Seminar Report on
Survey on Smartcard and Mobile Payments

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Introduction
Electronic payment system is the alternative to the coin or paper based cash payment system to ease the user to make payment for their purchased goods or services over the network or internet and in absence of the physical (entity) presence. Initially cheque in bank payment systems are used to serve the purpose of the same but now in the era of internet and e-commerce paying securely over the internet is important task for the electronic payment system. Currently credit card are also in use for the payments over the network but still users are doubting about trustworthy and the security of their money because of the increase in the frauds which ultimately causes loss of value (money) either to users, merchant or participating banks.

Present electronic payment system are to far from ideal payment system because of the higher transaction cost, more fraudulent activities, and multiple parties are involved in the payment processing simultaneously lacks users acceptance, proper application plans and incompatible standards/specifications. The good payment system should satisfy the user’s acceptance and merchants in the mass scale.

In traditional system user spends his own physical money and merchant receives direct physical money no third party come in between transaction but in electronic payment system variety of models are specified by different organization / researchers. These organizations have analyzed the issues and problems that could arise in electronic payments and had set up certain standard for catering these issues. More over these standards will help the inter operability between different payment schemes. The two major standards are EMV (Euro pay MasterCard Visa) and CEPS standards.

By following the standards a lot of vendors have introduced electronic payments schemes. This paper discusses about the various payment schemes that are prevalent in different countries and its impact on the society. This pear also evaluates its effectiveness acceptance of different payment schemes by the society. By the end of this paper we present the surveyed result of various analysis reports regarding the future payment schemes and new developments in the electronic payments.
This paper is organized as follows. The currently implemented smartcard electronic payments are described in section II. Section III describes its existing mobile payment counter parts. Implementation for transit purpose is described in Section IV. Section V gives other area of applications. Section VI briefs the challenges regarding the implementation of electronic payment schemes. Section VII describes the challenges in implementation of smartcard/mobile based payments. Section VIII concludes the future of the electronic payment schemes.

**Smart card payment schemes**

In this section we brief different payment schemes that are commercially launched which are based on smartcard. Even though the under line technology is the same, it is applicable in the following business domains.

- General retail
- Mobile commerce
- Transit
- Campuses & Government

Each market application is concerned about security, speed, convenience and customer gratification.

**General retail**

The ability of smart cards to support programs like Loyalty programs, electronic coupons, targeted advertising, partner marketing programs and customer profiles are stimulating the interest of retailer marketing groups. Smart cards provide significant benefits to both retailers and consumers by being able to securely store data so that no unauthorized entity can view it. Smart cards impose strict security requirements on data access, hiding information stored in one application from others. This ensures that consumer data is private and that retailers can securely access only data that is relevant to them. Some of the commercial implementation of the smartcard for retail purpose is listed below.

**Speed pass:**

It is introduced by Exxon Mobil in 1997. This is the first automated payment system for retail purchasing introduced with the RF technology. Motorist enrolled for the speed pass uses a key fob, watch or the transponder attached to the vehicle communicate securely with gas pump or Point Of Sale (POS) terminal. This is a kind of online transaction which took in two steps. First the small frequency radio frequency RFID is send and authorized by the bank and in the next step the transaction is charged to the customer.
**Master card  Paypass**

Pay pass is launched in 2002 by the MasterCard. This contact less smart card eliminate the need to swipe the card at the terminal. Customer tap the card at the card reader and transmit the payment details wirelessly. The Vendors like Chase, MBNA, Citibank are the vendors bank who support Paypass. Theses banks are piloting this product in Orlando and Florida.

**American Express Express pay**

Express Pay is another Contact less payment scheme that is targeted for fast and small value transaction. This is being piloted in Phoenix, Arizona. Express is an account based transaction. Once the customer enrolls for the transaction they need to specify an account that should be used for Express pay transaction.

Customer has two options. The Express pay direct link, which have the daily spending limit of $150, links directly connects to an account or credit card for the payment. Express pay preloaded can preload up to $600 per month.

**E-ZPass**

E-ZPass uses ultra-high frequency RF transponder especially used for paying tolls in the Highways, bridges, airport parking lots etc. it uses account based payment scheme where in which the customer is authorized by the transponder. The amount is directly deducted from the customers account.

