COUPLING MOBILE PAYMENTS AND CRM IN THE RETAIL INDUSTRY

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ABSTRACT

The growing prevalence of electronic commerce and the widespread use of mobile devices have made mobile payments an interesting alternative method of payment for customers and merchants. One major issue to be resolved is the integration of a real-time wireless means of payment within their current payment system. In this paper, we propose an architecture of mobile payment system to improve business processes and increase customer loyalty. An all-in-one device that enables mobile payments and also integrates a membership scheme would simplify and significantly accelerate the payment process at the point of sale (POS). Moreover, the deployment of an effective customer relationship management (CRM) system and an adapted data mining tool would allow retailers to propose a dynamic-generated website to their customers. This would follow a one-to-one e-marketing strategy and would improve companies' ability to suggest customized offers and coupons.

KEYWORDS

Mobile payments, retail, CRM, customer loyalty.

1. INTRODUCTION

The continued release of new technology constantly pushes retailers to update their POS - the place and moment in a store where a customer pays for merchandise (Jensen 2001). A recent survey shows that 41 percent of the retailers interviewed have replaced their POS package within the last two years (Retail Systems Alert Research Services 2002). This indicates that there is a real incentive for the retail industry to invest in information technology. In addition, the new functionalities of the POS are growing since they are embedded with operating systems such as Unix, Linux and MS-Windows.

Moreover, the increasing general enthusiasm on mobile technologies such as Bluetooth and radio frequency identification (RFID) has a positive effect on the acceptance of new mobile applications and services. This would explain why wireless POS solutions are already on their way to arrive at your local retailer. Contactless payments and ticketing are becoming a new trend for quick-service oriented industries (Moore 2003) such as public transports (e.g. Public Transport Pass), toll booths (e.g. FasTrak), gas stations (e.g. ExxonMobil's Speedpass) fast-food restaurants (e.g. McDonald's) and ski resorts (e.g. Swatch Access).

Therefore, an architecture in the retail industry combining mobile technology and traditional commerce techniques has the potential to generate some significant benefits for the merchants and their customers. For example, the payment process would be faster, easier and more secure. As a result, waiting time at the POS will be shorter, so customers would not have the impression that they waste precious time waiting in lines.

Another problem encountered at the POS is the probability that the credit card reader malfunctions or slows down the payment process. Consumers become very impatient when technology fails. Therefore, retailers should be able to guarantee a high level of quality of service. To do so, they need to have a very reliable payment system. Otherwise, they will lose consumers as cash-based transactions become increasingly rare.

In addition, CRM systems are very popular in the retail industry: every successful company in the sector uses this type of system to analyze customer behavior and predict sales. Consequently, with the collected data, retailers can offer personalized offers and coupons to consumers who are members of their loyalty programs.

This paper aims at proposing an architecture which adapts legacy systems used in the retail industry with mobile technologies. The objective is to demonstrate how a retailer can benefit from the improvement of the payment experience and a good customer relationship management. This architecture stands to increase sales and customers' loyalty. Once customers have an ID and an account, they will have a good reason and a tangible reminder to go back to a specific merchant. Hence, this fully integrated system using wireless payment capabilities and a one-to-one marketing through the company's website could be a factor of differentiation and an improvement of the value proposition offered to the customers. Furthermore, using a mobile device to pay should be seen as a incentive for participating in the membership scheme.

2. MOBILE PAYMENT ISSUES

Mobile payments are generally defined as payments carried out wirelessly via a mobile device. According to Gartner Research, the transaction value of mobile payments will expand to $15 billion in Western Europe by year-end 2005 (Adrian 2002). Despite the predictions, mobile payments are confronted with technological and business issues that delay its development. One major challenge is to convince consumers and merchants that they need new payment systems (Jones 2001). Moreover, device and network limitations, maturity of payment solutions, and customers' lack of interest, all represent problems preventing the mass adoption of new mobile payment schemes. However, mobile payments are still expected to be an important application in m-commerce (Varshney and Vetter 2002).

A logical evolution occurred in the monetary value transaction environment due to the progress of technology. In the beginning, payments were mostly conducted on a face-to-face basis (cash-, paper-, card-based). As technology progressed, remote transactions gained in popularity with the development of data wired networks (credit cards, e-payments). The current trend is to implement wireless systems that can handle remote as well as face-to-face mechanisms with a single device.

