Product Innovations on Mobile Money

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Abstract

We conduct a thorough review of the state of product development and innovation on mobile money platforms. It is, in effect, a first-of-its-kind catalog of products and services that have been rolled out, are being piloted or have been proposed. In each case we discuss the specific functionalities they entail, or how they build on the basic mobile money rails.

Keywords: mobile money, mobile payments, financial inclusion, electronic money, electronic payments

1. Motivation and scope

Mobile money has often been likened to a network of digital *rails* through which a variety of financial and payment services can be delivered. Much of the burgeoning literature over the last seven years has focused on how to build the rails (regulatory enablement, industry partnerships, cash merchant networks, technology choices, interoperability, etc.) and the marketing and profitability analysis of basic mobile money propositions.

Yet for mobile money to deliver on its promise, it needs to prove that it is capable of supporting a wide variety of products and use cases. More uses ought to drive broader appeal to more customer segments and generate more transactional volume, which will help in justifying the required heavy investments and sustaining denser cash merchant networks. More products and services with more differentiated pricing present more opportunities for providers to both create and extract more customer value. And by underpinning a wider range of essential socio-economic activities going on in a country, mobile money providers can gain a much higher level of impact, durability and goodwill.

Our aim of this report is to review the state of product development and innovation on mobile money platforms. It is, in effect, a first-of-its-kind catalog of products and services that have been rolled out, are being piloted or have been proposed. In each case we discuss the specific functionalities they entail, or how they build on the basic mobile money *rails*.

This is not a formal survey, so we do not seek to quantify how many schemes have what type of products, and neither do we claim to have done an exhaustive product review of all mobile money schemes in operation today. It is intended to complement the GSMA´s "State of the Industry" report (Pénicaud 2013a) which offers a higher-level but more quantified view of the main trends in the industry. We have assembled the information through desk research and interviews of key industry participants and observers. In cases where a large number of players are doing similar things, we refrain from pointing out specific examples, and in fact we only mention providers in the context of particularly innovative or unusual product features they have become associated with.

To structure our research and the presentation of our findings, we developed a (fairly standard) product typology or framework, shown in Figure 1. We separate financial transactions (more typically associated with banking) from non-financial transactions (typically thought of as payments). Financial transactions fit into an institutionalized, self-contained, inter-temporal pattern of purely financial obligations, and can be split by the direction of the obligation (savings and insurance vs. credit), whether the obligation is fixed or contingent (savings vs. insurance), or whether the obligation is held on an individual or group basis. Non-financial transactions are generally a real-time discharge of a business or personal obligation, and can be classified by the nature and relationship of the parties (P2P, B2C or C2B), the number of parties involved (1:1, 1:many or many:1), where the transaction takes place (in or out of store), and the nature of the underlying business transactions (products, digital content or cash). Of course, product definitions may not reflect such sharp boundaries and customer uses of those products even less so, but it is nonetheless useful to define broad product categories along these lines. Note that the high-level product typology does not include a complete mapping of all possible

transaction types, but an outline of the main transaction types which occur in practice and which are described in detail below.
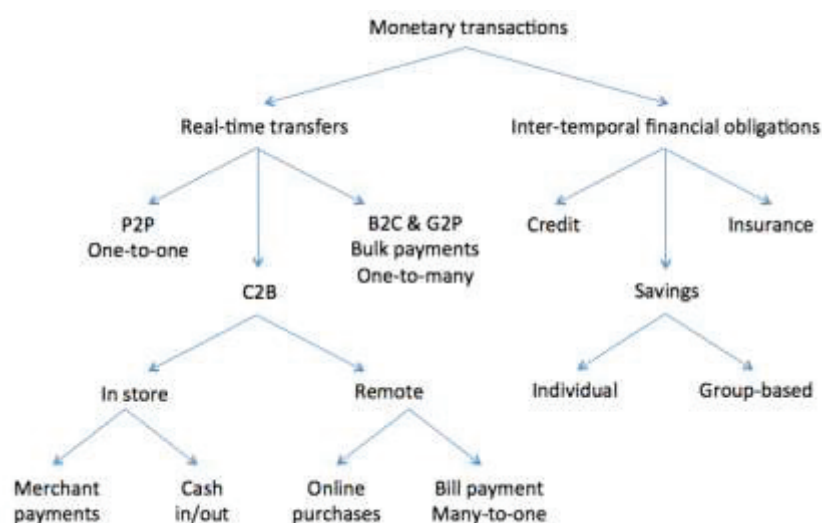

Figure 1. High-level product typology

We structure this document according to the product categories shown in the above diagram. We look at each product category as a collection of functionalities which, in combination, support the purpose intended by that product category. We take a building-block, or bottom-up approach: instead of starting from hard product definitions and drilling down to their constituent elements, we lay out incrementally the functionalities which could be added on top of basic mobile money transactions so as to deliver added value in each product area.

Products fit within fuller service delivery chains which themselves entail innovation at many levels, so it was necessary to limit our focus to specific functionalities which add direct customer value. Accordingly, we do not cover innovation aspects relating to the operationalization or marketing of these products (e.g. account registration procedures, distribution, promotional campaigns). Because so much product definition is expressed through the mobile user interface (UI), we cover innovations that impinge on the UI of individual services, but do not delve into the broad structure of user menu structure across services.

Another core element of productization is pricing, and where relevant we have chosen to cover innovations which enable new charging models (e.g. who is charged) but not specific innovations in pricing structures (e.g. pricing levels, flat-rate vs. percent fee, etc.). Beyond pricing, we consider other incentive schemes which cause a substantial change in customer behavior in how they engage with mobile money services. Thus, we look at product development proper, not the broader propositions in which they are packaged and taken to market.

Products also fit within a broader ecosystem of players. Our intent has been to focus on innovations that are added by the mobile money service provider to its core service or platform, rather than by the constellation of value added service providers that are at their fringes, though in some cases we do mention product innovations by partners who are particularly tightly linked with the mobile money provider. (For a study that focuses on mobile money innovations brought on by value added providers on an arms-length basis in Kenya, see Kendall et al 2011).

In our review we have included mobile money schemes operated by mobile operators, banks or independent third-parties, but only if they enable or target services for large swathes of the population, including those previously unbanked. Key criteria in this regard are that they must: *(i)* be supported by a broad-based distribution network of cash in/out points that go beyond traditional bank outlets; and *(ii)* offer a mobile interface that works on basic mobile devices, without a need for smartphones (though a smartphone app may be offered in addition).

In the following sections of this report we review innovations in each of the product categories defined in Figure 1. For each product category, we include discussion of: *(i)* standard functionalities which are most common among providers who already offer the service; *(ii)* service variants or add-ons which at least one player has already implemented; and *(iii)* potential enhancements which have been suggested but which to our knowledge

have not yet been rolled out.

2. P2P money transfer (one-to-one)

Peer-to-peer (P2P) money transfers are often positioned as the core product of mobile money, but they also represent the basic building block from which all other mobile money services are built. Here we use the more generic notion of P2P as a real-time transfer of funds between two participants in the mobile money network, whether they are individuals or registered as a business, and whether it is for personal or business use. Throughout the rest of this paper, we will be deriving the whole tree of mobile money products as expansions in the functionality of this basic P2P transaction.

At its most basic, P2P means the ability to push money between two mobile money peers with access to the network. In a typical basic version, the sender originates the transaction, addresses it to the recipient's phone number, and the money is moved between the account of the sender to the account of the recipient. However, there are ways of implementing a P2P transaction. The main variations in the product relate to: *(i)* whose accounts are used, *(ii)* how the recipient is addressed, and *(iii)* whether recipients need to be pre-registered by the sender.

