

Towards a framework for the evaluation of mobile payments integration

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Abstract: This paper derives a theoretical framework for consideration of both the technologically driven dimensions of mobile payment solutions, and the associated value proposition for customers. Banks promote traditional payment instruments whose value proposition is the management of risk for both consumers and merchants. These instruments are centralised, costly and lack decision support functionality. The ubiquity of the mobile phone has provided a decentralised platform for managing payment processes in a new way, but the value proposition for customers has yet to be elaborated clearly. This inertia has stalled the design of sustainable revenue models for a mobile payments ecosystem. Merchants and consumers in the meantime are being seduced by the convenience of on-line and mobile payment solutions. Adopting the purchase and payment process as the unit of analysis, the current mobile payment landscape is reviewed with respect to the creation and consumption of customer value. From this analysis, a framework is derived juxtaposing customer value, related to *what* is being paid for, with payment integration, related to *how* payments are being made. The framework provides a theoretical and practical basis for considering the contribution of mobile technologies to the payments industry.

Keywords: Payments, framework, mobile, value

1. Introduction

Payments are central to the growth of modern civilisations. Payment systems have evolved substantially over time, from earliest bartering systems, to systems based on coins of precious metal, to the virtual payment systems of today. The mobile phone is capable of providing a bridge between the traditional and the new payment systems, supporting on demand purchase and payment processes in a manner heretofore not conceivable. The transition to mobile phone driven payment processes is not smooth, however, not because of a lack of technology innovation, but because the underlying players in the industry are reluctant to change highly profitable business models. Banks and their customers are not in agreement as to what constitutes good value in terms of payment alternatives, a phenomenon also found among stakeholders to technology adoption (Au and Kauffman, 2008). Research has suggested that the high failure rate of mobile payment solutions is linked to their inability to provide the right value proposition to customers (Ondrus et al., 2005). Banks promote payment instruments that earn the most revenue. These tend to be centralised and inconvenient. Customers have little choice in selecting payment instruments, but are being seduced by the control and convenience of on-line and mobile payment solutions. Until a solid value proposition emerges that combines value for both banks and customers, the innovation in terms of payment solutions will remain sporadic and piecemeal. This paper explores the existing research domains from which such value propositions or business models could be drawn, and extrapolates a theoretical basis for further research in the area of payments.

The challenge of understanding the driving forces in the market for electronic payments is that there are an accelerating range of solutions that address shortcomings in legacy payment processes. For example, many innovative solutions support the connection of existing bank or credit card accounts to

on-line virtual wallet transactions), substituting the phone for the desktop computer but without changing the underlying value proposition. Other solutions leveraging the processing capability of Smart phones seek to associate the payment transaction with other customer related processes such as loyalty points programmes, but are by definition focused on a particular segment of Smart phone using consumers. While such developments espouse key technology adoption factors such as consumer convenience and ease of use, they also tend to obscure visibility of the comparative value of choosing a particular payment instrument over an alternative.

The language used for describing payments has relied on traditional banking terminology such as payment instruments, or on technological concepts such as connectivity. There are many other possible dimensions for describing payments such as transaction type, payment domains or geographic scope. Indeed one of the difficulties for the development of an ecosystem for mobile payments has been the lack of a common vocabulary between the financial services community and the technology community. The method used in this study is to categorise the concepts used to describe mobile payments, and map these “technological” categories against factors describing the business setting of procurement and settlement, thereby allowing us to effectively accumulate knowledge, and to interpret previous findings (Dahlberg et al., 2008). This framework is based on the hypothesis that mobility (Gump and Pousttchi, 2005) is simply an extension of the same virtualisation technologies that have been used by organisations since the earliest days of information technology. Rather than considering laptops, PDA's, smart phones and tablets as disruptive technologies (Christensen, 1997), we take the view that their pervasiveness as access devices to processes and information does not fundamentally alter the relationship between people, processes and technology. Virtualisation provides users with visibility and control of resources, and mobile technology should provide this visibility and control on the move.