An important strategic issue for mobile payment system suppliers is choosing the type of payment dimension they want to focus on. For example, micropayments generally represent a payment, which is below 10 Euros and is usually supported by cash or debit cards. Merchants are reluctant to accept credit card transactions for small amounts because of transaction fees. However, most companies promoting micropayments failed because the margins on small value payments are notoriously low, and sufficient economies of scale are extremely difficult to attain (Costello 2002). On the other hand, macropayments, which are thus logically every payment above 10 Euros, represent a real challenge for mobile payments. They need stronger security mechanisms because of the large amount of money involved and the greater possibility of fraud (Salvi and Sahai 2002 ; Herzberg 2003).

A survey from SpeedFacts shows a very surprising statistic: the mobile phone is the preferred payment method between 12.5 and 50 Euros (Speedfacts Online Research GmbH 2001).

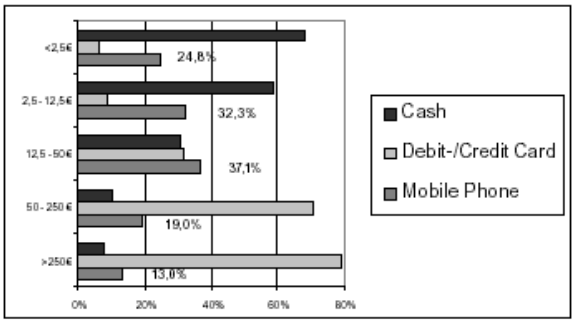

Figure 1. Preferred Payment Method of Internet Users if Away

The location of purchase is another dimension that electronic payment has already changed. Mobile payments will deliver even more new features to improve the current systems. F2F (face-to-face or proximity payment) transactions are the most common way to purchase goods. However, considering the explosion of e-commerce, remote payments are about to become increasingly popular. Mobile payments should revolutionize these two types of transaction. In fact, a mobile phone can replace a wallet for small expenses. People would go shopping to their local retail store and would be able to pay with their mobile handset directly at the POS (Point-of-Sale). For remote payments, the major benefit for the consumer is that there is no need to be present at the time of the purchase. Therefore, this possibility would enable payments of physical and digital goods on the Internet via a mobile device.

To emphasize the future importance of mobile payments in Europe, Forrester's research predicts some values of mobile payment transaction types considering two distinctive dimensions: size of payment and location. Table 2 illustrates this forecast done in 2001 for Europe (De Lussanet 2001).

Table 2: Past, Actual and Projected Value of M-Commerce Transaction (in million), Europe

	2000	**2001**	**2002**	**2003**	**2004**	**2005**
Micro Remote	< 1	< 1	1	4	12	27
Macro remote	5	24	162	619	1'890	3'014
Micro F2F	26	87	423	3'370	4'440	5'005
Macro F2F	19	67	314	1'387	5'241	12'674

The potential of proximity or face-to-face (F2F) payments seem to be the best opportunity for the long term. Furthermore, in the short term, micro face-to-face payments offer the best revenue.

The benefits of using a wireless device to pay are narrowly linked to the convenience of using an easy, real-time, cashless and frictionless payment system. Consumers expect mobile payments to be easy-to-use, fast, personalized, secure and universal. The challenge for a wireless device is that it should be able to conduct any transaction, anytime and anywhere.

In fact, mobile payments also bring many problems to solve. One of the most crucial issues is the price that a mobile payment will be charged. More than ever, consumers are reluctant to pay more without having an added value service; arguments like convenience and security will probably not be attractive enough. Moreover, Dahlberg argues that, from the businesses' perspective, SMS and value added services are considered expensive, and operator's and banks' transaction fees irritate some consumers (Dahlberg 2002). Hence, service providers have to find the right revenue model if they want mobile users and merchants to adopt their new mobile application. Otherwise, there is no chance that the mobile payment solution will succeed. Technology suppliers also have the mission to design mobile devices that are easy-to-use, fast and reliable in a payment context. Without a convenient device, consumers will not make any effort. A very popular m-commerce example is the book ordered in 40 minutes using a mobile phone!

Security is a critical factor for mass adoption. Consumers need to use a payment means that they can trust. Since data are sent wirelessly, there are no guarantees of total security. For micropayments, the problem

is not as important as for macropayments. Since simplicity and speed are crucial, then security features need to be aligned with the financial risk that customers and merchants take during the transaction.

The direct benefits of mobile payments for customers in retail stores are related to speed and convenience. Both would improve payment experience at the POS. Consumers would not lose time looking for their credit card or cash in their wallet. They would not have to slide or insert their card into the reader. They would not wait for the credit card to be processed and authorized. Then, they would not have to sign a receipt. Moreover, they would not forget their credit card in the reader or on the counter at the end of the transaction. During that scanning and payment time they would have the time to pack their purchases into bags.

