile carriers at the end of the billing period. Relief agencies collected \$43 million in donations via this effort.³⁸ In this instance, the mobile phone carriers and the Red Cross successfully collected donations relatively rapidly via mobile phones with some help from the U.S. State Department and the media. This model has been successfully replicated for other relief efforts.

However, general-purpose mobile phone in-store and in-app U.S. purchases have not taken off despite adoption by consumers, merchants, banks, and payment card networks. In September 2014, Apple introduced Apple Pay where single-use tokens are used to make purchases once the customer has authorized the transaction with her fingerprint. Google and Samsung also introduced general-purpose mobile payments. While adoption of these mobile payments options is relatively high by consumers and merchants, usage remains low.³⁹ In the United States, only .2 percent of the estimated \$4.35 trillion in-store sales last year were made with mobile phones according to a survey by eMarketer cited by Eavis (2016). Furthermore, of those that made mobile payments, only 15 percent used their phones to make payments more than once a month.⁴⁰

An example of an interesting partnership is Apple Pay and OpenTable whereby diners can pay their bills using their OpenTable app. When at a participating restaurant, a diner can see her bill in real time and at the end of the evening pay the bill without waiting for the waiter to

³⁸ Figures for text-based donations in Haiti are from Gahrn (2012). She also reports that based on a Pew Internet and American Life Project survey, around 75% of donors used text donation for the first time. Furthermore, more than half of donors made text donations to other disaster relief efforts such as the Japanese earthquake and tsunami, BP oil spill in the U.S. gulf region, and victims of U.S. tornadoes.

³⁹ According to Apple's website on April 12, 2016, about 90 U.S. merchant chains have started to accept Apple Pay. Many U.S. banks support Apple Pay. In the United States, American Express, Discover, MasterCard, and Visa cards are supported by Apple Pay.

⁴⁰ This statistic was based on a survey by First Annapolis that was cited by Eavis (2016).

bring her bill. While not widespread, this technology allows a more convenient and secure payment option for cardholders and restaurant owners because no vital cardholder information is stored and no payment card is left behind accidentally. Furthermore, OpenTable may directly apply its frequent-use awards to the bill to potentially increase usage on its platform as well as increase Apple Pay payments in the future.

Provide Necessary Security

There are different parts of the payment process that need to be secure. First, account access needs to be limited to only authorized users. Traditionally, authorized users can be identified by government-issued identification, passwords, signatures, and other information about a person such as her favorite sports team, name of her first grade teacher, or the first street that she lived on. To some extent, such information can be accessed by unauthorized users. Biometrics can be a means to which to authenticate users as well. While biometrics has long been part of science fiction and spy movies, only recently, consumers are able to use their fingerprints to access sensitive data and approve payments. While still in the early stages of adoption, fingerprint authentication is likely to expand in the coming years.

Second, the exchange of live account credentials that are used to make purchases is extremely high. Payment card numbers along with demand deposit numbers are commonly asked for to make purchases.⁴¹ Once these numbers are in the possession of unauthorized users the likelihood of fraud increases. Data breaches at large merchants such as Target, Home Depot, and Neiman Marcus demonstrate the dangers of storing active payment card numbers. One solution to this risk is to use tokens that expire after each use. By using tokens, account

⁴¹ Demand deposit account numbers along with routing numbers are written at the bottom of checks. In fact, billers and employers often ask for voided checks to set up ACH payments.

credentials are not used in payment transactions. Tokenization can be used for non-card based payments as well. The Clearing House has embarked on an industry-wide tokenization project.⁴²

Third, fraud associated with making payments when accounts do not have sufficient funds can be eliminated by buyers instructing their financial institutions to make payment. Given today's technology and online connectivity, payment instruments such as checks where real-time account and sufficient balance verification are not generally available should be eliminated for large purchases or transfers. Some countries have had great success in eliminating checks.

Fourth, payment providers often take on additional liability to encourage usage which may have the unintended effect of reducing incentives for cardholders to make prudent decisions regarding keeping live payment credentials secure. For example, the payment card networks eliminated cardholder liability on any unauthorized credit and debit cards used online to promote greater online usage in the mid-1990s. However, significant fraud continues to occur and these costs may be reduced if consumers were held accountable for not adequately safekeeping their payment credentials.

Adopt or Create Industry Standards

While there are many competitors at various points in the payment ecosystem, there is a strong need for cooperation on standards to allow for improvements to the payment system. As we have discussed, most payment innovations leverage existing payment standards and, to some extent, these standards may need to be updated for new technologies. In addition, there are benefits of interoperability across payment networks. Standards are necessary to encourage end-users to adopt and use the new payment products especially to gain wide acceptance. Broader

⁴² For more details, see The Clearing House (2015).

technology standards may be critical for third-parties to increase access and enhance the payment system. Security standards are necessary to combat fraudulent activities across multiple platforms.

Standards are essential when a payment instrument has multiple issuers along with a decentralized clearing and settlement process. For example, checks are offered by thousands of financial institutions in the United States today. To automate the processing of checks, the American Bankers Association (ABA) adopted a magnetic ink character recognition (MICR) code standard in 1958. This standard not only defined the format, font, and special characters but also a special type of ink that was readable even when stamps covered the code at the bottom of checks by special magnetic ink readers. In 1963, American National Standards Institute (ANSI) adopted the ABA's standard as the American standard and a few foreign countries adopted it as well. The adoption of the standard allowed for faster and more accurate processing of checks. While legislation passed after the terrorist attack of September 11, 2001 allowed for the substitution of the physical check with an image, check issuers are still required to use the MICR standard even though reading of images have advanced dramatically since 1958.