Researchers have adopted different units of analysis in studying the evolution of mobile payments, including exploring the payments *market* (Dahlberg et al., 2008; Ondrus et al., 2005) in the macro-economic sense, payments *technologies* (Ondrus and Pigneur, 2007), or payments technology *adoption* factors (Pousttchi, 2003; Plouffe et al, 2001). In this study, we are interested in understanding mobile payments as an element of a purchase and settlement *process*. From this perspective we are not only interested in the footprint of mobile phones in the payments landscape, but also the topography of that landscape in terms of the actors involved, the nature of the payment and the value to the customer of different levels of payment automation. It is suggested that adding this value dimension (Osterwalder, 2005; Ondrus et al., 2005) helps to conceptualise mobile commerce in the context of micro-economic transactions in public, commercial and social interactions.

The structure of this paper is as follows. Firstly, we provide an overview of the payments industry and why the potential of mobile technology has not (yet) translated into innovative payment instruments. The specific issues surrounding the adoption of mobile payments are then discussed. Based on research in this domain we then describe the dimensions that may be used to delineate the different payment service offerings and scenarios, and from this an integration framework is presented that may be used to investigate the relationship between payment service offerings and the associated value proposition from a customer perspective. The final section discusses the theoretical implications of this paper and its relevance to existing research.

2. Inertia in the payments industry

Traditionally, the transfer of value from payer to receiver, along with the associated risk, is managed by a small number of highly centralised intermediaries (banks). Funds are transferred from the payer's bank account to the receiver's bank account via a number of physical or electronic payment instruments. The key value of these centralised instruments is managing the risk of account holder liquidity and fraud. The cost of managing this risk is recouped by levying “interchange fees” on users of these payment instruments, merchants and consumers. A successful business model has thus built up around the use of payment cards, which involves charging merchants and ultimately customers for the facility and convenience of using particular payment instruments. The perceived value for the customer is access to a universally accepted payment instrument, and instant access to significant lines of credit.

The revenues generated from the provision of payment services have been estimated at \$900bn, representing 25-30% of total bank revenues. Reluctance to move away from a winning formula no

doubt constitutes the principle barrier to faster integration of mobile technology into the payments ecosystem. Three other factors contribute to the inertia in the evolution of traditional payments services, related to technical skills, customer expectations and management culture. Firstly, many retail banks run back office payment processing systems that are so old that Universities are now being solicited to create programming modules focused on legacy development environments such as Cobol, PL1 and RPG, such is the reliance on these systems and the associated scarcity of skilled resources. The costs of re-writing back-end payment processing modules is therefore prohibitive. Currently internet banking could be characterised as providing a web-based front end to account information that is embedded in legacy applications, without addressing any other requirements that customers might have with respect to liquidity control, budgeting or access to alternative products. Legacy banking systems were simply not designed to empower customers in this way.

Secondly, the virtualisation of banking and the sense of empowerment among smart phone application users have whetted the account holder's appetite for a different relationship with his or her bank. Providing on-line visibility of customer accounts is the first step in controlling expenditure, supporting customer requirements for flexible payment instruments is the second. Ultimately the integration of bank accounts with planning tools will empower customers to manage their finances in a more pro-active way. Exhibitors at the Finovate Europe 2011 event in London showed a marked tendency towards personal finance management products (PFM), with payment instruments being seen as lifestyle commodities influenced by customer perceptions of value as communicated in social networks.

Thirdly, it is likely that management in both the commercial and retail banking sectors do not have experience of the newer forms of collaborative business models familiar to service providers in the new payments ecosystem. Particularly with respect to mobility and payments, it is clear that financial institutions, in order to achieve critical mass, will have to collaborate with new intermediaries such as hardware vendors, payment solution providers and trusted service managers. The next section discusses the adoption of mobile payments and the likely shape of such a new ecosystem.