On the first dimension of variation across P2P implementations, there are four main payment modalities, based on whose accounts are used:

Account-to-account	Both sender and receiver are presumed to have a mobile money account, and the money is shifted electronically between their respective accounts. Here the money transfer service (and fee, if any) is strictly separated from the cash in/out (CICO) service, and money transfers which start or end in cash must be supplemented by the appropriate CICO operation.
	While the sender needs to be preregistered, FNB in South Africa and Tigo Money in Paraguay have a service whereby an account is opened automatically for money transfer recipients who had not previously registered. (In the case of Tigo, accounts are opened only for Tigo SIM card holders, and in fact senders can send the money from cash – see below).
Account-to-cash (sending money to unregistered customers)	The money is sent not into a registered customer's electronic account but as a unique, secret code by text message (Short Messaging Service, or SMS), which the recipient can use to collect the cash at any eligible CICO outlet. For security reasons, the code is only valid for a limited period of time (e.g. one day), and if the cash is not collected during this period the transaction is automatically reversed. Technically, the money is sent to a temporary escrow account, until the cash is claimed by the recipient.
	This is a useful mechanism by which to send money to non-registered customers, and is often packaged as a customer acquisition strategy in two ways: *(i)* it is priced more expensively than account-to-account transfers so as to incentivize the sender to put pressure on the receiver to register as a customer in order to receive future money transfers; and *(ii)* the text message received by the recipient may include a call to action to register, and may even prompt for immediate registration if local account opening regulations permit.
Cash-to-account (direct deposits)	Some banks, such as Zanaco in Zambia which operates the Xapit mobile money service, allow anyone to deposit cash into a customer account. This is used by customers to effect money transfers, for instance Zambian schools often request parents to deposit fees directly into their accounts and present the deposit slip to the school as proof of payment. To avoid revenue cannibalization, Zanaco charges a higher fee on cash deposits to a third-party account than an electronic transfer between two accounts.
	Direct deposits can happen on mobile money platforms in an informal fashion, where customers purport to be depositing in their account but actually deposit it in someone else´s, thereby bypassing the P2P charge. Many deployments penalize agents who do not properly check depositors´ identity and are therefore caught conducting direct deposits on behalf of customers.
Cash-to-cash (over the	The receiver retrieves the money at a retail agent as in the previous case, but in addition the sender pays cash to an agent rather than having the money taken out of their mobile account.

counter)	This is a non-electronic transfer from the point of view of both sender and receiver, since neither need have an account or an electronic payment instrument linking to an account. The electronic transfer occurs strictly between agents' mobile money accounts, to offset the cash that one agent is collecting and the cash the other agent is handing out from their respective customers. Therefore, both sender and receiver need to show up at an agent location and transact over the counter. The transaction is initiated and processed by the agents; customers do not use their mobile phones for anything other than receiving transactions confirmations by text message.

The second dimension of variation across P2P implementations is the addressing method. While the most common method is using the recipient's mobile phone, other possibilities exist:

Dedicated business number	Many mobile money schemes assign unique numbers to special classes of users: agent codes, biller codes and, increasingly, merchant numbers (more on them later). Using dedicated numbering ranges that are distinct from phone numbers may be justified on three grounds: *(i)* convenience, if short codes are used); *(ii)* pricing transparency, to highlight that such transactions carry different pricing from basic P2P; and *(iii)* safety, to the extent that money sent in error to such commercial entities are easier to investigate and possibly reverse than money sent to essentially anonymous phone numbers.
Bank account number	Mobile money systems that are operated by or interoperate with banks would typically give the choice of sending money to a phone number or directly to a bank account number. This gives customers more choice about the destination of the funds if the recipient has multiple accounts, whether in the same or across different financial service providers.
	However, bank account numbers have the drawback that they tend to be significantly longer than mobile phone numbers, and are not often remembered even by the account holder. In some countries, there is still no unique bank account numbering system across banks, in which case the recipient's bank needs to be selected expressly, which complicates the usability of the service.
Mobile Money ID (MMID)	The National Payments Corporation of India, which operates a real-time, low-value, mobile-enabled switch open to all banks and mobile money issuers, has introduced its own simplified account addressing system which abstracts from both (lengthy) bank accounts and (telco-controlled) mobile phone numbers. Every account is identified by a 7-digit MMID, which uniquely identifies a user's bank or mobile money account. This is ostensibly to create full uniformity between bank- and telco-led schemes, but it does introduce a new set of numbers which users need to remember and senders need to ask for in order to transfer money.
Email address	This is the main addressing system used by PayPal, though its applicability is much less relevant in developing countries where vastly more people have mobile phone numbers than email addresses.
Business number with error detection	A common business complaint relates to situations in which money has been received from a customer, who subsequently alleges to have made the payment in error (whether because of a genuine mistyping or a fraudulent attempt to renege on the payment) and calls the provider to try to reverse the transaction. The reversal process disrupts the business, due to reconciliations and delayed access to or loss of funds.
	One solution is to introduce a special account numbering range for business users who want to avoid this situation, which incorporates automatic data-entry error detection features. This can be done by adding a *check digit* to the account number, which is computed from a secret mathematical operation on the rest of the digits in the account number. A mistyped digit causes the check digit to not match the rest of the account numbers, and hence the transaction is immediately identifiable as invalid.
	Bank account numbers generally include this feature, but mobile phone numbers do not. At the very least, mobile money providers could add this feature on the agent, biller and merchant numbers they already issue. They could go further and offer all of their customers

the choice of identifying their accounts by their easier-to-remember phone number or by a more secure business number.

The third dimension of variation across P2P schemes is in the flexibility users have to send money to new recipients:

Defined recipient list	Some bank implementations require that customers state ahead of time who they may wish to send money to, in a process akin to setting up a list of 'favorites.' This they typically need to do at a branch or through an online process. This is done for safety reasons: it cuts down on erroneous transactions when people type destination numbers on the fly, and it makes it more difficult for criminals who break the security of the account to transfer money to themselves.
Unrestricted	Telco-based mobile money systems typically do not require any pre-definition of potential money recipients, so that anyone can send money to anyone else at any time. This approach emphasizes convenience and universality.

A common extension of the P2P service is to expand beyond domestic transactions and include international remittances (Pénicaud 2013b). Mobile money schemes would then process one leg of the transaction (typically the termination side), and partner with others abroad to do the other leg (typically the origination). International partners tend to be established remittance players with broad-based distribution, such as Western Union. In terms of origination for international remittances, we typically see the following:

Money transfer agent (cash to mobile wallet)	International money transfer companies such as Western Union and MoneyGram offer their in-country network of retail agents as they have done traditionally. The sender need only specify that the funds should land directly in the recipient's mobile wallet. Western Union allows consumers from 45 countries to send money directly mobile wallet holders from M-PESA in Kenya and Tanzania, MTN Mobile Money in Uganda, Tigo in Central America, and Smart Money in the Philippines. MoneyGram is set to launch a similar service with Vodafone in the second quarter of 2014.
Online transfers (bank account to mobile wallet)	Online platforms for money transfer (e.g., westernunion.com) provide a convenient mechanism for banked senders to send an international money transfer to a mobile money wallet abroad. The sender needs to select the option online for the recipient to receive the funds through their mobile wallet instead of in cash at an agent location.
Mobile transfers (Mobile wallet-to- mobile wallet)	Operator groups that have mobile money deployments in multiple markets are starting to offer cross-border transfers between mobile wallets. In 2013, Orange launched Orange Money International to enable transfers between Orange Money accounts in Mali, Senegal and Cote d'Ivoire (all part of the West African Monetary and Economic Union, circumventing foreign exchange issues). Companies such as Ripple Labs have created a common ledger or protocol for payments, similar to SMTP for email, which can allow people to send cross-border transfers between accounts on different platforms. While it is technically possible, we have yet to see this in practice.