Standards are often difficult to replace once widely adopted by payment system participants. For example, the embossed numbers on payment cards were once critical to transfer account information on physical credit card receipts. Although used on occasion, today, the embossed feature is not necessary because information is generally captured electronically either via a magnetic stripe or chip. However, some merchants are reluctant to accept cards that do not have embossed numbering because they fear that these cards may be fraudulent.

In some cases, the adoption of new payment forms such as mobile phone payments require adoption of certain types of technologies by merchants such as near field communication

(NFC) that has not been adopted uniformly across the globe. The speed of adoption and usage of Apple Pay and other technologies will be further delayed if the NFC standard is not widely adopted.

Large Platforms and Payments

Today, the Internet affords us greater connectivity to purchase goods and services such as rides by Uber, hotel room substitutes by Airbnb, and goods on eBay. David Evans and Richard Schmalensee (2016) discuss the value of matchmaking and how the economy values these services often higher than firms that produce goods and services. They state that three out of the five largest companies by market cap are matchmakers. As two-sided or, in some cases, multisided market economic theory teaches us, there is not only value in the number that participate on these platforms, but these markets are more valuable as the number of potential matches increase. In other words, Uber needs both drivers and riders otherwise their network is not as valuable to drivers or riders. However, a key part of any commerce still remains the transfer of monetary value not only to the sellers but also to the matchmakers. Any new payment technology needs to be able to serve large networks to gain widespread acceptance.

Let us focus on the four horsemen—Amazon, Apple, Facebook, and Google—as called by Professor Scott Galloway (2015). The operators of these platforms would like to expand and monetize their global connectivity. Amazon expanded on a business model that relied on large warehouses from which books could be shipped.⁴³ Today, this network has expanded in the types of goods it sells with greater global reach. In November-December 2015, Amazon accounted for close to 43 percent of e-commerce sales. It accounted for over 50 percent of e-

⁴³ Although some individuals would like to browse books in the traditional way, Amazon provides reviews of books and suggests other books that could be of interest to you based on previous purchases.

commerce growth and 24 percent total retail growth in 2015 (Galloway, 2015). As mentioned previously Amazon also made purchasing easier with its one-click system. Amazon payments allows Amazon customers to make purchases at other merchants. Today, 23 million customers out of over 300 million have used Amazon Payments (Gonzalez, 2016).

In addition to selling goods such as phones, computers, and watches, Apple has transformed industries such as the music industry by unbundling songs from albums and selling them on its iTunes platform. Along the way, it has integrated its products on devices and used its iTunes platform to sell more than just songs. In addition, it allowed the development and selling of mobile phone apps that dramatically increased the functionality of iPhones and iPads. Along the way, Apple has built its own ecosystem that it continues to integrate to provide a extremely positive user experience. Not surprisingly, Apple wants to expand its in-store and in-app payments capabilities to make the customer experience better and more secure than it is today.

On the other hand, Google and Facebook did not start as sellers of goods and services. Instead they provided connectivity—to content on the Internet (Google) and for individuals to interact on social networks (Facebook). In the process, both platforms were driving individuals and businesses to their websites and started to earn significant ad revenue. Both are leveraging their vast networks to expand their economic footprint. Similar to Amazon and Apple, both Google and Facebook want to have seamless and convenient payment technologies that their participants can use. However, all these payment technologies need to provide increased value to end-users. While having a captive customer base is a necessary step, end-users may not use the application unless sufficient benefits or incentives are given to them vis-à-vis existing payment choices.

Conclusion

Underpinning all commerce is the settlement of monetary obligations. As commerce changes, there will be corresponding changes to the way we make payments. In addition to changes in the way we shop for goods and services, payment innovations may result from the need to increase access, merchant sales, or reduce payment processing costs. In this article, we have discussed old and new payment innovations and find that successful innovations share some key attributes. These necessary conditions include: increasing benefits to end-users, penetrating a niche market initially, changing end-user behavior, providing incentives for adoption and usage, offering profit opportunities for payment providers, forging partnerships between new and emerging payment providers, providing necessary security, and adopting or creating industry standards.

There are certain trends that payment providers must consider when thinking about future payment innovations. The first trend is the use of mobile technologies to make purchases. The opportunity to make real-time purchases for services that may be delivered immediately such as Internet access on planes requires efficient and convenient payments that are not ubiquitous yet. The second trend is the provision of efficient and convenient payments for peer-to-peer payments domestically and globally. The challenge in this space is to provide profitable solutions because individuals are not accustomed to paying for payments. Virtual currencies may allow for less costly and faster cross-border transactions as the interconnectivity between traditional banking and providers of virtual currencies continues to strengthen. The third trend is the provision of payments by large networks or platforms to encourage greater sales opportunities such as Facebook payment solutions. While the incentives to provide efficient payments are high, the abilities for these players to gain market traction remains challenging.

The fourth trend is that there is a blurring of online, mobile, and in-store purchases. While payment providers initially target niche payment market segments, eventually payment innovations bleed into other payment market segments. The future of payment innovations is bright although there will be many winners and losers on the way to making payment systems more convenient, secure, and efficient.

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