**Mobile commerce**

The mobile commerce market has seen high growth through-out the world. The SIM card in the mobile phones will allow issuers to provide an easier payment mechanism for mobile commerce. Other technologies, such as Bluetooth, are also being investigated to further mobile commerce. On-payment applications such as identity authentication and information provisioning will be key to driving this market.

**MasterCard PayPass**

MasterCard PayPass, which was announced in December 2002, eliminates the need for consumers to swipe their credit or debit cards through a reader. Consumers tap their payment cards on (or wave them at) a specially equipped merchant terminal, transmitting payment information wirelessly from the consumer to the merchant.

In 2003, Nokia, AT&T Wireless, JP Morgan Chase, and MasterCard ran a pilot in Dallas, Texas, in which the PayPass RF chip was embedded in the back panel of a Nokia phone.
Cingular

Cingular was involved in other mobile payment pilots at the University of Southern California (USC) and Santa Clara University, in which infrared was used to communicate payment information between a phone/PDA and a physical POS terminal. The pilot users paid for products at on-campus locations using their campus debit card by beaming the card information to the POS terminal via IR technology.

Dexit4

Dexit4 has introduced a contact less RF payment service in Toronto, Canada, that offers an alternative to cash for low-value, everyday purchases. Consumers who register for a Dexit customer account are issued RF-based payment tags in the form of key fobs or adhesive stickers that can be attached to mobile phones or other devices. To use the tag at a participating merchant, the customer pre-pays funds into a Dexit account and then replenishes the account for a fee, as needed. Dexit has partnered with Bell Canada, TD Canada Trust, National Bank of Canada and TELUS Mobility to offer the Dexit service. As of September 30, 2004, more than 300 merchant locations in and around downtown Toronto were accepting Dexit tag payments and more than 37,000 consumers were registered for the Dexit service.

MobileLime5

MobileLime5, a mobile payment pilot that was launched in the Boston area in 2004, allows consumers to pay for retail goods and services using their mobile phones and a credit card or prepaid account. After registering, the consumer speed-dials a toll-free number, enters a location ID, listens to the purchase amount, and then enters a personal identification number (PIN) to approve the purchase. A text receipt is sent either to the phone or to an e-mail account that is established at the time of registration. Over 7,000 users and 40 merchants now accept MobileLime payment in the Boston area, including some Subway and Quizno’s sandwich stores, movie theaters, restaurants, and taxi services. In the first quarter of 2005 at the National Retail Forum, MobileLime was launched nationally.

I-mode FeliCa

Japan’s mobile phone operators have introduced mobile payment applications. NTT DoCoMo, the largest mobile phone operators in Japan (with over 60% of the market), has been piloting their i-mode FeliCa service for over a year and introduced the service to the public in August 2004. This service is a joint venture between Sony, NTT DoCoMo, and East Japan Railway Company (JR East). Currently there are over 20 i-Mode retail and banking partners. Payments can be accepted in several environments, including cafeterias, vending machines, gaming venues, retail POS, airline ticketing, and concert/event ticketing. As of December 2004, four manufacturers offer the NTT DoCoMo smart phone with a built-in Sony FeliCa chip: Panasonic, Sony-Ericsson, Sharp, and Fujitsu.
As of December 2004, 43 million NTT DoCoMo subscribers are using i-mode. Vodafone's local unit (formerly J-Phone) is testing similar technology, while KDDI, the country's number two carrier, plans to launch a competing product early in 2005.

**Moneta Card**

At the end of 2001, South Korea Telecom (SKT), in conjunction with five South Korean issuers, launched the Moneta Mobile Card. The Moneta card, a smart card based on Global Platform technology, supports several applications, including EMV credit, Visa Cash e-purse, SKT membership functions, and the SKT OK Cashbag loyalty application. All cardholders had a mobile phone incorporating a full-size smart card slot into which the cardholder inserted the Moneta card to complete transactions over SKT’s mobile network. As of March 2003, SKT redesigned the phone, so that the cardholder can insert the SIM-size Moneta chip on the back of the phone to complete transactions with offline (i.e., physical) merchants. SKT has installed 330,000 dongles and sold 520,000 handsets fitted with the payment chip since the service was launched.