Finally, there are some functionalities that can be added to basic P2P services to make them more convenient for users (Mas & Ng'weno 2012):

Erroneous destination phone numbers	As stated above, mistyped destination phone numbers is a common problem with mobile money. Some SIM Toolkit-based solutions, such as Safaricom's, lets customers select the destination phone number from the numbers stored in the SIM's phone book. USSD-based solutions could remember frequent numbers used and could prompt users to check or re-enter the number when they have not used it before.
A common approach to mitigate the risk of sending money to erroneous numbers is for the mobile money system to notify the sender of the name of the legal account holder associated with the destination phone number that the sender has entered. The principle is that it is a lot easier for senders to spot potential errors by looking at recipients´ name rather than their phone numbers. Being session-based, USSD-based systems can notify the sender of the

recipient´s name *before* the sender is asked to confirm the transaction. SIM Toolkit-based systems, in contrast, can only notify the sender of the recipient´s name on the SMS confirmation message, i.e. after the sender has authorized the transaction. In the latter case, errors cannot be prevented but may be identified more promptly.

Printing receipts	P2P transactions (and all mobile money transactions, broadly speaking) are typically confirmed only digitally, with a text message. There may be situations when customers genuinely need a printed receipt, for instance to claim an expense or in the event of a payment dispute. Safaricom in Kenya lets customers print receipts at their own shops for a fee, but their number of shops is relatively low. This could be made more ubiquitous and convenient by creating a receipt website, so that payers can print off a receipt as and when required, after they have entered their phone number and a unique transaction ID from the confirmation SMS (i.e. without requiring distribution of special usernames and passwords).
Viewing transaction histories	It is common for mobile money services to include a menu option to view the last few transactions on the mobile phone (a kind of mini-statement). MTN in Cote d'Ivoire goes further and offers a self-care web portal for customers, where they can view all of their transactions online.
Entering optional descriptors	Another common business complaint occurs when a business gets a valid payment but doesn't know who it is from or what it is for. The customer might have sent it from a different phone than usual, or he may have several invoices outstanding. There could be an optional reference field on all money transfers so that senders could enter some kind of identification or description for the payment. This could be a default for all P2P transfers, or an opt-in selectable through a global menu setting.

Some (but not all) of these aspects are specifically addressed in the bill payment and bulk payment solutions that have typically been implemented for larger corporate users, which we discuss next.

3. Bill payments (many-to-one, C2B)

Bill payment is a facility that allows a corporate entity (the biller) to receive regular payments from a broad base of users remotely. It can be thought of as a structured collection of individual wallet-based or *over the counter* P2P payments, typically with the following enhancements:

High transactionality accounts	The biller needs a collection account with higher balance and transactional limits, to accommodate potentially high transaction volumes. The biller will accordingly need to be subjected to more stringent Know Your Customer (KYC) requirements.
Required payor identification	Payors need to be able to state the number of the account they have with the biller, since the biller may not be able to identify them based on their phone numbers alone. Accordingly, bill payment services generally include a mandatory data field in which customers are asked to type in their account bill number or another identifier (e.g. child's name in case of a payment to a school).

Incomplete or mistyped account details are a common source of problems on mobile bill payments, which trigger anguished customer calls to the call center of both the biller and the mobile money provider and much manual reconciling. Beyond requiring a non-empty account number field, bill pay systems could enforce a biller-specific syntax on the account number field (e.g. a particular number and type of alpha-numeric characters), so that customers are prompted to supply the necessary information before confirming the payment. |
| *Easy biller selection* | Customers need to be able to identify the various billers they need to pay bills to. To make data entry easier, providers typically offer three facilities: *(i)* short codes for billers, so that users need to type in fewer digits; *(ii)* direct placement of biller names on the bill payment menu, so that users can just scroll down a list and select them without having to enter any biller code; and *(iii)* possibility for users to store or define biller 'favorites,' so that they don't need to enter the biller and account data each time they want to pay a bill. |

The latter two are easier to implement on USSD-based systems, which have more dynamic menu possibilities.

If bills are paid o*ver the counter* (OTC) at an agent location, i.e. from cash rather than from a mobile account, data collection can be automated by providing the agent with a barcode reader. Where bar codes are standardized such as in Brazil, they can use this to automatically pick up the biller and customer's account number from the paper bill brought in by a customer. Alternatively, agents can be provided with a sheet of barcodes, one for each of the more common billers in their area. Then, when a customer wants to pay a bill, they can identify the biller by scanning the appropriate barcode on that sheet, rather than having to typing in a biller code or scroll down a long menu on their digital terminal.

Charging flexibility	Some billers want to absorb the cost of bill payment in order to encourage their customers to pay bills remotely rather than at their offices, while others want to translate that cost entirely to bill payers. Many mobile money systems include a variety of charging options based on different cost splits between the biller and the payer.
Biller account manageability	As big users of mobile money, billers require better tools to view and manage the transaction flow they receive. Accordingly, they are often given a dedicated web access with a graphical user interface which enables them to view their transactions and manage their collection account.
	The more advanced systems provide a mechanism for real-time transaction notification of incoming payments into the biller's corporate IT system. This way billers can view all their transactions in real time from their own systems, rather than having to log in to the mobile money provider's biller access portal. Telesom in Somaliland offers a web-based interface for billers and merchants that is particularly flexible, customized for their biggest (Pénicaud & McGrath 2013). It allows corporate users to filter transactions by customer, for example.

One important limitation of bill payment services is that they tend to be costly to set up and hence are generally directed at the larger corporates, utilities and schools. Some operators seek to offer more easily accessible collection solutions. Easypaisa in Pakistan offers a simple donation service though which customers can directly fund certain organizations and foundations. M-PESA in Kenya now offers a limited-duration bill payment service ("renting a bill pay number") which customers can use for special events such as a wedding or a charity function.

The other main limitation of bill payment services is that they are generally not designed to cover the entire transaction cycle: customers are not informed when bills are due, nor do they interact directly with the biller when paying through mobile money. The following enhancements would allow for an improved customer experience:

Electronic bill presentment	With electronic bill presentment, customers can be automatically informed when a bill is due, and could pay it directly without having to re-enter the bill details. This could be done by having bills that are due appear in the phone-based bill payment menu, which customers could select to view and pay (with the bill payment fields automatically populated from the selected bill). Alternatively, the bill could be sent to customers by SMS, which they could pay simply by responding to the SMS. (It would be safe to pay by SMS, without entering a PIN, given that the money could only go to select billers.)
	Electronic bills can be presented for post-paid services, e.g. at the end of each month. But they could also be presented as suggested top-ups on pre-paid services (commonly mobile airtime and electricity) based on a remaining-balance threshold.
Biller confirmations	Customers who pay a bill from their mobile phone typically get a transaction confirmation SMS from the mobile money provider. While this confirms that money has been debited from the customers' mobile money account, it does necessarily confirm that the biller has received the payment and credited the customer's account. The

respective systems of the mobile money provider and of the biller may not have communicated appropriately, or there may be an error in the customer's account number. In this situation, payments can go into a limbo without the customer's knowledge. This can be avoided by having bill payment confirmations come directly from the biller rather than from the mobile money provider. This would provide more reassurance to the customer, and would give the customer an opportunity to react when something has gone wrong.