3. Adoption of mobile payments

A mobile payment is any payment where a mobile device is used to initiate, authorize and confirm an exchange of financial value in return for goods and services (Pousttchi, 2003; Au and Kauffman, 2008). Mobile payments emerged in the 2000's, with early successes in the sale of mobile content and services such as ring tones and logos. Later, mobile payments were suggested as an alternative for micro-payments at point-of-sales systems, where the use of cash had been declining for many years. Many mobile and electronic payment solutions have been introduced ever since, but most of them have failed or have had a low penetration rate (Mallat, 2007; Dahlberg et al. 2008). The "chicken and egg" situation for emerging payment models means that enough merchants need to be on-board with any new solution for it to catch on with consumers, but in order to be appealing to merchants there must be a critical mass of consumers interested. Lee et al. (2004) refer to mobile payment *liquidity* as the extent to which it is accepted by sellers and therefore adopted by customers. Au and Kauffman (2008) refer to the theory of network externalities to explain value creation in the networked economy, suggesting that the value of such services to banks and their customers will increase as the network grows. Standardisation and technology maturity have equally been highlighted as key requirements for expansion of mobile payments (Mallat et al., 2004; Lee et al., 2004).

So, while the most popular payment instruments are still cash, cheques, debit and credit cards (Dahlberg et al, 2008) with smart cards being the most serious challenger to traditional cash (Dahlberg and Mallat, 2002), the ways to make contactless payments and especially mobile payments are increasing. When looking into the future, companies and experts agree that the mobile phone is the technical device that they will try to turn into the new wallet, mainly because of the diffusion of mobile phones, which no other technical device can match, but also due to the fact that most of us carry our mobile phones with us most of the time. If the mobile phone as e-wallet succeeds it will very likely be at the expense of traditional payment instruments. But it is also a possibility that the mobile wallet will simply become a new way of entering the current card and account-based payment services (Dahlberg et al., 2008).

Contini et al. (2011) describe the mobile ecosystem as a complex set of interconnected entities and relationships which interact to form a stable functioning payments system, with participants including

financial institutions, money service providers, handset makers, technology service providers, mobile network operators, mobile virtual network operators, merchants and consumers. Internationally, national governments have individually pledged support to developing electronic payment capabilities as part of the broader adoption of e-Government capabilities, while in Europe, much of this development has been driven by the establishment of SEPA (Single Euro Payments Area).

Understanding the importance of these emerging solutions is the key motivation for developing an integration framework for mobile payments. Webster and Watson (2002) describe how theory in the IS field evolves from ad-hoc classification systems through taxonomies to conceptual frameworks. There is a need for a “robust analysis framework” (Kauffman and Walden, 2001; Au and Kauffman, 2008) to abstract meaning from the myriad technology offerings, and indeed to differentiate between business value and technology capability. Practitioners and academics require an abstracted view of the business requirements and their solutions in order to design lasting solutions. The next section outlines the dimensions that can be used to build this abstracted view.

4. Classifying the dimensions of mobile payments

Mobile payment solutions may be described by a number of attributes that relate either to the process or the technology of making a payment. The process dimension refers to *what* type of payment is being made, and crucially should include the notion of customer value. The technology dimensions describe *how* a payment process works, and typically involves the integration of a number of physical and virtual payment instruments.

4.1 The value dimension

The value dimension, described as a *market* perspective by Ondrus et al. (2005), or as a *value taker* perspective by Kauffman and Walden (2001), relates to both customer benefits and needs respectively. Ondrus et al. (2005) suggest that it is the failure to address the demand issues that undermine many payment service offerings. It is therefore suggested that the customer demand (value) dimension be used to characterise mobile payments. This dimension will calibrate customer value across a “consumer to merchant axis” (Ondrus et al., 2005; Dahlberg et al., 2007). Clearly the time and location independence afforded by the mobile phone user is an advantage (Mallat, 2007; Kim et al., 2010). Indeed the “anytime, anywhere” accessibility of mobile phones increases merchant access to location specific consumers, thereby potentially instigating demand and increasing sales opportunities, but not necessarily creating customer value. Customer value, for example, might be providing the payer with visibility of, and direct access to, alternative payment execution options, as well as related decision support information such as account balances, loyalty points, discounts and special terms. The customer value here is created through the *information* value as distinct from the *mobility* value (Gumpp and Pousttchi, 2005).