**MIFARE cards**

In late 2004, the Proximity Mobile Transaction Service Alliance of Taiwan officially launched a new initiative that incorporates contactless Near Field Communication (NFC) technology into mobile handsets so that commuters can pay with a wave of their phones instead of the contactless “Easy Cards” they currently use. Both Visa International and MasterCard International are part of the Taiwan alliance, along with such telecommunications companies as Chung-Hwa Telcom, Far EastTone Telecommunications, Taiwan Cellular Corp., and VIBO Telecom. Taipei Smart Card Company, which has issued 4 million contact less MIFARE cards used for Taiwan public transit, is responsible for deploying the contact less infrastructure for the alliance.

**Simpay**

In 2003, Orange, Telefonica Moviles, T-Mobile, and Vodafone announced Simpay, a mobile payment scheme that allows customers to make low-priced purchases through mobile operator-managed accounts. Recently, two additional operators have joined Simpay – Amena from Spain and Proximus from Belgium – which means the scheme now has members in 20 European countries with over 300 million mobile consumers across Europe. Simpay will go into use in Spain in mid-2005, followed by launches in the United Kingdom and Belgium in the fourth quarter of 2005. Simpay is estimating that it will generate 1 billion euros (US$1.3 billion) in revenues through its system by 2007 [Wireless Week, op. cit.]

The vendors involved in the design and implementation of the Simpay payment platform include Valista, Encorus (First Data), and QPass. Valista's payments software will be used by Orange and its partner France Telecom's w-HA when the carrier launches Simpay. A number of other service providers globally are using the payments software.
from Valista. Valista provides payments solutions to America Online and the large lottery operator, G-Technology, in the United States

**MobileCredit**

In South Africa, CreditPipe/MTN has introduced Mobilecredit, a mobile commerce solution enabling merchants to process credit card and check payments using a mobile phone instead of a POS terminal. To perform a transaction a merchant can telephone, using either the MobileCredit option on the MTN menu on the SIM card (MTN subscribers only) or the MobileCredit line number. The merchant is prompted for the details of the transaction, and the transaction is processed using CreditPipe by the appropriate bank.

The service can be used to authorize credit card transactions and guarantee checks, and in both cases a reference number is sent to the merchant’s phone as an SMS to confirm the transaction.

**mCheque**

In Nov 2005 A Little world in association with Airtel and other leading banks in India has launched a mobile payment scheme. With mCheque it is possible to pay from one mobile device to another mobile device. This scheme uses encrypted sms for transferring the money equivalent from one account to another.

The credit/ debit card information is saved inside the sim card. An application in SIM card enable the transaction. Your mobile can hold up to 16 credit/debit cards from different banks. Use a single PIN to secure all your cards. MCheque brings the ultimate convenience to pay all utility bills, insurance premiums, credit card bills, EMIs, school fees – register once for each biller – and bills are sent to your mobile to be paid in seconds through your mobile. this pay scheme even enable to pay even through internet.
**Transit Application**

The transportation and transit market is already moving ahead with smart card technology. These systems use smart card-based electronic tokens for fare collection. Issuers can take advantage of these systems by offering a payment method tied to the transit cards at nearby retailers.

**GO Mumbai**

In 2004 A Little World pvt ltd has launched a transit ticketing system for one of the largest public transportation for Mumbai India. Card is easy to re-load by paying cash or by debiting your bank account. Hundreds of re-load points are being set up all over Mumbai. BEST, HPCL and ICICI Bank are program partners for GO Mumbai. The cards can be used for multiple other applications including payment at shops using debit/creditor stored value; recording service details of utility bills; HP Gas SV/TV vouchers; loyalty; confidential data storage; digital signatures; mediclaim and many other applications. Limited number of cards has been issued for the piloting.

**Hong Kong Octopus card**

In 1997 Octopus card is launched as a e purse for public transportation. Over 9 million card and 150,000 watche have been issued and over 7 million transaction are recorded in 2 years. This contact less smart card ticketing include 100 service provider. The use of card has shortened queues at ticket barriers. In addition to that the card can be used for payments at photo booth and pay phones. after 5 years of implementation 25 percent of card transactions are unrelated to transit. More than 160 merchant started accepting the card. This include leading supermarket & care shapes, softdrink vending machine, payphones and other recreational centers. Nokia has launched a mobile phone cover that include an embedded octopus chip. twelve Honkong a bank are one credit card company support octopus card. According to the official report by asian pacific smart card association 95% of the “economically active population” in Hong Kong was using octopus card.