Many retailers are already working on self-checkout. This would definitely accelerate the checking out process. Each items purchased will be embedded with a RFID tag. The consumer would just pass through a reader, which would make an inventory of every item in the caddy. Moreover, consumers could pay directly with a RFID payment device.

3. MOBILE TECHNOLOGIES FOR PROXIMITY PAYMENT DEVICES

As exposed before, retailers and customers want to avoid connectivity problems during financial transactions. Therefore, they would prefer to rely on a simple local network. This is possible since proximity payments usually involve two parties using an ad-hoc network based on a wireless technology such as Bluetooth, infrared and radio frequency identification (RFID) which enable short range wireless device-to-device payments (Mobile Payment Forum 2002). These technologies have already been applied for proximity micropayments (Mallat et al. 2004). Each of these networking technologies have their benefits and shortcomings (Table 4).

Table 4. Comparison of IrDA, RFID and Bluetooth (Ailisto et al 2003)

	IrDA	RFID	Bluetooth
Operating range	medium	short	long
Cost	medium	low	medium-high
Power consumption	medium	none	medium-high
Data storage capacity	unlimited	limited	unlimited
Interference hazard	medium	low	medium-high

These technologies are well adapted to be used in small mobile payment devices. However, depending on the type of constraints, one technology can be better than the others. PDAs (Personal Digital Assistants) and many mobile phones already support Bluetooth and IrDa for wireless communication. Furthermore, these devices are coming with greater memory capacity, which enables them to store larger amount of data. Therefore, this type of device would be more appropriate for complicated wireless transactions than a simple RFID tag embedded in a small key chain, for example.

Needless to say, the great advantage that RFID tags have on other current wireless communication or data transmission schemes is a low power consumption. The tag is composed of few computer chips and a tiny antenna. The power that activates the transponder comes straight from the reader. Still, there is a distinction to be made between active and passive tags. Active tags have their own source of energy provided by an embedded battery. The passive tag is only activated when the reader finds the frequency on which the passive tag responds. As a result, passive tags are much more adapted to small and cheap payment devices since they are power autonomous. The failure rate using passive instead of active tags for wireless payment is diminished because of the absence of power breakdown on the client side.

IrDA and Bluetooth could be an alternative for mobile proximity payments. However, they suppose that the consumer owns a device that is already equipped with such technology. The price of these mobile devices is much higher than a simple key chain with RFID capabilities. However, the data storage capacity of devices such as mobile phones and PDAs is much larger than a single small RFID chip. The storage capacity has to be chosen in function of the data transmitted wirelessly. RFID is typically used to transmit an identification

number, in contrast with PDAs or mobile phones, which can exchange much more information due to the better processing power and almost unlimited storage capacity.

IrDA devices have to be pointed in the right direction to be able to reach the other terminal. This phenomenon can be easily observed with the use of a television and a classic remote controller. This problem is not present with radio-based devices. Figure 1 shows how different technologies transmit signals.

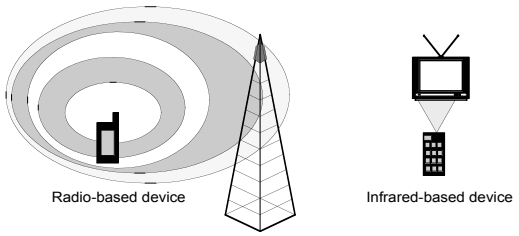

Figure 2. An Illustration of Radio-based and IrDA-based Devices

Radio-based devices such as mobile phones use higher frequencies than infrared. One result is the available bandwidth is larger. Moreover, IrDA devices usually transmit in a unidirectional mode, as opposed to Bluetooth and RFID-based devices, which emit signals in an omnidirectional mode.

Since proximity payments have to stay simple and easy to use, the technology chosen for the financial data transmission at the POS should be adapted. The mass adoption of a new mobile payments means will not be possible if this new payment system requires the consumer to be an expert in computer science. Moreover, retailers attach an importance for easy and fast cashier training. They do not want to hire an extra IT staff to support the payment process at the POS. Therefore, the payment process has to remain simple for the customer and the cashier.