For the purposes of this research, the value proposition is considered to include the context or scenario (Kreyer et al., 2003) of the purchase and payment transaction. This covers the *nature* of the goods or service being purchased, *where* the payment is being made, and *who* is involved. The nature of the purchase covers, for example, the purchase of physical and digital goods, the payment of utility bills or the purchase of on-line services. The procurement of physical goods by individuals or organisations may be considered to be part of the supply chain. Supermarket shopping for groceries and household goods (B2C) or raw material purchases by manufacturers (B2B) have the characteristics of being repetitive, subject to scrutiny on price, and sensitive in terms of lead time. The point of sale may be physical, virtual or both.

All businesses have payment processes for overhead expenditure related to personnel (payroll, tax and expenses), rent, maintenance, catering or hygiene services. Utility payments could be considered to include energy supply, refuse services, tax, banking services, digital network services and digital content. Transportation related services include local transit tickets, parking, automobile taxation, fuel, holiday and airline payments. Consumer goods might include white goods, electronic equipment, computer equipment, clothing and furniture. Leisure and entertainment payments include cinema tickets, concert and event ticketing, use of sports facilities, vending machines and access to public amenities. Digital content includes phone credit, digital media (music, video, newspapers, books, ...), gift vouchers and virtual gaming products. Person to person (P2P) payments might include payments to tradespeople, babysitters, home-helpers, local and cross border remittances, micro-payments and

micro-finance. Charity or fundraising donations constitute a section of “person to non-profit” organisation payments (P2NP). Social and Government payments include welfare, pension and health payments (G2C).

On the other hand, the context of the payment also distinguishes the location of the payment and the actors involved. For example, payments may be made from a mobile phone at a point of sale, from a mobile phone remotely, in person at a bank branch, in person at an ATM or payment kiosk, in person at a post office or credit union branch. Payments may be sent by post, or made over the phone, via a digital TV service, or through a gaming or digital content interface such as iTunes. Bill payment services may be made on-line or via physical points of sale such as PayZone and PayPoint. On-line payments may be made via electronic wallets such as PayPal or Boku. Economic definitions of commercial actors include shareholders, debtors, creditors, managers, employees, community and government (Au and Kaufmann, 2008). The purpose of this dimension is to understand where value is being consumed, and by whom.

4.2 The integration dimension

The second dimension for mobile payment attributes relates to the products, instruments or technologies through which the payments are executed. These attributes describe *how* the payment is processed, and are independent of both the transaction types or the payment channels discussed above. This virtualisation axis calibrates the extent to which payment execution has been mobilised (Gump and Pousttchi, 2005) using information technology. Technology or product related aspects of the mobile payments landscape are more “inward” looking (Dahlberg et al., 2008), defining customer *value making* (Kauffman and Walden, 2001), as distinct from *value taking*. This corresponds to the service provision (vertical axis) on the framework described by Dahlberg et al. (2007). The purpose of this dimension is to understand where value is being created, and by whom.

The payment products include traditional physical instruments such as cash, cheques, coupons, pre-paid gift cards, postal orders and bank drafts. Credit transfer instruments include credit cards, debit cards, Electronic Funds Transfer, Direct Debits and Standing Orders. Mobile phone related instruments include bill to carrier account, bill to credit card account and bill to current account (ACH). Pre-loaded virtual instruments include electronic money accounts (eg. PayPal), virtual gift cards and virtual loyalty cards. Payment authorisation options include signatures, passwords (on-line, SMS), PIN number, Chip, card user verification services, voice authorisation or biometric methods. The degree to which the payment is integrated into an enterprise or domain driven process defines an interface dimension including Buy-now, Accounts Receivable, Accounts Payable, Payroll, Expense disbursement, Bank reconciliation or treasury management. Geographic scope for payments may include proximity, local, national, European or global. Payments across different currencies should include exchange rate calculations. The account types from which payments are drawn include unbanked customers, post office accounts, credit union accounts bank accounts (current, credit, deposit, savings), commercial or merchant accounts, e-Money accounts, Mobile Network Operator customer accounts, merchant loyalty account and digital media accounts. Account funding mechanisms include cash loading, SMS with top-up, Direct Debit, wire transfer, electronic funds transfer, credit transfer by SO/DD from third party bank account, remittances and on-line e-Money transfer. Device connectivity options include credit cards (eg. Visa / Mastercard), debit cards (eg. Maestro, Cirrus, Laser), Internet (TCP/IP, GPS, WiFi), Bluetooth and NFC. Clearing and settlement options include paper (eg. IPCC), electronic (eg. IREPCC), Credit Card and ATM. Timing of payment execution may be in advance, at moment of purchase, days or weeks after purchase.