**Washington Metropolitan travel card**

Washington Metropolitan travel authority launched contact less smartcard called smart trip in May 1999. Just over 4 years more than, 360000 travelers started using smartcard. Increasing acceptance of smart trip cards is used both Contac less transit payment card. Survey data gathered from cardholder indicates that the card holder have found very high level of acceptance and has let to 99% customer satisfaction index.
London Oyster cards

In 2002 transys introduced smartcard payment for London commuters. In Nov 2002, 6000 buses and 255 tube stations were equipped to accept the smartcard payment. It is expected that 5 million cards will be issued in the greater London area. There are over 16,000 Oyster card enabled terminals spread throughout London. The cards can be reloaded via the online facilities and at ticket offices.

San Francisco Bay Transit link

Metropolitan transport commission of san francisco bay are has introduced smartcard for their transit system. Approximately 7000 contactless smartcard called translink cards have been distributed for phase 1. Ultimately 26 transit operators could participate in the program. This card complies with ISO standard for smartcard and card has 4Kb of internal memory for data and application storage. The card has a dual interface. A central clearing house and service bureau operator can be reloaded with variety of means, including telephones, mail, and internet. The Translink card can then be used to pay at parking and tolling taxis and retail payments.

Campuses & Government

Both college and business campuses have begun to use smart cards. Major uses have been: asset tracking; meal plans; physical access to labs, dorms, and special events; network logons; and secure data storage, including personnel records, digital certificates and health data. The same card can also have a financial application, allowing purchases on campus and at nearby retailers via stored value or prepaid accounts.

The power of the smart card for government health and entitlement programs lies in the card’s ability to hold both payment and non-payment applications. Government can also use smart cards to control both physical and logical access to facilities and networks and can expand the number of programs and agencies that are using smart cards for identification.

Challenges in implementing Mobile/smartcard based payment systems

In the coming years thousands of merchant start accepting payments by RF-enabled contactless devices through the MasterCard, Visa, and American Express. In this case there are a lot challenges we need to address before going for mass deployment.

A sufficient supply of mobile phones with contactless RF technology is needed. Before mobile phone payment can be a standard at physical stores, enough merchant locations must be enabled to accept this payment method and a sufficient supply of mobile phones...
must be available to consumers to support payment. Most major mobile phone manufacturers will need to enable numerous phone models. The process may be as straightforward as providing a standardized location for consumers to insert their contact less payment device as an accessory, or it may require other changes to integrate payment functionality with other phone services. In the case of smartcard payments deployment, availability and cost of POS terminals is yet another factor that hinder the implementation of smartcard sort of payment.

Mobile phones must be designed to support branded financial applications.
- The current specifications for the MasterCard PayPass, American Express ExpressPay, and Visa Contact less programs will allow the same interface to be used between mobile phones and contact less POS systems, allowing mobile payments to leverage the thousands of contact less readers being deployed.

Card issuers need to proactively issue mobile “payment cards” to their card holders. Card issuers will need to implement the infrastructure required to issue mobile payment cards securely. Consumers need to be able to add and move payment functionality to their mobile phones easily. Most pilots described earlier involved only one card issuer per pilot; card issuers and mobile operators will need to support and provide the management tools required for multiple payment cards and transactions from multiple mobile phones per consumer.

A mobile phone infrastructure is needed to support the payment services. Enough merchants must accept contact less payments to encourage consumer use of mobile and contact less payment devices. Consumers need mobile phones that support payment and they need to be able to use their mobile phones to make payments at a wide variety of merchants. But merchants must see sufficient consumer demand to justify investing in new POS equipment that supports contact less payment. This is a kind of chicken and egg problem.

**Conclusion**

In this paper we have seen various smart card payment schemes which are becoming popular. Even though certain systems are launched successfully and the piloting result also reveals that customer is satisfied with the new payment scheme, not getting much popularity because of the above mentioned challenges. But every one is agreeing unanimously that current system of payment need to be changed. It is oblivious that the current system has a lot of loop holes in terms of security. While looking forward a new system of payment and its adoption by the society also need very good initiative to train the public. In certain countries these system are restricted by law.

Due to the high penetration of mobile devices and its capability for storage and processing reveals innovative opportunity for payment scheme. Since this technology need to be matured, smartcard payment scheme are under observation by the business giants.
Reference

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