4. Bulk payments (one-to-many: B2C or G2P)

Bulk payments are the logical reverse of bill payments, but they share some of the same types of service requirements on the corporate account side: the need for a larger disbursement (rather than collection) account, the need for a specialized web-based user interface and APIs, and flexible charging models. The specific service enhancements that bulk payments require, over and above the basic P2P and corporate account capabilities, are:

File uploads for batch processing	Unlike bill payments which occur on an unscheduled basis (i.e. whenever a customer wishes to pay), bulk payments tend to happen in an entirely programmed basis. Payment instructions are generally provided ahead of time, for subsequent execution on a batch basis. Bulk payers need a secure electronic mechanism to inform the mobile money provider which accounts need to be paid, how much, and by when. This information is typically uploaded by the bulk payer into their corporate web portal.
Charging flexibility	Bulk payors typically bear the full cost of the electronic payment; the service falls under the conventional 'sender pays' logic. In addition, bulk payors may also want to absorb the cost of the cash withdrawal by the recipient, for instance if it's for wages *in lieu* of a cash payment. The bulk payment charge-sheet typically offers both options.
	Mobile money providers' are typically very eager to acquire bulk payment customers as it is a targeted way to acquire customers on a group basis and a low-cost way to get electronic value into mobile wallets. Therefore, bulk payments tend to be priced well below the equivalent P2P charge despite the extra value added in a bulk payment service, and providers are often prepared to offer deep volume discounts for heavy users.

Governments and NGOs are increasingly interested in using bulk payments as a mechanism for distributing social welfare payments, under their conditional cash transfer or other social protection programs (Almazán 2013). These payments tend to be relatively small in value but large in number, and are usually disperse in the most rural and remote areas in the country. They therefore put a lot of demands on the providers' CICO network, since CICO outlets in those areas may be few and far between, and those that exist may find it expensive and time-consuming to rebalance at distant bank branches. A number of mechanisms have been developed or conceived to ease the agent liquidity problem at rural agents:

Use of restricted-use vouchers	Some schemes pay out to beneficiaries in the form of vouchers which can be exchanged for goods at participating stores. This makes cash-out unnecessary, and hence obviates the need to ensure agent proximity and liquidity. It is also easier to convince stores to accept electronic payments when there is a captive customer base with restricted-use money, rather than with cash which they can use anywhere. It may be that program administrators are even able to negotiate price discounts on behalf of beneficiaries. The social program may also see value in restricting what types of goods people buy with their benefit money, for example for food and clothing only. On the other hand, by limiting choice, directed vouchers schemes may reduce beneficiaries' perception of the value they are getting.
	Vouchers schemes can be implemented as a stand-alone, closed-loop wallet with little or no cash out (the Net1 model in South Africa and elsewhere), or as a second special-purpose wallet on a standard mobile money platform. It could also be implemented as a paper-based voucher scheme (like Zoona did for cotton farmers associated with Dunavant in Zambia).
Scheduling of	Another approach is to try to schedule payments based on local liquidity conditions on

payments	the ground. It might be as simple as staggering payments over a few days rather than releasing them all at once, so that not all beneficiaries attempt to gain liquidity at the same time. For instance, DaviPlata in Colombia informs beneficiaries via text message when their payment is scheduled to be made and which cash outlet they are assigned to. Agents can also be routinely informed of the volume and value of scheduled payments that are coming up in their area, so that they are able to prepare the necessary liquidity on those days. Or there might be a more proactive discussion with agents to understand which days of the month they are more naturally cash-flush and concentrate payments on those days.

5. Merchant payments (C2B: in-store)

Merchant payments can be thought of as a special kind of P2P transfers which arise from commercial transactions, generally inside stores in exchange for goods. Like bill payments, they accumulate in a collection account, and merchants typically desire higher account limits and web access to be able to view their transaction flows and manage their collection account.

In a face-to-face transaction at a store, electronic payments face more direct competition from more established physical instruments such as cash, checks and cards than would be the case in a remote payment setting (McCarty 2012). This imposes two special requirements on merchant payments: they need to be fast and they need to be cheap. Therefore, innovations in merchant payments tend to focus on the payment process at the check-out counter, the devices used by both buyer and seller, and the transaction reversal process (if any). Together these aspects define the payment architecture.

The payment process largely follows from who initiates the transaction –the buying customer or the merchant— and how the data is exchanged between the two to create the payment instruction. There are three broad cases:

Payment push	Standard P2P transactions are based on a payment push model: the sender originates the transaction and enters all transaction details. Applying this model to a merchant setting requires that at the till the buyer sets up the payment on her handset by identifying the merchant (the destination of the money) and entering the amount of the purchase. Merchants would typically be given special merchant numbers distinct from their phone numbers, which they would display at the till.
Payment pull	Traditional card-based merchant payments, on the other hand, are based on a payment pull: it is the merchant (i.e. the recipient) who requests the transaction and enters the transaction details. Pull payments in effect shift the work onto the merchant. It evolved in this way because merchants are presumed to have the more convenient device (POS) and to be more adequately trained and experienced with conducting electronic payments.
	Many mobile money systems are now introducing a merchant-initiated or pull-payment model. The traditional pull model will of course be used by all systems that rely on a companion card. In the mobile-only model implemented by Tigo Money in Paraguay, the merchant enters the transaction details on her terminal (the client's phone number and the amount of the purchase). The provider then pushes a payment confirmation request to the buyer's handset via a USSD message, and the customer completes the transaction by entering her PIN. In this setup, merchants do not need to be issued merchant numbers because it is now the store that identifies the shopper through her phone number.
A hybrid using OTPs	In a push payment the customer enters the full transaction details, while in a pull payment the customer only enters her PIN. The latter is more convenient for the customer, but presents a greater risk of inadvertent acceptance of a wrong payment since the customer didn't specifically enter the recipient's details. (Imagine a fraudster who, upon seeing you at the check-out counter, sends you a pull payment request which the shopper accepts thinking it is coming from the store's cashier.) Pull payments are therefore inherently more risky.
	To mitigate this risk, mobile money systems in South Africa (including MTN and TYME) and Indonesia (XL) employ a hybrid system that requires customers to first request a one-time password (OTP) through their mobile device. This can be obtained

prior to reaching the check-out counter, as the OTP would typically be valid for 30 to 90 minutes. Once the buyer is at the check-out counter, the merchant initiates the transaction but in this case asking the customer to show the OTP on her mobile phone screen rather than dictating her phone number. In this fashion, there is much more privacy around the transaction, and pull transactions are disabled as long as the customer doesn't request a (temporary) OTP.

Beyond who initiates the mobile payment transaction, another issue is who pays for it. The standard P2P charging model is for the sender to pay for the cost of the transaction. On the other hand, the traditional card-based merchant model is for the merchant (i.e. the recipient) to pay for the transaction, in the form of a merchant discount (i.e., it might get something less than the nominal value of the transaction from the mobile money provider). Many mobile money systems are now seeking to introduce a merchant-pays model, albeit at lower merchant discounts than are typically in card systems. This is purely a business model issue, based largely on considerations of willingness to pay and potential cannibalization of revenues, and there is no reason why the payment process or the underlying devices should condition what charging model is used.

The nature of the devices and data network used by both buyer and seller will determine: *(i)* the convenience and speed of data entry at the point of sale, which is necessary to capture transaction details and the buyer's payment authorization; *(ii)* the speed of data exchanges between buyer, seller and the payment scheme provider, which are necessary to issue process payment instructions and confirm transactions; and *(iii)* the security around the transaction.

