

Smart Card Systems : Multi-application Technologies and Strategies

The fundamentals of multi-application systems

Multiple applications are provided by multiple suppliers. The case for multi-application smart card systems requires that the applications will be sourced from a variety of issuers rather than just one. This is because the costs and benefits that are essential to market growth have to be distributed across many organizations. If single parties issue all the applications, the costs will be higher and the benefits may be lower.

This has profound implications :

- implementers and adopters that had no previous business relationship (or considered themselves as competitors) will have to form co-operative working relationships so that they can both benefit from smart cards,
- the standardization of system components is critical to developing the smart card market – multiple parties must create components that will interoperate. Standardization starts with card applications but extends to the cards themselves, interface devices, transaction message formats and back-end servers.

Multi-application systems are essential for market growth

The smart card market depends on multi-application systems, including closed schemes. There are six reasons for this dependence :

- cost versus benefit for existing issuers,
- the low cost of entry for newcomers combining applications to increase overall card usage,
- the natural affinity between application suppliers,
- consumer convenience,
- the smart card's use in a pervasive computing environment.

Cost versus benefit for existing card issuers : Combining applications from multiple sources improves the return on investment. The cost of migrating the infrastructure can be shared across application issuers, and infrastructures can be linked to provide the required scale of implementation.

Most issuers of non-smart cards are finding that the cost of migrating from existing technologies to smart cards is expensive – often prohibitively so. The technology upgrade – in terms of equipment costs & field installation and the scale of the incumbent infrastructure – is the main cost : for example, there are 14 million magnetic stripe-based point-of-sale terminals worldwide. MasterCard and Visa have stated their intention to migrate to smart cards, but the owners and leasers of the interface devices (that is, the banks and merchants) are wary of the huge cost that this will involve and are unconvinced of the benefits it will bring.

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There are few proven examples of a positive return on investment : these are limited to prepayment schemes, loyalty and closed schemes. Other application types promise a return on investment (such as credit and debit cards, and e-cash) but results have been inconclusive – at best, they show a lengthy return on the investment period.

The low cost of entry for newcomers : Multiple application environments offer the least expensive (and possibly the only) opportunity for potential applications issuers to enter the smart card market. They may not be able to afford to issue cards and/or install an infrastructure, but by incorporating interface devices and infrastructure provided by other organisations, they could restrict their investment to developing (or sourcing) an application and leasing capacity on the smart card system.

Combining applications to increase overall card usage

An advantage of storing two complementary applications on the same card is that using one application may increase the use of the other. This is especially important if the second application has significant inhibitors to its adoption.

A loyalty application may be combined with e-cash, for example : consumers are familiar with loyalty programmes and they bring concrete benefits. E-cash, however, presents an extremely difficult proposition to consumers. There is no obvious benefit over physical cash or other methods of payment. By linking the use of the loyalty application with e-cash – increasing the loyalty points awarded if payment is made by e-cash, for example – consumers will be encouraged to use e-cash. This type of relationship is happening in the Burger King loyalty scheme trials in association with Mondex, and with McDonalds and GeldKarte in Germany.

The natural affinity between application suppliers : There are many smart card applications issuers that will want to combine their products with those of other non-competing organisations. For example, American Express offers a smart card programme in association with Hilton Hotels and American Airlines. Combining these issuers presents a strong offering to the target audience (in this case, business travellers).

Another generic example is the university campus scheme. Even when the scheme was introduced and functionality was still limited, it was quickly supplemented by other applications from issuers outside the university administration, including banks, and transport authorities. The captive market supplied by the campus attracts these organisations and the schemes offer excellent opportunities to establish a customer relationship with young adults. The approach here is to establish a market and then extract economic rent from partners that join later.

Consumer convenience

Smart card systems will be more successful in terms of consumer adoption and usage if they are delivered as packages of applications. Consumers prefer the convenience of having a variety of applications within a single delivery channel. The value of the Internet, for example, is that it brings a huge number of applications straight to the consumer. Consumers also prefer :

- having supermarkets with in-store bank and pharmacy services
- to receive one bill that consolidates their utility service payments
- to be able to buy stamps from a bank ATM.

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The main factor in building consumer demand is identifying those applications that collectively appeal to the targeted group of cardholders. This will vary by geography, environment and demographics.

It is important to differentiate between consumer acceptance and consumer demand. Consumer acceptance is essential for supply-driven markets but may involve expensive marketing and promotion. Consumer demand creates a market with its own momentum that is based on the proposition to the consumer population. To date, there has been little consumer demand for smart cards because of :

- a weak proposition
- the fact that consumer acceptance of single application systems (such as e-cash) has been low.