4. AN ARCHITECTURE COUPLING MOBILE PAYMENTS AND CRM

We propose an architecture where customers could use a mobile device to pay. This device would replace also a membership card used in most common loyalty programs in the retail industry. Consequently, consumers would have an all-in-one device to pay their purchase at the POS. The POS would be equipped with a wireless terminal that could communicate with the small client device. Since POS would be connected to mainframes to store sales data, they should be able to retrieve and send information about the customer who pays. The cashier would use the data stored on each client to verify the identity of the customer. The data sent to the retailer mainframe would be collected and analyze with a data mining tool. This way, the retailer would be able to use a CRM system to improve its customer service. A website dynamically built on the preferences of each consumer would also enable a one-to-one marketing. Therefore, customers could have personalized offers and coupons for their next purchase. The whole system is illustrated in Figure 8.

The mobile device that retailers could offer to their customers needs to be cheap. The use of a mobile phone or a PDA with Bluetooth or IrDA is possible, but many complications can arise during the payment process. For example, the battery level of the mobile phone could be too low to complete the transaction. Then, with the heterogeneity of mobile devices on the market, retailers would not be able to support the compatibility of every existing device. Therefore, it would be better for the retailers to offer a device they can support, repair, or replace for cheap. Another advantage of using a small proprietary device would be that fraud would be more difficult. The idea to propose a key ring would be that consumers could always carry it with their keys. Hopefully, the key chain would be light and small enough to be convenient. Another benefit would be that the consumer would not have to look for the device during the checkout process. It would work even if it stays in a pocket or a bag. A significant advantage that RFID has on its competitor is that passive tags do not need any source of energy onboard. Therefore, power issues would be avoided.

The POS would be equipped with a cash register that could communicate wirelessly with the customer's device. As explained before, retailers already use POS with powerful and flexible operating systems such as Unix, Linux and MS-Windows. Therefore, only a simple hardware and software update should be necessary for the cash register to be compatible with the proposed architecture. The integration of this architecture should not be a colossal investment but, on the contrary, should represent the normal budget for POS upgrade.

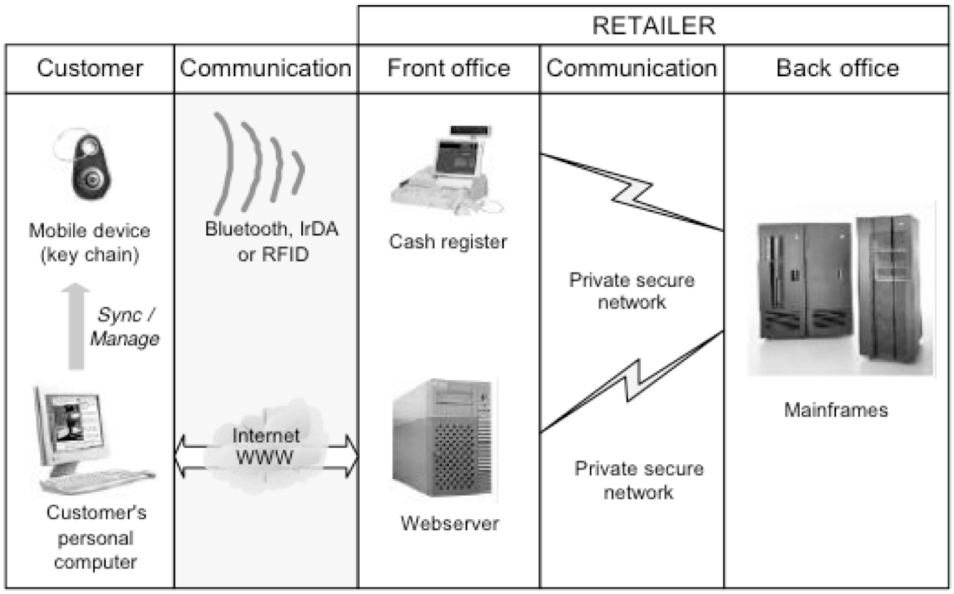

Figure 3. The Proposed Architecture Illustration

In fact, collection of data is already done in datawarehouse for most retailers. However, those who use a CRM system do not necessarily exploit the data to build a dynamic website for their consumers. Moreover, few retailers show the data collected to their consumers. If retailers let their consumers observe and manipulate their own data, there would probably be a new kind of relationship between them. Retailers would help consumers to visualize the history of their purchase and also optimize their expenses by giving them personalized offers and coupons. To highlight the benefits that consumers would have using the loyalty program, the amount of savings would also be shown for informative purposes.