These two dimensions are correlated in the next section to construct a framework for mobile payments integration.

4.3 A framework for mobile payments integration

Drawing on the discussion regarding the dimensions of payment integration (virtualisation) and value (merchant to consumer axis) in the previous section, a framework is proposed to conceptualise the position of mobile payments within the greater context of electronic payments. This framework is presented in Figure 1. In this framework, payment integration is conceptualised as an ongoing process of reconciling demand with supply. The degree to which payment processes are integrated, or supported by electronic means, is recognised as an economic lever in the value proposition to

customers. The information that is valuable for consumers (as individuals or enterprise buyers) in making payments is defined along two dimensions, one related to the level of visibility of purchase and payment information, and one related to control of the transfer of value.

The purchase control dimension maps the gradation between a commitment to purchase and settlement of the amount due. This axis is temporal, left to right, in there are stages between the commitment to purchase and the actual transfer of value (ultimately there is value in offering a consumer the ability to intervene at these stages). The payment integration dimension refers to the degree to which the attributes of payments (both supply and demand related) are known and communicated, and represents a gradation from traditional physical payments instruments to increasingly virtual payment instruments. It is only with the virtualisation of payment information that it is possible compare the cost of a planned expenditure with the actual availability of funds (budget).

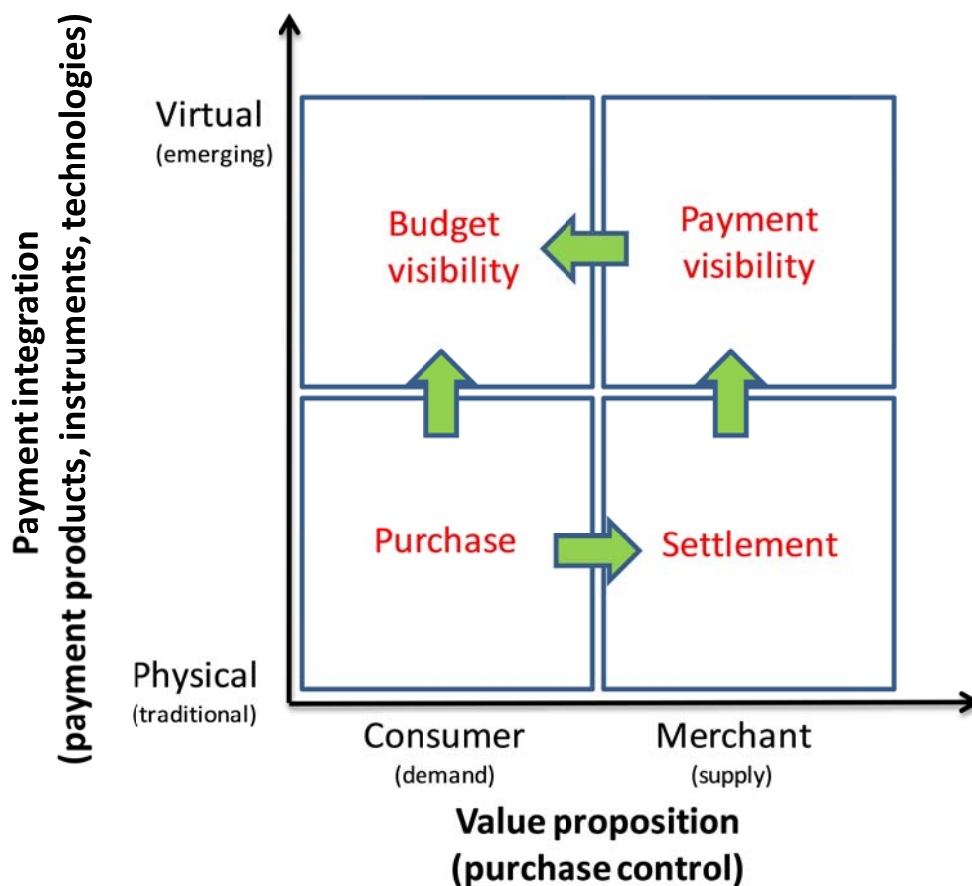


Figure 1 Integration framework for mobile payments

The quadrants represent stages in the value proposition to consumers in electronic payments. The purchase (bottom left) quadrant represents the buyer's commitment to purchase. With traditional physical payments instruments, visibility of budget information is limited. Information that would be valuable to the buyer at this point relate to product supply (for example, price, discount or loyalty credits), but also related to the available consumer budget. How this information is provided is a question of integration. The budget visibility quadrant (top left) represents the degree to which visibility of available funds can be provided. This may also entail electronic decision support tools to inform the consumer's decision to purchase.

The settlement quadrant (bottom, right) represents the actual transfer of value from the consumer to the merchant which may be automated or happen in stages. Payment in cash is instant settlement whereas payment by card is deferred settlement. The payment visibility quadrant (top right)

represents the degree to which settlement information is available. This visibility provides the merchant with his confirmed revenue and the customer with his real time budget position.

The final section of this paper discusses the practical and theoretical implications of this framework.

5 . Discussion and conclusion

The proposed integrated payment framework highlights the difference and relationship between payment integration and value proposition. It also strives to increase theoretical parsimony by integration of previous literature, such as Ondrus et al. (2005), Mallat (2007), and Kim et al., (2010) into a two by two matrix. The validity of the framework can be assessed by three particular properties: the integration of the framework (logical coherence), its practical and theoretical relevance, and its relative explanatory power (Glaser, 1978). These properties are derived from Glaser's (1978) work on theoretical sensitivity and have been applied in previous research (Hedman and Kalling, 2003). The logical coherence is addressed in the previous section and will not be further addressed here.