The smart card's use in a pervasive computing environment : A multi-application smart card can be used in a variety of situations and transactions, including those unrelated in traditional business models. A smart card can plug into a variety of devices and infrastructures; it can also span the physical and virtual worlds to offer services wherever consumers are. It can therefore be used in a so-called pervasive computing environment.

The goal of pervasive computing is to enable service providers to develop applications that can be accessed over a network from a broad range of devices. A single application could be accessed from any device or any location.

Multi-applications change business relationships

The existing infrastructure for non-smart cards is based on complete control of the system components by one organisation, and/or by organisations collaborating within a vertical industry. This changes in multi-application systems, but extending control to multiple parties increases business and technical complexity. Many suppliers may provide each type of component in a system: this complexity has significant consequences for the ways in which a smart card system is implemented.

Who owns multi-application cards ? Existing issuers of single-application cards cannot assume that they will own the multi-application card ; one organisation may own the card, or an association of organisations may own the card jointly. Few organisations will maintain complete ownership of a multi-application card. For most card issuers moving to multi-application systems, control of the card's content, integrity and physical design is removed or diluted.

This situation leads to a battle between potential issuers of multi-application cards as they compete to be the card owner or dominant partner – and therefore own what they perceive to be the customer relationship. For example, the Creative Star consortium of companies in Hong Kong operates the Octopus contactless card travel ticketing scheme. Four million cards have been issued and most of them are used regularly. In contrast, the banking community in Hong Kong has issued around 400,000 cards associated with Mondex and Visa and many of which are not used.

Creative Star and the banks have been in contact with each other to discuss locating an application on the other's card. The banks have traditionally assumed that they would be the card issuer and dominant brand. Given the transport system's larger installed base and higher usage rate, however, it would be advantageous to both parties if the bank application resided on the Octopus cards. This is unacceptable for the banks, so co-operation has stalled.

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Consumers may own the card : It is possible that consumers themselves will own cards and, to some degree, control the loading and unloading of applications on their card. This case mirrors that of consumer PC ownership, where applications are loaded from CD-ROMs or over the Internet, or are pre-installed. The business model for application issuers changes significantly, because they are competing in a completely open market for the attention and business of consumers.

Who owns multi-application interface devices?

It is likely in a multi-application system that the card issuers will not own or control the interface devices that interact with the cards. Interface devices mediate between cards and servers : their provision by a third party introduces an intermediary service provider. This affects the business model for card issuers and means that they may have to pay for their applications to be supported by devices. A prime example of this type of intermediary is the use of a payphone or cellular network for a variety of smart card applications.

Fixed-network in the UK, Australia, the US, Japan and Switzerland have installed smart card-based payphone networks. Cellular handset manufacturers, such as Alcatel and Motorola, have entered the smart card interface devices market with their dual-slot handsets. Visa has coined the term 'point of convenience', referring to an interface device where consumers may buy or trade their loyalty points, be identified, present their prescriptions, and so on. This type of device assumes that it will be possible to service many applications from different issuers.

Consumers may own the device : Consumers could own smart card interface devices. It is likely, for example, that they will buy smart card interface devices for their PCs either as external peripherals to upgrade their existing equipment or as part of a new system. Microsoft and Intel recommend smart card readers as a standard for PCs in their PC99 specification.

Who owns multi-application networks ? Issuers of applications on multi-application cards will not own the networks that the transactions are carried over. This is because :

- with advances in cryptography, transaction data can be sent over public networks instead of private (and expensive) networks,
- those organisations with installed public networks are already positioning themselves as transaction carriers. The companies that are installing smart card-ready payphone infrastructures are also planning a business based on carrying transaction data,
- the Internet will also be a major network for carrying smart card transaction data.

Operators of private networks also have an opportunity to open up their networks to carry new transaction types. There will be a significant overlap of suppliers providing network services and other value-added services.

Who owns multi-application servers ? A variety of smart card system servers have to support multiple applications from multiple issuers that co-exist within the same system. It is likely, for example, that each application issuer will have their own server to perform the actual transaction processing (account debits, user verifications and so on).

It is unlikely, however, that an application issuer's server will be the first or only computer to touch the transaction as it is transmitted from the interface device – there may be several constituent routers or switches in the system back-end.

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The frontline server could be owned and operated by any organisation – whether they provide an application for the system or not. Telstra, for example, plans to process financial transactions on behalf of banks that use its network infrastructure. Visa is planning to offer additional services to non-financial industries, capitalising on their global network.

A new service provider market is emerging for buying multi-application transactions. MasterCard intends to outsource buying Mondex transactions in the US to a third-party provider – for example, First Data Corporation. Nobil (based in Toronto, Canada) provides a gateway system that allows consistent payment and data presentation services to be accessed from multiple platforms such as the Internet, point-of-sale devices, kiosks and telephony devices. The system is aimed at financial service organisations, but could be used by any service provider to buy any transaction type.