Figure 2 shows a range of device options for merchant payments. While mobile money systems started off being purely basic phone-to-basic phone, there is a trend now towards more specialized solutions to optimize the payment experience at merchants. Schemes based on pull (or hybrid) payments will tend to rely on store devices that have specialized embedded applications (whether on a general computing device such as a PC or smartphone, or a dedicated POS terminal), which offer an easier and faster user interface than basic phones. Below we review the main combinations of devices, classified in the first instance by the payment device presented by the shopper:

Simple phone	If the customer has a simple mobile phone as a payment device and nothing else, then the customer's phone needs to exchange data with the store's device through a cellular communication channel. This has implications in terms of cost (usage of cellular bandwidth) and speed (messages between buyer and seller –who may be a mere meter apart—need to go back and forth through the mobile operator). The store's device may be another simple mobile phone, but if a pull payment model exists it is more likely to be a feature phone or smartphone with more convenient data-entry capabilities.
	The two devices can use various cellular communication channels, depending on the mobile money system's design. The most basic arrangement would be through USSD or encrypted SMS (using SIM Toolkit). If the seller has a smartphone, the communication with it can go through the much cheaper data channel. Tagattitude implements a clever communication through the voice channel: the two phones connect on a regular voice call, and they exchange data encoded as audible frequencies.
Companion card	Mobile money customers in a few markets are offered a normal-sized physical card (whether magstripe or with chip) as a *companion card* to the mobile wallet. This is increasingly common in middle-income countries that have relatively high card acceptance infrastructure, at least in urban areas. This way, customers can use the mobile phone to push payments in remote settings, and the companion card to accept pull payments in a shop setting. This preserves the traditional merchant payment experience, minimizing the requirement for customer learning and enabling faster payment experiences at the check-out counter. Zuum in Brazil, the mobile money joint venture by Telefónica and MasterCard, offers an optional companion card, as does MiFon (a collaboration of Rev and Banorte) in Mexico. But distributing and servicing cards adds significant extra cost, and such a multi-channel approach creates unique marketing challenges for providers, particularly in the early days.
	The shop requires card-reading infrastructure, which may be in the form of a traditional

dedicated POS terminal or a smartphone equipped with an external card reader (this set-up is often called an mPOS). While Square has captured headlines due to its success in enlisting merchants with such external card readers in the US, dozens of similar companies have emerged (such as iZettle across Europe and Brazil, Clip in Mexico). There is now a range of cheap card readers which can be attached to the audio jack of any smartphone (or sufficiently capable feature phone).

Contactless tokens

The payment card size and form factor became a standard because it had to be inserted into reading devices for data to be exchanged. Now there are *contactless cards* or *tokens*, which communicate with the card reader through a local (or near-field) radio link. Contactless capabilities may already be built within a phone, or attached to the back of the phone (hence the use of the word *token* as a generalized form of the old card). In order to exchange the necessary data, the devices need to be in very close proximity but need not touch, a process often referred to as *tapping* the card or phone.

The shop or cashier needs to have a device with the same local radio capability. Again, this can be integrated into a traditional POS terminal or into a phone. In the latter case, no external card reader is required, although in practice mPOSs would probably offer both a card reader and contactless capabilities. For some years now there has been a standard for mobile phones called Near-Field Communication (NFC), though still not so many models of smartphones incorporate it.

Digicel rolled out contactless payments in the Pacific (Beep & Go), integrating Verifone mWallet's NFC POS enabled-payment solution with Digicel's mobile money wallets. Mobile money users were registered with an NFC tag to enable this contactless solution.

Figure 2. Device options for merchant payments

An area of future potential innovation around merchant payments has to do with transaction reversals. Mobile money schemes generally work on the principle of irrevocability of payments, such that transactions can only be reversed if the recipient explicitly agrees to return the funds to the sender. On the other hand, traditional card-based systems such as those operated by VISA and MasterCard allow for merchant payments to be reversed at the buyer's request in some circumstances, at the merchant's cost. This introduces more consumer protections for buyers, but it does entail complex rules and procedures to govern this process and it raises a range of costly fraud opportunities. While it is doubtful that mobile money systems will adopt such burdensome rules, it is likely that there will be some cautious and gradual movement in this direction as providers seek to make their customers more comfortable with using mobile payments more profusely.

6. Online merchant payments (C2B: through the web)

A special case of merchant payments is where the merchants are online retailers. In an e-commerce setting, the key technical challenges are: *(i)* avoiding customers having to enter their mobile PINs on an insecure web page, and *(ii)* linking the mobile payment with the commercial online transactions. This can be achieved in several

ways:

Using bill payment	The customer can pay the online merchant through a normal mobile bill payment service from his mobile phone. If the merchant doesn't have a corporate bill payment account with the mobile operator, it can work through a payment aggregator who does. To link the bill payment with the online transaction, the customer must enter the transaction ID from the SMS bill payment confirmation message into the merchant's website – a somewhat inconvenient and error-prone procedure.
Creating a pull transaction	An alternative approach is to turn this into a pull (i.e. merchant-originated) transaction. The mobile money customer enters his phone number (and possibly another secret identifier, but not his mobile PIN, to avoid fraudulent pull transaction requests) on the merchant's website, and the merchant then requests payment from the customer via the mobile money provider. The mobile money provider launches a USSD session to the customer's phone, asking him to authorize the payment by typing his PIN. If the payment is approved, the mobile money provider will confirm the transaction with the online merchant, who will then release the order. Such a system was recently launched by M-PESA in Kenya, branded *Lipa na M-PESA online*. While more convenient for the customer than the previous case, it may be slower as a separate mobile communication needs to be set up with the customer.
Through a payment gateway	Both of the above options entail use of separate channels for the online transaction (the web) and the payment (via mobile). A more direct approach is to create a secure website to which customers wishing to pay online are redirected. Customers can confirm the payment with their PIN on this website, and the merchant can be notified of the payment immediately, online.
Issuing a virtual card	Some mobile money providers, such as Banorte in Mexico, offer their customers the possibility of requesting a 16-digit PAN (Primary Account Number) which is routable under some major payment scheme such as VISA or MasterCard. This would act as a virtual debit card, though it could also be issued as a physical companion card. Customers can move funds from their mobile money account to their virtual card, and then make payments from it through any website (or any physical store, for that matter) that accepts VISA or MasterCard.

7. Cash in/out (P2P offset by an opposite cash transaction)

CICO transactions are a special kind of P2P transfers which are made to offset cash transactions between a mobile money customer and a mobile money agent. Like merchant payments, these transactions are face-to-face, but transaction speed is perhaps less critical because there is no direct competition with cash (this being a service to exchange between cash and electronic value) and the store is specifically paid to conduct the service. And, unlike with merchant payments, the store engages in transactions both ways (to buy and sell cash against electronic value), so the store sometimes is a sender and sometimes a recipient of electronic money.

There are some process variations on the basic CICO setup:

Cardless transactions at ATMs	In many mobile money systems, customers can access (and, presumably, deposit) at ATMs that are modified to interwork with mobile money systems. The possibility of ATM withdrawals is very significant for mobile money systems as ATMs offer a liquidity of last resort in case local agents face liquidity shortages, especially for larger transactions. What is required to enable this service is: *(i)* a link between the ATM network (typically through an ATM switch) and the mobile money provider's platform; *(ii)* a (soft) button on the ATM user interface that wakes up the ATM so that it can process a cardless transaction; and *(iii)* a way for the customer to request and receive a limited-duration, one-time password (OTP) on his mobile phone, which he can then enter on the ATM to release the funds. Typically, providers leverage existing ATM networks, but some have deployed their own proprietary infrastructure (e.g., Tigo's Tigo Matic and Orange Cote d'Ivoire).