One of the most essential components of the solution would be the website, which is powered with the customer relationship management system. The main importance of the website lies in the strong opportunity of using a one-to-one marketing strategy which would increase sales and loyalty. Customers would find personalized coupons based on their previous purchases. This functionality would bring the user a feeling that the company knows the customer personally. This would probably improve the perceived quality of customer service. In addition, retailers would have higher profit and lower cost of keeping profitable customers, which is much higher than the acquisition cost. The ultimate objective of couponing would be to keep the customers out of the competitor facilities and therefore creating an "addictive" loyalty which has not been reached with current membership schemes.

A way to attract consumers to the retailer’s website is the simple interface used to manage the member's account. Consumers would be able to add money on their account using their credit cards. They would also add more authorized people to pay with the same key chain. Indeed, the account could be used by a group of individual. Computers located in the customer service area would be connected to the website to allow anyone to add money or manage their account directly from the store. Since the credit card number would be already stored in the database, consumers would not need to have their wallet or their credit card with them. To prevent problems during the payment when the consumer has not enough money on the account, the consumer could indicate a limit of overspending that retailer could charge directly on the credit card. This

would give the chance to customers who forgot their wallet or do not have enough money on their account to shop conveniently, given that they have their key chain on them.

To enhance security, the POS would display all the information attached to the account defined by an ID. This number would be encoded in the mobile device. It would be transmit to the cashier terminal when a payment is made. The cash register would retrieve all the needed information for the datawarehouse where all the data are stored. A picture of the owner would be display to enable verification the identity of the consumer. There would be also a list of other authorized people attached to the same key chain in case the buyer is not the principal owner. Further biometric solutions can be possible to enhance the security of the payment at the POS (Walner 2002). This would limit a risk of financial fraud, which retailers would logically not like to take. The risk will be also limited because the key chain would function like an e-purse. The money would be loaded on the account through the website. The great benefit about centralized data is that even if the customer would lose the device, the money is still on the account. Moreover, with the picture identification, fraud becomes very difficult for thieves of mobile devices.

This solution would be based on a proximity payment scheme independent of a third billing party. Therefore, we avoid all the annoyance due to a mobile network operator infrastructure. For example, if the payment is made through a mobile network operator (e.g. GSM, GPRS, UMTS, CDMA), there can be reception problems for the client device. Another benefit when bypassing a third-party is the absence of connection and transaction fees.

Since POS would be connected to a private secure network, the data transmitted would not be as vulnerable as a wireless communication. The only data sent out in the air is the identification number of the account. All credit card information would be stored in a secure database.

To justify the proposed architecture, we summarize the benefits in Table 5.

Table 5. Benefits of the Proposed Architecture

Simple	The payment process would be very simple. First, the user arrives at the cash registers. The account number of the consumer is transmitted to the wireless-enabled point-of-sale terminal. Once the retail employee authenticates the person (photo-based recognition), the cashier gives a receipt to the consumer.
Fast	This architecture simplifies the process by decreasing the number of operations the consumer and employee have to go through. Therefore, the speed of transaction is increased.
Secure	During transmission, only the encrypted account number is transmitted. This diminishes the risk of credit card fraud. In fact, the credit card number is only transmitted during the update of the account on the retailers website.
Convenient	The consumer would not have to worry about finding coins, bills or a credit card in the wallet while packing the goods into bags.
Personalized	Subscribing to the membership program enables the consumer to get personalized offers and rebates. The retailers would therefore increase the loyalty of their consumers.
Multifunctional	The device combines a means of payment and a membership card.

As we can see, this architecture fills many conditions that can push consumers to adopt a new payment system combined with a membership scheme.

However, a few things can limit the adoption of such a system. For example, privacy could be one problem. Therefore, we think that the fact that consumers can have access to their purchases' history and can also take advantage of this system by finding better offers and coupons, will limit the impact. Another problem comes from the fact that not all consumers are familiar with new technologies such as the Internet. Furthermore, the key chain will not be a universal means of payment, which makes it less likely to succeed in the payment market. However, since retail stores already offer other non-classical payment schemes and

there is not a universal mobile payment device, our architecture could take advantage of the absence of a real alternative.

5. CONCLUSION

This paper introduced the need to offer a mobile payment solution combined with a loyalty program in the retail industry. The objective was to demonstrate how mobile technologies could improve the value proposition of a retailer by integrating legacy systems with a new attractive payment scheme. As retailers need to innovate their payment systems and membership programs in order to keep and acquire more customers, the proposed architecture is one example of how coupling different technologies could be done in the retail industry.

The next step in our research would be to validate the significance of such architecture by interviewing retailers and consumers.

In conclusion, mobile payments are probably the next step in the electronic payment market and retailers are already working on it.

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