There are both practical and theoretical aspects to the relevance of the framework. Firstly, it facilitates discussion of the nature of information required by consumers and merchants and the associated value they may place on the automation and visibility afforded by payment integration. It can be understood, for example, that visibility of settlement information requires a level of real-time interaction with the funding accounts which will have significant technical design implications. By the same token, budget visibility could be extremely valuable for consumers but may equally imply sophisticated design scenarios. Where settlement is itself a virtual process (for example, via a PayPal account), this visibility is provided automatically and is of significant value for consumers, so much so that they are prepared to pay a hefty premium for the service. The visibility provided by traditional credit card networks for both consumers and merchants is significantly less automated, but merchants will sacrifice margins for the convenience afforded to consumers, who in turn are prepared to pay for the line of credit. Secondly, the interfaces between the quadrants, represented by the arrows, are points where integration decisions may be conceptualised. The use of cash versus direct debits versus online payment can be positioned along the payment integration axis. The question of mobile payments involving settlement from a bank account, credit card account or carrier account could also be represented on this axis. Crucially the related visibility of the payment transactions may be discussed, where the consumer perception of value of a given mobile payment scenario may be classified in terms of control and visibility. Thirdly, the framework provides an overview of the contribution of payment integration to the value proposition to buyers. On the one hand, mobile payment solution providers offer convenience based services to consumers, and, on the other, consumers have control and visibility requirements related to planning for and making payments. The framework allows for the consideration of both these dimensions, and in so doing, provides a unique approach to the evaluation of integration decisions.

The framework is meaningful for the players in the payments ecosystem: financial institutions, payment solution providers, mobile network operators and, ultimately, consumers. Using the framework, the evaluation of innovative payment technologies can take place in the context of actual customer value. The framework is developed to conceptualise the driving forces in the mobile payments industry, in that sense it builds on the existing body of theoretical work (for example, Au and Kauffman, 2008; Ondrus et al., 2005, Mallat, 2007, and Kim et al., 2010). Furthermore, it is felt that the framework brings to center stage the notion of customer value discussed in such literature.

Further research on this topic should entail validating the framework empirically on a range of different emergent and traditional payment scenarios. Such research should aim to clarify the collaboration decisions for players in the market for mobile payments. On the basis of these collaboration decisions, real progress in the provision of consumer oriented payment services that leverage the "anytime, anywhere" visibility and control of the mobile phone might be envisaged.

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