Scratch cards for cashing in	Some systems have thought of replicating the widespread mobile top-up experience via scratch cards for depositing money into mobile money accounts (this was the original concept of Money Box in Nigeria, and also of the *Fonoahorro* service planned by the federation of *Cajas Municipales* in Peru). Under this system, stores would stock physical cards with fixed denominations, which customers would take from the shelf and pay for. Customers would then need to top their account by scratching the card and entering the unique card number on their mobile phone. This creates a physical product around depositing and reduces the need for agent training for cash-in.
Standardized bar codes as cash-in vouchers	Standardized bar codes are being used in some markets to commoditize the cashing-in process so that it's no different than purchasing a good at a formal retailer. For instance, the recently launched mobile money service *Meu Dinheiro Claro* in Brazil allows users to top up their accounts via a printed *Boleto Bancario* online—a paper bill with a unique number encoded in a barcode, used predominantly for bill payments. The user then takes this to any banking correspondent where the barcode gets scanned, and the customer pays cash to the agent for the amount owed. In this way, customers can convert their cash into electronic value, albeit only if they have internet access.
Authenticated deposits	Mobile money systems generally require customers to show their ID. This has a regulatory purpose (identifying the source of funds to prevent illicit uses) and a commercial purpose (avoiding direct deposits into other people's accounts so as to bypass P2P charges). This could be entirely avoided by requesting that depositors (who by definition must already be customers in account-based systems) use their electronic credentials instead. This can be done by essentially turning the deposit into a pull transaction: depositors would request the deposit transaction and confirm it by entering their PIN, and the agent would then authorize it by entering their own PIN (Levin 2013).
Cash vouchers sent to oneself	A common reason why some people share mobile PINs is so that they can ask a friend going into town to pick up some cash from their account on their behalf. This of course compromises the security of their entire account. This could be done more safely by creating a withdrawal request for a specific amount against a one-time password which people can then share with their friend going into town. This would work much like when one sends money to an unregistered customer, except that the SMS code would be sent to the account holder rather than to a named recipient.

8. Savings / Money management

Pure-form mobile money systems incorporate a store-of-value mechanism, in the form of an account. This may be used simply to enhance payment convenience, by permitting a consolidation of multiple electronic transactions into fewer CICO transactions as well as timing separation between electronic inflows and outflows. However, this account can in principle be used to accumulate savings beyond what is required to meet shorter-term transactional needs. OTC-based (i.e. non-account-based) systems have of course stripped out this functionality entirely.

The global experience has been that few people use mobile money accounts for savings purposes. There are five leading reasons as to why that may be the case, which have a bearing on product design and how the product is marketed.

Account limits set by regulation	The capacity of mobile money accounts to be used for savings may be limited by regulation. Regulations often impose balance limits on individual mobile money accounts or a maximum value of cumulative deposits and withdrawals per day or per month. How low these limits are would depend on the quality of the KYC that has been performed on the customer (depending on the extent of customer documentation collected and who performs customer ID verification) and the security of the electronic channel utilized (depending on the strength of the authentication mechanism and of the encryption of the data being transmitted). These constraints could be eased by innovations which enhance the quality of the KYC and the security of the mobile

channel without placing an undue burden on the customer experience.

If the mobile money provider operates under an e-money rather than banking license, regulations may impose further restrictions on balances and transactionality, as well as prohibitions to pay interest or advertise the service as a savings product, in order to distinguish the banking from the non-banking product. Moreover, regulations in India force mobile operators to partner with banks and show a banking brand if they want to offer full mobile money services. These restrictions may be overcome by associating the mobile money account to a full bank account.

Trust

People may learn to trust mobile money to undertake real-time transactions relatively quickly, after they have (or heard of someone who has) done it a few times. But savings is a different matter because it requires customers to have faith in their provider over a more protracted period of time. Savings decisions may also be more emotionally charged, and hence linked to the attitudinal feelings about the provider, whereas payment decisions are much more pragmatic.

This trust gap is sometimes perceived to be more significant for non-bank mobile money players such as mobile operators, in which case it could be addressed by associating the mobile money account to a full bank account and leveraging the bank's brand. However, it may well be in some cases that a mobile operator's brand has more brand affinity with the mass market than a bank brand. In this case, it may be sufficient for trust-building purposes to be able to claim it is a banking product without necessarily having to promote the specific brand of the bank involved, i.e. leveraging a *category brand*.

Rewards

Most mobile money providers offer very low or no interest on saved balances. An exception is EasyPaisa in Pakistan, a mobile money service offered by mobile operator Telenor under the bank license of Tameer microfinance bank which it acquired. Easypaisa encourages customers to opt into one of three savings plans. These plans constitute a ladder of higher interest rates the higher the minimum balance that customers commit to. Interest is paid on the full saved amount, but only if customers meet their minimum balance commitment.

In countries where regulations do not permit non-bank mobile money providers to pay interest on saved balances, there may be scope for to consider alternative rewards within the bounds of regulation. While there are some examples of telco-based providers rewarding transactional use with airtime bonuses, we have yet to see this applied to incentivize balance accumulation. Getting around these restrictions might be a further reason for associating the mobile money account to a bank account that can offer interest. For instance, in Kenya, M-PESA accounts bear no interest but the tightly integrated bank-issued M-Shwari account does.

Earmarking and mental accounting

Much anthropological client research suggests that people like to separate their money for various purposes. Earmarking funds in this fashion helps them to budget and to eliminate the notion of freely disposable money. Banks routinely facilitate this, by offering multiple accounts with different degrees of access (e.g. current, savings and time deposits) or targeting different purposes (e.g. a school fees account or a pension account).

In general, mobile money providers have kept to very simple offers, favoring simplicity and ease of use over sophistication of use models. To the extent that they offer anything more than a transactional account or wallet, they have generally done so by permitting a linking of accounts held at banks. Separation might also be achieved through non-bank savings products as well. In India, some microfinance institutions offer micro mutual funds to their customers as an alternative to bank accounts; these products could in principle be offered through mobile money platforms as well. In Kenya, there are plans to let people buy Treasury bills through M-PESA.

Separating money through multiple linked accounts is likely to be more effective in

triggering savings behavior if they differ in their accessibility, such that people can choose the degree of *distance* they want between them and their money based on their intentions behind that money. There is of course an inherent difference in liquidity between accounts based on how many access points the respective providers have, but in general linking a mobile money account (accessible through agents) and a transactional bank account (accessible through ATMs) may not create sufficient sense of *distance*. In the case of Kenya's M-Shwari, money in M-Shwari is 'two steps away' from use, since the money first needs to be transferred into M-PESA before it can be cashed out or used to make an electronic payment.

Discipline devices and illiquidity	Beyond sheer separation of funds, mobile savings products might incorporate a variety of discipline mechanisms which people can use to preserve the value of their savings from their impulsive selves. Mas (2013) explores how many such discipline mechanisms are embedded in informal savings solutions, including the notions of waiting period (no immediate liquidity), indivisibility (no partial liquidity), peer pressure (social consequences) and mental labelling (loading emotional charge). He suggests how these notions might be incorporated into a mobile-based personal money management framework, for instance letting people send money to themselves (Me2Me payments) against various concepts such as future dates, days of week, animals or colors.
	There have been several schemes that seek to build savings discipline through SMS reminders. Customers make savings plans or commitments, and they are prompted to make payments on scheduled days, encouraged along with positive messaging, or admonished if they fall behind. However, such systems are generally not integrated into the mobile money user experience, and are rather an additional information provision layer. For instance, Bancolombia enlisted Juntos Finanzas to help design and deliver SMS content for its mobile savings account (*Ahorro a la Mano*) holders. A particular aim is to create a high-touch two-way 'conversation' to build trust, encourage routine, and remind, ultimately offering the convenience of links to e-transfer functionality.

The above discussion has highlighted the opportunities that exist from associating non-bank mobile money products more closely with banking products. This allows mobile money providers to circumvent restrictions on wallet size, payment of interest and marketing of savings, as well as to address both the money-separation and trust-building arguments. Non-bank mobile money players therefore have sought to associate their service with bank savings products, in one of three ways:

As a channel for a bank account	This is where the mobile money account is in fact replaced entirely by a bank account: there are no 'mobile wallets' as such. In Kenya, mobile operator Orange offers its Orange Money service through an Equity Bank account, on a co-branded basis. Dutch-Bangla Bank's mobile money service in Bangladesh and Zanaco´s Xapit service in Zambia were in fact primarily introduced as a savings product and only later associated with payments.
White-labeled bank accounts	In this case the accounts are hosted within the mobile money provider's platform and they are fully operated, marketed and branded by the mobile money provider, though the accounts are technically issued by a bank. An early example was Smart Money, operated and marketed by Smart Communications, but technically an account with Banco de Oro. A more recent example is bKash in Bangladesh which offers BRAC bank accounts; there is a corporate relationship with the two, but the bKash brand prevails for this service at the retail level.
Linked bank accounts	In other cases, mobile money operators choose to offer a bank savings option to their customers, but without giving up their own mobile wallets. This they do by enabling direct electronic transfers of money between a customer's mobile wallet and certain linked bank accounts. In this case the mobile money provider may not capture the value of their customer savings, but they capture instead the transactions *around* those savings: the extra CICO and electronic payments that are triggered.

The mechanisms for linking mobile wallets to bank accounts may differ according to how seamlessly integrated they are. There are three main levels of integration:

Mobile user interface (UI)	Under a low level of integration, the mobile money and bank accounts are each managed through the mobile UI offered by the respective providers. You need to check balances on the two accounts separately, and you cannot transact from one account when you are using the UI of the other institution. Transfers of money between the two accounts are done through the UI associated with the originating account: through the mobile money UI to push money from the mobile wallet to the bank account, and through the bank's UI to push money in the reverse direction. Operating these two UIs may be quite confusing for customers, at least at first, especially if the two UIs are implemented using very different menu structures and on entirely different technologies (e.g. STK versus USSD).

Under the low-integration model, non-bank mobile money providers have tended to implement money transfers to linked bank accounts through their bill payment functionality rather than through a dedicated entry on the phone menu. Thus, to push money to your linked bank account, you would go to "bill payment" on your menu, enter a biller code that corresponds to your bank, and enter your bank account number in the biller account field. Again, this may not be the most intuitive process for customers, and if the UI does not allow for storage of favorite billers it can be quite tedious to do repeatedly.

At the opposite extreme, with full menu integration, both the mobile wallet and the linked bank account are manageable entirely from a single mobile user interface. This is the case, for example, with the M-Kesho and M-Shwari products in Kenya: the M-PESA wallet and the bank-issued accounts are all managed from the M-PESA user interface. While this provides much greater convenience for the customer, it does represent a loss of control over the user experience on the part of the bank.

It is conceivable that the arrangement could be symmetric, such that both accounts could be managed from either the mobile money provider's or the bank's user interface, thereby having both user interfaces 'compete' for the customer's attention. However, there is no such precedent.

Inter-account transfer pricing	A second issue is how transfers of money between the non-bank mobile money and bank account are priced. In some cases, such as with M-Kesho, the bank (Equity Bank) chose to interpret a transfer of money from the M-Kesho to the M-PESA account as a withdrawal, and hence applies a similar fee as if the customer had withdrawn at an ATM. When the customer cashes out at an M-PESA agent, it will be charged another withdrawal charge, this time by Safaricom. This charging duplication makes the service quite expensive.

In other situations, such as with M-Shwari, electronic transfers between the two accounts are free to the customer (though there may be wholesale charges between the bank and the mobile money provider). This offers much more seamless manageability of funds because customers do not need to worry about incurring costs when they are simply rearranging their funds between the two accounts.

Account registration	The third type of integration is at the account registration level. In most cases, the mobile money and bank accounts need to be opened separately with each institution before they can be linked. M-PESA in Kenya again offers more integrated models. In the M-Shwari case, customers can register for a CBA-issued M-Shwari account directly from their M-PESA menu, and M-PESA shares its customer details with CBA. Thus, for account opening, there is UI level integration as well as delegation of KYC from the bank to the telco.

KCB's new M-Benki accounts are also opened through M-PESA and offer an equivalent service to M-Shwari, but without any specific UI integration between KCB and M-PESA. Instead, they have developed an ingenious work-around process to open M-Benki

accounts through M-PESA's bill payment service: you enter KCB's biller code, you type "ID" plus your national ID number on the biller account field, and you enter the amount of your initial deposit in the transaction amount field. M-PESA will share KYC details with KCB, so that the account can be opened instantaneously. Unlike with M-Shwari, though, customers can lift the transaction limits by going to a KCB branch at a later point in time and undergoing a full KYC.

Bankable Frontier Associates (2013) highlights some institutional and business case barriers that banks face in aggregating small deposits. Mobile money may also enable savings mechanisms to be devised by non-bank providers running on top of the mobile money rails. For instance retailers can create a lay-away plan, such as Kickstart has done in Kenya. Customers can use the mobile bill payment service to make periodic payments towards the acquisition of some asset, and they can collect the asset once the full amount is reached. The *Mamakiba* service on the M-PESA platform in Tanzania helps pregnant women save in a structured fashion (with commitments and deadlines) for pre-maternal healthcare.

9. Credit

The provision of credit through mobile money channels is still incipient, beyond using it for disbursements and collections through corporate accounts. Experimentation has been centered on three main areas:

Processing credit requests through agents	Mobile money agents can serve as facilitators for credit applications, acting as post boxes where customers can pick up and drop off application forms and other documents. They can also promote the availability of credit and help customers complete forms. Agents can make the credit process particularly convenient and fast in cases where there is no need for face-to-face interviews with credit officers, either because customers are prequalifed for credit or because they request a simpler product like a payroll advance. While banks such as Banco de Crédito de Perú (BCP) are currently using their agents in this capacity, we have yet to see this applied in mobile money.
Credit on demand	M-Shwari in Kenya has introduced a credit-on-demand product which is now being widely emulated. Customers can request credit from the (enhanced) M-PESA menu, and they are notified of a loan decision almost instantaneously. This is based on a credit scoring algorithm which takes account of the customers' standing with the credit bureau and their history of airtime top-ups, use of Safaricom's airtime advance service, M-Shwari savings balances and M-Shwari loan repayments. MTN has a similar credit-on-demand offer in Ghana and Cameroon, powered by MFS Africa.
	These credit-on-demand facilities are a logical extension of the earlier service offered by some mobile operators whereby customers could get a small instant airtime credit when they ran out of talk time. Now this facility can be offered as money into customers' mobile account rather than as airtime.
Collateralizing assets through mobile 'locks'	This is an innovation introduced by M-KOPA in Kenya for customers on the M-PESA platform. Their idea is to sell small equipment such as solar lamps on leasing terms, such that customers can pay for it over time while they use it. The equipment has an embedded mobile chip, and it can be turned off remotely if customers fall behind on their payments. Thus, their technology allows for small, moveable equipment to become effective collateral.

These schemes are all based on the credit characteristics of individual borrowers. A novel approach, which hasn't been tried yet on a mobile money platform to our knowledge, is to incorporate social capital and peer pressure elements in the credit decision:

Peer-based credit scoring	Microcredit group lending has shown us that lenders don't need to know much about their borrowers as long as the borrowers know a lot about each other, and there is an incentive for people to screen and monitor each other. In a microcredit group structure, the incentive takes the form of joint liability, i.e. borrowers effectively guaranteeing each other. A similar, though potentially lighter-touch, approach could be employed by mobile money providers (Mas 2012). Mobile money customers who want credit beyond what

their individual credit score might get them could get other customers to vouch for them, with the weight attached by the lender to each person vouching being based on their past vouching track-record. Given some positive incentives for good vouchers and enough time for the system to learn, certain customers would naturally self-select themselves as de-facto loan agents in their town. This vouching process need not take the form of a financial guarantee; if the borrower doesn't repay it may be sufficient to simply reduce the weight of that person's recommendations in the future.

10. Group-based savings and credit

Much of traditional low-value finance in developing countries occurs on a group basis. Group-based mechanisms draw on peer pressure and habituation –ritualized through periodic group meetings— as key discipline drivers. They can also be operationally cost-effective, as cash is recirculated locally. Group-based savings and credit mechanisms can range from the self-forming Rotating Savings and Credit Associations (ROSCA) to the more structured Savings-Led Groups (SLG). ROSCAs do not hold any communal funds at any point in time, as all contributions made at a meeting are given to one or more members at the same meeting. SLGs do carry funds between meetings, as a buffer between the demand for savings and credit within the group. Cash is usually kept in a box with 2-3 locks and the keys are distributed to different rotating group members; security dictates that no individual in the group ought to be able to access the funds by herself.

The main opportunity for mobile money to support SLGs is to hold the group's funds in a single, pooled account. The typical use model would be for two group members to be delegated to go to a mobile money agent to service the account before and after each group meeting: before a meeting to withdraw available balance which may need to be given out to members as credit at the meeting, and after the meeting to deposit any excess cash that was not given out. The operation of a group account would benefit from the following enhancements:

Linked bank account	The group account may be relatively sizable as it represents consolidated savings from up to several dozen people. Where mobile money account limits are too small to accommodate this balance, the money would have to be pushed into a linked bank account.
Multiple account signatories	Much like the cash-based system with multiple locks for security purposes, any financial operation on the mobile money account should require at least two designated group members to enter their own distinct and secret PIN. Orange Money in Kenya has developed a special SIM Toolkit (STK) application for SLGs which explicitly requests two PINs to be entered to authorize any monetary transaction.
	CARE has developed a work-around in Tanzania which consists of splitting the digits in the group account PIN so that one member knows the first half and another member knows the second half, such that together they can complete the password. This works well with STK, as the digits being typed into the PIN field are masked, and hence are invisible to the other member. But this cannot be done on USSD since the numbers are not masked and hence the second person who is completing the PIN would be able to see the first person's PIN on the USSD response they are jointly composing.
	Newly launched Airtel Chama in Uganda plans to employ the multiple-signatory concept at a more sophisticated level. Each group will appoint a set number of PIN holders. When the group SIM keeper converts Airtel Money to cash at an Airtel agent, or moves Airtel Money to or from a group bank account, the Chama service will require each PIN holder to enter a PIN on their respective phones to approve the transaction.
Multiple transaction confirmations	Another desirable feature of a mobile money account specialized for SLGs is the automatic sending of transaction confirmation text messages to all group members, not just to the transacting phone. This enhances the transparency of the group's operations, as each member would be able to verify that the transactions on the account match what was agreed at the prior meeting. This is another feature Airtel Chama will be pioneering in Uganda. All group members will have their personal phone numbers registered with Airtel so that they can be notified of any Chama transactions.

| *Electronic book-keeping* | SLGs generally operate on paper-based records, exposing the group to errors, loss of records and potential fraud. Some initiatives exist to digitize the book-keeping using a hand-held device, such as FSDK's E-recorder app, but so far they have not been integrated with mobile money services. In Kenya, Bank of Africa (BOA) has signed a partnership agreement with Safaricom to launch a mobile platform for SLG management, dubbed *M-Chama*. |
| | While not practical at this time due to transfer fees, individual group members that have their own mobile money wallets could conceivably make their group contribution electronically, transferring funds directly to the group account, and thus creating an electronic record of the transaction. This process could be encouraged if the group SIM were registered as a merchant to allow for free C2B transfers. |

Mobile money does offer a unique opportunity to bring individualized savings accounts to people who live beyond the traditional catchment area of banks. It would be most interesting to see how one can combine the privacy and security benefits of individual mobile money accounts with the disciplining benefits of group dynamics through peer pressure. One idea might be for a mobile money provider that is expanding into a new village to agree on a community-level reward once total e-money balances reach a certain level (Mas 2011). The reward would be agreed to with the town elders (e.g. paint for the school), who could then be expected to play a role in locally promoting savings and the mobile money system behind it. Total community savings could be displayed on a thermometer at prominent place, for all to see, prompting people to want to save so as not to fall behind everyone else.

11. Insurance

In recent years there has been substantial interest in delivering microinsurance services leveraging the mobile channel (Tellez 2012). While mobile microinsurance is currently being offered in several markets independent of mobile money, mobile money provides an opportunity to maximize the value of such a service for providers and customers alike. The mobile money provider can assume various roles in the microinsurance delivery chain:

As payment channel	This is the more straight-forward function that mobile money can perform. Monthly premiums may be collected via a mobile bill payment service (e.g. Vodacom Tanzania, Easypaisa in Pakistan), or else on a direct debit basis from customers' mobile airtime balance (e.g. Tigo Ghana). On the other side, claims can be paid out via mobile bulk payments.
As a sales channel	A microinsurance item may be placed on the mobile money menu, through which customers can contract and view the status of microinsurance products. However, this has typically resulted in low conversion rates. Microinsurance might require a higher-touch sales channel, and some providers sell it instead through their agent network.
As a loyalty benefit	The more common positioning of microinsurance by mobile operators is as a loyalty benefit or reward rather than as a stand-alone, sellable product. Easypaisa in Pakistan offers free insurance for customers who commit to a minimum level of mobile money usage. Most operators, however, link the microinsurance loyalty benefit to use of prepaid airtime rather than mobile money. In essence, such operators are counting on the resulting churn reduction to pay for the cost of the insurance. Most schemes offer only one coverage level, although under some schemes customers have the option of buying additional insurance coverage.
	Tigo Ghana provides such a loyalty-based life insurance product for pre-paid subscribers and any one member of their family. The more the customer spends, the higher the insurance cover they receive.

Mobile money providers' offering tends to be focused on life insurance or funeral cover. In all cases, mobile money providers buy the insurance service from third parties. In future it is possible that the payments made by customers using mobile money may be used to verify an insurance claim, such as payments to a hospital under a medical insurance scheme.

12. Some concluding thoughts on the product innovation journey

Mobile money services have tended to start as fairly focused propositions (send money home, bill payment, bulk payments, etc.) but over time have the potential of becoming platforms for delivery of a broad range of products and services, both financial and non-financial. All is to play for yet.

We see at least two main gaps in the usage patterns of mobile/electronic money: *(i)* most accounts are emptied soon after cash is deposited or received, i.e. there is little storage of value, which makes people not naturally inclined to pay electronically at stores; and *(ii)* there is very little formal business use of electronic payments, where cash and especially checks prevail. These two gaps work together to limit the electronification of payments in everyday life, and the ability of providers to gain sufficient insight into customers' income sources and financial habits and to develop more robust credit-scoring mechanisms.

An opportunity to strengthen the value proposition in both cases is for mobile money to offer manageability tools *around* the money balances that people keep and the payments they make or receive. As a saver, mobile money should make me feel *in control* of my money, and substantially beat informal alternatives. As a business, mobile money should make it easy for me to keep accounts, reconcile receipts with invoices, and match against things like inventory.

We feel that innovation and experimentation around the *manageability* of saved balances and payments ought to be the core focus in the future, especially as we start to prepare for the inevitable transition to smartphones. The greater computing abilities and richer, more tactile user interfaces of these devices should be leveraged to make customers feel more *in touch* with their money, their business concerns and their goals.

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